

# **Project Manual**

with project specifications

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## **Town of Barrington NH** **Town Office Project**

Ramsdell Lane, Barrington NH



Sheerr McCrystal Palson Architecture, Inc.  
Concord, NH

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**December 11, 2015**

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Not used

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Owner: **Town of Barrington New Hampshire**  
John Scruton, Town Administrator, Owner's Representative.  
333 Calef Highway (PO Box 660), Barrington NH 03825  
Telephone (603) 664-9007  
[barringtonta@gmail.com](mailto:barringtonta@gmail.com)

Architect: **Sheerr McCrystal Palson Architecture, Inc.**  
Jason LaCombe AIA  
30 South Main Street, Building Two, Concord NH 03301  
Telephone (603) 228-8880, Fax (603) 228-8881  
[sheerr@sheerr.com](mailto:sheerr@sheerr.com)

Structural Engineer: **JSN Associates**  
Hossein Salehkhrou  
One Autumn Street, Portsmouth NH 03801  
Telephone (603) 433-8639 X205  
[hossein@jsneng.com](mailto:hossein@jsneng.com)

Mechanical Engineer: **Kohler and Lewis Engineers**  
Adam Kohler, PE, LEED AP BD+C  
27 Mechanic St., Keene, NH 03431  
Telephone (603) 352-4841  
[adam@kohlerandlewis.com](mailto:adam@kohlerandlewis.com)

Electrical Engineer: **Swiftcurrent Engineering Services, Inc.**  
Timothy Matthews P.E.  
10 Forest Falls Drive, Unit 4B, Yarmouth ME 04096  
Telephone (207) 847-9280 X301  
[tim@swiftcurrenteng.com](mailto:tim@swiftcurrenteng.com)

### Owner's Consultants

Site/Civil Engineer: **DuBois and King inc.**  
Jeff Adler  
18 Constitution Drive, Suite 8, Bedford NH03110  
Telephone (603) 637-1043  
[jadler@Dubois-king.com](mailto:jadler@Dubois-king.com)

## END OF PROJECT DIRECTORY

DOCUMENT 000101 - PROJECT TITLE PAGE

1.1 PROJECT MANUAL VOLUME 1 – **Bid and Construction Set**

- A. Barrington Town Office
- B. Town of Barrington New Hampshire
- C. Architect Project No. 1312



- D. Sheerr McCrystal Palson Architecture Inc. dba SMP Architecture
- E. 30 South Main Street, Building Two
- F. Concord NH. 03301
- G. Phone: 603-228-8880
- H. Fax: 603-228-8881
- I. Web Site: Sheerr.com
- J. Issued: December 14, 2015
- K. Copyright 2015, SMP Architecture All rights reserved.

END OF DOCUMENT 000101

## DOCUMENT 001116 - INVITATION TO BID

### 1.1 PROJECT INFORMATION

- A. Notice to Bidders: **Qualified** bidders are invited to submit bids for Project as described in this Document according to the Instructions to Bidders.
- B. Project Identification: Barrington Town Office Project
  - 1. Project Location: Ramsdell Lane, Barrington New Hampshire
- C. Owner: Town of Barrington New Hampshire
  - 1. Owner's Representative: John Scruton, Town Administrator
- D. Architect: Sheerr McCrystal Palson Architecture Inc. dba SMP Architecture
- E. Project Description: Project consists of an all new one story building of approximately 10,000 sf with a partial walk-out basement.
- F. Construction Contract: Bids will be received for the following Work:
  - 1. General Contract (all trades).

### 1.2 BID SUBMITTAL AND OPENING

- A. Owner will receive sealed bids until the bid time and date at the location indicated below. Owner will consider bids prepared in compliance with the Instructions to Bidders issued by Owner, and delivered as follows:
  - 1. Bid Date: January 8, 2016
  - 2. Bid Time: **2:00 p.m.** local time.
  - 3. Location: Barrington Town Office Planning Department
    - a. 333 Calef Highway, (Route 25) Barrington NH.
- B. Bids will be thereafter **publicly opened and read aloud.**

### 1.3 BID SECURITY

- A. Bid security shall be submitted with each bid in the amount of **5** percent of the bid amount. No bids may be withdrawn for a period of **60** days after opening of bids. Owner reserves the right to reject any and all bids and to waive informalities and irregularities.

### 1.4 PREBID CONFERENCE

- A. A non-mandatory prebid conference for all bidders will be held at the Early Childhood Learning Center 77 Ramsdell Lane, on December 21, 2015 at **3:00 p.m.** local time.

## 1.5 DOCUMENTS

- A. Printed Procurement and Contracting Documents: Obtain after December 15, 2015 by contacting Signature Digital, Hooksett NH. Documents will be available to all bidders. Only complete sets of documents will be issued.

## 1.6 BIDDER'S QUALIFICATIONS

- A. Bidders must be properly licensed under the laws governing their respective trades and be able to obtain insurance and bonds required for the Work.
- B. A Performance Bond, a separate Labor and Material Payment Bond, and Insurance in a form acceptable to Owner will be required of the successful Bidder.
- C. Bidders must submit AIA A305, Contractors Qualifications statement with bid with a least five references listed. Bidder may include any other company information such as brochures, project sheets, etc. at their discretion. Qualifications will be considered as part of the award of the project.
- D. Bidders must submit project schedule at time of bid, which will be considered as part of the award of the project.

END OF DOCUMENT 001116

## DOCUMENT 002213 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

### 1.1 INSTRUCTIONS TO BIDDERS

- A. Instructions to Bidders for Project consist of the following:
  - 1. AIA Document A701, "Instructions to Bidders, **a copy of which is bound in this Project Manual.**
  - 2. The following Supplementary Instructions to Bidders that modify and add to the requirements of the Instructions to Bidders.

### 1.2 SUPPLEMENTARY INSTRUCTIONS TO BIDDERS, GENERAL

- A. The following supplements modify AIA Document A701, "Instructions to Bidders." Where a portion of the Instructions to Bidders is modified or deleted by these Supplementary Instructions to Bidders, unaltered portions of the Instructions to Bidders shall remain in effect.

### 1.3 ARTICLE 2 - BIDDER'S REPRESENTATIONS

- A. Add Section 2.1.3.1:
  - 1. 2.1.3.1 - The Bidder has investigated all required fees, permits, and regulatory requirements of authorities having jurisdiction and has properly included in the submitted bid the cost of such fees, permits, and requirements not otherwise indicated as provided by Owner.
- B. Add Section 2.1.6:
  - 1. 2.1.6 - The Bidder has incorporated into the Bid adequate sums for work performed by installers whose qualifications meet those indicated in the Procurement and Contracting Documents.

### 1.4 ARTICLE 3 - BIDDING DOCUMENTS

- A. 3.4 - Addenda:
  - 1. Delete Section 3.4.3 and replace with the following:
    - a. 3.4.3 - Addenda may be issued at any time prior to the receipt of bids.
  - 2. Add Section 3.4.4.1:
    - a. 3.4.4.1 - Owner may elect to waive the requirement for acknowledging receipt of 3.4.4 Addenda as follows:

- 1) 3.4.4.1.1 - Information received as part of the Bid indicates that the Bid, as submitted, reflects modifications to the Procurement and Contracting Documents included in an unacknowledged Addendum.
- 2) 3.4.4.1.2 - Modifications to the Procurement and Contracting Documents in an unacknowledged Addendum do not, in the opinion of Owner, affect the Contract Sum or Contract Time.

## 1.5 ARTICLE 4 - BIDDING PROCEDURES

### A. 4.1 - Preparation of Bids:

#### 1. Add Section 4.1.8:

- a. 4.1.8 - The Bid shall include unit prices when called for by the Procurement and Contracting Documents. Owner may elect to consider unit prices in the determination of award. Unit prices will be incorporated into the Contract.

#### 2. Add Section 4.1.9:

- a. 4.1.9 - Owner may elect to disqualify a bid due to failure to submit a bid in the form requested, failure to bid requested alternates or unit prices, failure to complete entries in all blanks in the Bid Form, or inclusion by the Bidder of any alternates, conditions, limitations or provisions not called for.

### B. 4.4 - Modification or Withdrawal of Bids:

#### 1. Add the following sections to 4.4.2:

- a. 4.4.2.1 - Such modifications to or withdrawal of a bid may only be made by persons authorized to act on behalf of the Bidder. Authorized persons are those so identified in the Bidder's corporate bylaws, specifically empowered by the Bidder's charter or similar legally binding document acceptable to Owner, or by a power of attorney, signed and dated, describing the scope and limitations of the power of attorney. Make such documentation available to Owner at the time of seeking modifications or withdrawal of the Bid.

### C. 4.5 - Break-Out Pricing Bid Supplement:

#### 1. Add Section 4.5:

- a. 4.5 - Provide detailed cost breakdowns no later than two business days following Architect's request.

### D. 4.6 - Subcontractors, Suppliers, and Manufacturers List Bid Supplement:

#### 1. Add Section 4.6:

- a. 4.6 - Provide list of major subcontractors, suppliers, and manufacturers furnishing or installing products no later than **two** business days following Architect's request. Include those subcontractors, suppliers, and manufacturers providing work totaling

**three** percent or more of the Bid amount. Do not change subcontractors, suppliers, and manufacturers from those submitted without approval of Architect.

1.6 ARTICLE 5 - CONSIDERATION OF BIDS

A. 5.2 - Rejection of Bids:

1. Add Section 5.2.1:

- a. 5.2.1 - Owner reserves the right to reject a bid based on Owner's and Architect's evaluation of qualification information submitted following opening of bids. Owner's evaluation of the Bidder's qualifications will include: status of licensure and record of compliance with licensing requirements, record of quality of completed work, record of Project completion and ability to complete, record of financial management including financial resources available to complete Project and record of timely payment of obligations, record of Project site management including compliance with requirements of authorities having jurisdiction, record of and number of current claims and disputes and the status of their resolution, and qualifications of the Bidder's proposed Project staff and proposed subcontractors.

1.7 ARTICLE 6 - POSTBID INFORMATION

A. 6.1 - Contractor's Qualification Statement:

1. Add Section 6.1.1:

- a. 6.1.1 - Submit Contractor's Qualification Statement concurrent with bid.

B. 6.3 - Submittals:

1. Add Section 6.3.1.4:

- a. 6.3.1.4 - Submit information requested in Sections 6.3.1.1, 6.3.1.2, and 6.3.1.3 no later than **two** business days following Architect's request.

1.8 ARTICLE 7 - PERFORMANCE BOND AND PAYMENT BOND

A. 7.1 - Bond Requirements:

1. Add Section 7.1.1.1:

- a. 7.1.1.1 - Both a Performance Bond and a Payment Bond will be required, each in an amount equal to 100 percent of the Contract Sum.

B. 7.2 - Time of Delivery and Form of Bonds:

1. Delete the first sentence of Section 7.2.1 and insert the following:



- a. The Bidder shall deliver the required bonds to Owner no later than **10** days after the date of Notice of Intent to Award and no later than the date of execution of the Contract, whichever occurs first. Owner may deem the failure of the Bidder to deliver required bonds within the period of time allowed a default.
  2. Delete Section 7.2.3 and insert the following:
    - a. 7.2.3 - Bonds shall be executed and be in force on the date of the execution of the Contract.
- 1.9 ARTICLE 8 - FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR
- A. As indicated in Section 006000 "PROJECT FORMS".
  - B. As modified by the requirements of other sections including, but not limited to, this Section and SECTION 002300.
- 1.10 ARTICLE 9 - EXECUTION OF THE CONTRACT
- A. Add Article 9:
    1. 9.1.1 - Subsequent to the Notice of Intent to Award, and within **10** days, the Awardee shall **draft, execute and deliver the Agreement to Owner**, in such number of counterparts as Owner may require.
    2. 9.1.2 - Owner may deem as a default the failure of the Awardee to execute the Contract and to supply the required bonds when the Agreement is presented for signature within the period of time allowed.
    3. 9.1.3 - Unless otherwise indicated in the Procurement and Contracting Documents or the executed Agreement, the date of commencement of the Work shall be the date of the executed Agreement.
    4. 9.1.4 - In the event of a default, Owner may declare the amount of the Bid security forfeited and elect to either award the Contract to the next responsible bidder or re-advertise for bids.
- 1.11 ARTICLE 10 – INSURANCE AND INDEMNIFICATION
- A. Add Article 10.1:
    1. Contractor to provide insurance certificates to the owner prior to commencing work or within 5 days of execution of the contract, whichever is earlier.
    2. Owner shall be listed as an additional insured on the general liability policies.
    3. Insurance limits as follows:
      - a. General Liability : \$1,000,000 per occurrence/ \$5,000,000 Aggregate
      - b. Motor Vehicle Liability : \$1,000,000 Combined Single Limit
      - c. Workers Compensation : As required by the State of New Hampshire

END OF DOCUMENT 002213



# Document A701™ – 1997

## Instructions to Bidders

### for the following PROJECT:

(Name and location or address)

Barrington Town Offices  
Ramsdell Lane  
Barrington NH

### THE OWNER:

(Name, legal status and address)

Town of Barrington, NH  
333 Calef Highway  
Barrington, NH 03825

### THE ARCHITECT:

(Name, legal status and address)

Sheerr McCrystal Palson Architecture, Inc.  
30 South Main Street  
Building 2, Suite 401  
Concord NH 03301

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

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## ARTICLE 1 DEFINITIONS

§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

§ 1.2 Definitions set forth in the General Conditions of the Contract for Construction, AIA Document A201, or in other Contract Documents are applicable to the Bidding Documents.

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

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

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

§ 1.6 An Alternate Bid (or Alternate) is an amount stated in the Bid to be added to or deducted from the amount of the Base Bid if the corresponding change in the Work, as described in the Bidding Documents, is accepted.

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

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

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

## ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

§ 2.1.2 The Bid is made in compliance with the Bidding Documents.

§ 2.1.3 The Bidder has visited the site, become familiar with local conditions under which the Work is to be performed and has correlated the Bidder's personal observations with the requirements of the proposed Contract Documents.

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception.

## ARTICLE 3 BIDDING DOCUMENTS

### § 3.1 COPIES

§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.



§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

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

§ 3.1.4 The Owner and Architect may make copies of the Bidding Documents available on the above terms for the purpose of obtaining Bids on the Work. No license or grant of use is conferred by issuance of copies of the Bidding Documents.

## § 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

§ 3.2.1 The Bidder shall carefully study and compare the Bidding Documents with each other, and with other work being bid concurrently or presently under construction to the extent that it relates to the Work for which the Bid is submitted, shall examine the site and local conditions, and shall at once report to the Architect errors, inconsistencies or ambiguities discovered.

§ 3.2.2 Bidders and Sub-bidders requiring clarification or interpretation of the Bidding Documents shall make a written request which shall reach the Architect at least seven days prior to the date for receipt of Bids.

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

## § 3.3 SUBSTITUTIONS

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

§ 3.3.2 No substitution will be considered prior to receipt of Bids unless written request for approval has been received by the Architect at least ten days prior to the date for receipt of Bids. Such requests shall include the name of the material or equipment for which it is to be substituted and a complete description of the proposed substitution including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

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

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

## § 3.4 ADDENDA

§ 3.4.1 Addenda will be transmitted to all who are known by the issuing office to have received a complete set of Bidding Documents.

§ 3.4.2 Copies of Addenda will be made available for inspection wherever Bidding Documents are on file for that purpose.

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

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



## ARTICLE 4 BIDDING PROCEDURES

### § 4.1 PREPARATION OF BIDS

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

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

§ 4.1.3 Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

§ 4.1.4 Interlineations, alterations and erasures must be initialed by the signer of the Bid.

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

§ 4.1.6 Where two or more Bids for designated portions of the Work have been requested, the Bidder may, without forfeiture of the bid security, state the Bidder's refusal to accept award of less than the combination of Bids stipulated by the Bidder. The Bidder shall make no additional stipulations on the bid form nor qualify the Bid in any other manner.

§ 4.1.7 Each copy of the Bid shall state the legal name of the Bidder and the nature of legal form of the Bidder. The Bidder shall provide evidence of legal authority to perform within the jurisdiction of the Work. Each copy shall be signed by the person or persons legally authorized to bind the Bidder to a contract. A Bid by a corporation shall further give the state of incorporation and have the corporate seal affixed. A Bid submitted by an agent shall have a current power of attorney attached certifying the agent's authority to bind the Bidder.

### § 4.2 BID SECURITY

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

§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney-in-fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney.

§ 4.2.3 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until either (a) the Contract has been executed and bonds, if required, have been furnished, or (b) the specified time has elapsed so that Bids may be withdrawn or (c) all Bids have been rejected.

### § 4.3 SUBMISSION OF BIDS

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

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids. Bids received after the time and date for receipt of Bids will be returned unopened.

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

§ 4.3.4 Oral, telephonic, telegraphic, facsimile or other electronically transmitted bids will not be considered.

### § 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.



§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

§ 4.4.3 Withdrawn Bids may be resubmitted up to the date and time designated for the receipt of Bids provided that they are then fully in conformance with these Instructions to Bidders.

§ 4.4.4 Bid security, if required, shall be in an amount sufficient for the Bid as resubmitted.

## **ARTICLE 5 CONSIDERATION OF BIDS**

### **§ 5.1 OPENING OF BIDS**

At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

### **§ 5.2 REJECTION OF BIDS**

The Owner shall have the right to reject any or all Bids. A Bid not accompanied by a required bid security or by other data required by the Bidding Documents, or a Bid which is in any way incomplete or irregular is subject to rejection.

### **§ 5.3 ACCEPTANCE OF BID (AWARD)**

§ 5.3.1 It is the intent of the Owner to award a Contract to the lowest qualified Bidder provided the Bid has been submitted in accordance with the requirements of the Bidding Documents and does not exceed the funds available. The Owner shall have the right to waive informalities and irregularities in a Bid received and to accept the Bid which, in the Owner's judgment, is in the Owner's own best interests.

§ 5.3.2 The Owner shall have the right to accept Alternates in any order or combination, unless otherwise specifically provided in the Bidding Documents, and to determine the low Bidder on the basis of the sum of the Base Bid and Alternates accepted.

## **ARTICLE 6 POST-BID INFORMATION**

### **§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT**

Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

### **§ 6.2 OWNER'S FINANCIAL CAPABILITY**

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

### **§ 6.3 SUBMITTALS**

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

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

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

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

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

## **ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND**

### **§ 7.1 BOND REQUIREMENTS**

§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.

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

§ 7.1.3 If the Owner requires that bonds be secured from other than the Bidder's usual sources, changes in cost will be adjusted as provided in the Contract Documents.

### **§ 7.2 TIME OF DELIVERY AND FORM OF BONDS**

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

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

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

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

## **ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR**

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.



## DOCUMENT 002513 - PREBID MEETINGS

### 1.1 PREBID MEETING

A. **Owner** and **Architect** will conduct a Prebid meeting as indicated below:

1. Meeting Date: December 21, 2015
2. Meeting Time: 3:00 pm local time.
3. Location: early Childhood Learning Center, 77 Ramsdell Lane with Site Walk-thru to follow.

B. Attendance:

1. Prime Bidders: Attendance at Prebid meeting is recommended.
2. Subcontractors: Attendance at Prebid meeting is recommended.

C. Bidder Questions: Submit written questions to be addressed at Prebid meeting minimum of **two** business days prior to meeting.

D. Agenda: Prebid meeting agenda will include review of topics that may affect proper preparation and submittal of bids, including the following:

1. Procurement and Contracting Requirements:
  - a. Bidder Qualifications.
  - b. Bonding.
  - c. Insurance.
  - d. Bid Security.
  - e. Bid Form and Attachments.
  - f. Bid Submittal Requirements.
2. Communication during Bidding Period:
3. Contracting Requirements:
  - a. Agreement.
  - b. The General Conditions.
  - c. The Supplementary Conditions.
4. Construction Documents:
  - a. Temporary Facilities.
  - b. Use of Site.
  - c. Work Restrictions.
  - d. Alternates, Allowances, and Unit Prices.
  - e. Substitutions following award.
5. Separate Contracts:
  - a. Work by Owner.



6. Schedule:
    - a. Project Schedule – submit with bid.
    - b. Other Bidder Questions.
  7. Site/facility visit or walkthrough.
  8. Post-Meeting Addendum.
- E. Minutes: Entity responsible for conducting meeting will record meeting minutes. Minutes of meeting are issued as Available Information and do not constitute a modification to the Procurement and Contracting Documents. Modifications to the Procurement and Contracting Documents are issued by written Addendum only.
1. Sign-in Sheet: Minutes will include list of meeting attendees.

END OF DOCUMENT 002513

## DOCUMENT 002600 - PROCUREMENT SUBSTITUTION PROCEDURES

### 1.1 DEFINITIONS

- A. Procurement Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Procurement and Contracting Documents, submitted prior to receipt of bids.
- B. Substitution Requests: Requests for changes in products, materials, equipment, and methods of construction from those indicated in the Contract Documents, submitted following Contract award. See Section 012500 "Substitution Procedures" for conditions under which Substitution requests will be considered following Contract award.

### 1.2 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

### 1.3 PROCUREMENT SUBSTITUTIONS

- A. Procurement Substitutions, General: By submitting a bid, the Bidder represents that its bid is based on materials and equipment described in the Procurement and Contracting Documents, including Addenda. Bidders are encouraged to request approval of qualifying substitute materials and equipment when the Specifications Sections list materials and equipment by product or manufacturer name.
- B. Procurement Substitution Requests will be received and considered by Owner when the following conditions are satisfied, as determined by Architect; otherwise requests will be returned without action:
  - 1. Extensive revisions to the Contract Documents are not required.
  - 2. Proposed changes are in keeping with the general intent of the Contract Documents, including the level of quality of the Work represented by the requirements therein.
  - 3. The request is fully documented and properly submitted.

### 1.4 SUBMITTALS

- A. Procurement Substitution Request: Submit to **Architect** Procurement Substitution Request must be made in writing by **prime contract Bidder only** in compliance with the following requirements:
  - 1. Requests for substitution of materials and equipment will be considered if received no later than 5 days prior to date of bid opening.
  - 2. Submittal Format: Submit each written Procurement Substitution Request, using **CSI Substitution Request Form 1.5C**.

- a. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specifications Sections and drawing numbers.
- b. Provide complete documentation on both the product specified and the proposed substitute, including the following information as appropriate:
  - 1) Point-by-point comparison of specified and proposed substitute product data, fabrication drawings, and installation procedures.
  - 2) Copies of current, independent third-party test data of salient product or system characteristics.
  - 3) Samples where applicable or when requested by Architect.
  - 4) Detailed comparison of significant qualities of the proposed substitute with those of the Work specified. 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.
  - 5) Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
  - 6) Research reports, where applicable, evidencing compliance with building code in effect for Project, from **ICC-ES**
  - 7) Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors, which will become necessary to accommodate the proposed substitute.
- c. Provide certification by manufacturer that the substitute proposed is equal to or superior to that required by the Procurement and Contracting Documents, and that its in-place performance will be equal to or superior to the product or equipment specified in the application indicated.
- d. Bidder, in submitting the Procurement Substitution Request, waives the right to additional payment or an extension of Contract Time because of the failure of the substitute to perform as represented in the Procurement Substitution Request.

B. Architect's Action:

- 1. Architect may request additional information or documentation necessary for evaluation of the Procurement Substitution Request. Architect will notify all bidders of acceptance of the proposed substitute by means of an Addendum to the Procurement and Contracting Documents.

C. Architect's approval of a substitute during bidding does not relieve Contractor of the responsibility to submit required shop drawings and to comply with all other requirements of the Contract Documents.

END OF DOCUMENT 002600

## DOCUMENT 003132 - GEOTECHNICAL DATA

### 1.1 GEOTECHNICAL DATA

- A. This Document with its referenced attachments is part of the Procurement and Contracting Requirements for Project. They provide Owner's information for Bidders' convenience and are intended to supplement rather than serve in lieu of Bidders' own investigations. They are made available for Bidders' convenience and information, but are not a warranty of existing conditions. This Document and its attachments are not part of the Contract Documents.
- B. A geotechnical investigation report for Project, prepared by Sovereign Consulting dated December 5, 2014, is bound into this project manual.**
- C. Related Requirements:
  - 1. Document 002113 "Instructions to Bidders" for the Bidder's responsibilities for examination of Project site and existing conditions.

END OF DOCUMENT 003132



# SOVEREIGN CONSULTING INC.

*Science, Service, Solutions*

## GEOTECHNICAL ENGINEERING REPORT

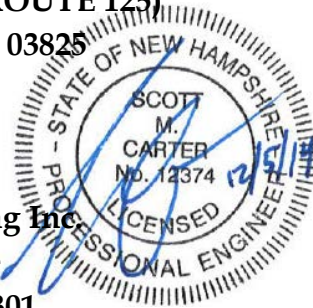
Proposed Town Hall  
Province Lane  
Barrington, New Hampshire

*Prepared for:*

TOWN OF BARRINGTON  
PO BOX 660  
333 CALEF HIGHWAY (ROUTE 125)  
BARRINGTON, NH 03825

*Prepared by:*

Sovereign Consulting Inc.  
7 Hills Avenue  
Concord, NH 03301



December 5, 2014

Project Number: NH067



## SOVEREIGN CONSULTING INC.

December 5, 2014

Mr. John Scruton  
Barrington NH Town Administrator  
PO Box 660  
333 Calef Highway (Route 125)  
Barrington, NH 03825

Re: **GEOTECHNICAL ENGINEERING REPORT**  
Proposed Town Hall  
Province Lane  
Barrington, New Hampshire  
Sovereign Project No. NH067

Dear Mr. Scruton:

Sovereign Consulting Inc. (Sovereign) has completed our geotechnical engineering services for the above referenced project. Services were performed in general accordance with our proposal dated September 11, 2014, and your subsequent authorization. This geotechnical engineering report presents the results of the subsurface explorations and provides geotechnical recommendations concerning earthwork and the design and construction of foundations for the proposed project.

We appreciate the opportunity to be of service to you on this project. If you have questions concerning this report, or if we may be of further service, please contact us.

Sincerely,  
**SOVEREIGN CONSULTING INC.**

Michael A. Ciance, PE  
Senior Engineer

Scott M. Carter, PE  
Project Manager

cc: Mr. Jason LaCombe, SMP Architecture

mac/NH067

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Figure 1	Site Locus Map
Figure 2	Subsurface Exploration Location Plan

### **ATTACHMENTS**

Attachment A	Description of Field Explorations
	General Notes
	Test Boring Logs



## **EXECUTIVE SUMMARY**

This report presents the results of our geotechnical engineering services performed for the proposed Town Hall project in Barrington, New Hampshire. Our geotechnical engineering scope of services included advancing five (5) test borings and two (2) auger probes within the proposed project area. Borings (B-1 through B-5) and auger probes (P-1 and P-2) were advanced to depths ranging from approximately 6.0 to 20.5 feet below the existing ground surface.

The executive summary should be used in conjunction with the entire report for design and/or construction purposes. It should be recognized that specific details are not included or fully developed in this section, and the report must be read in its entirety for a comprehensive understanding of the items contained herein. The section titled **General Comments** should be read for an understanding of the report limitations.

Based on the information obtained from our subsurface exploration, the site can be developed for the proposed project. The following geotechnical considerations were identified:

- ❖ Subsurface investigations generally encountered surficial layers of topsoil or bituminous pavement underlain by a granular fill over natural glacial till and bedrock. Auger refusal was encountered in each exploration at depths ranging from 6.0 to 20.5 feet. The fill is generally described as medium dense to dense, tan/brown, medium to fine sand with varying amounts of gravel and silt. The glacial till is generally described as dense to very dense, gray/brown, medium to fine sand, some to little silt, little to trace gravel.
- ❖ Groundwater was encountered in two test borings (B-1 and B-4) during drilling at depths ranging from approximately 8.5 to 10.0 feet below existing ground surface. However, iron staining and mottling within soil samples suggest groundwater may be seasonally perched at depths on the order of 2.0 to 7.0 feet below existing grade.
- ❖ Subsurface conditions within the project area are generally favorable for supporting the proposed development on conventional shallow spread footing foundations and slab-on-grade construction. Total and differential settlement should be within tolerable limits assuming proper site and subgrade preparation.
- ❖ Lowest floor slab may be soil supported bearing on a minimum 8-inch thick base course layer of compacted structural fill or crushed stone placed above proof-rolled existing granular fill or natural glacial till.
- ❖ Based on observed groundwater observations, temporary construction dewatering and permanent foundation perimeter and underslab drains may be necessary depending upon proposed finish floor elevation(s).

- ❖ Based on observed auger refusal depths, limited rock excavation may be required for the installation of foundations and/or deep utilities depending upon proposed footing and slab elevations.
- ❖ Based on the 2009 International Building Code, the seismic site classification is Site Class C; the site does not appear to be susceptible to liquefaction in the event of an earthquake.

Earthwork on the project should be evaluated by the geotechnical engineer of record (GER). The evaluation of earthwork should include review of engineered fill, subgrade preparation, foundation bearing soils, and other geotechnical conditions exposed during construction. The observation and testing of engineered fill should be accomplished by a qualified testing agency.

## 1.0 INTRODUCTION

This report presents the results of our geotechnical engineering services performed for the proposed Town Hall located at the intersection of Province Lane and Route 9 in Barrington, New Hampshire. Our geotechnical engineering scope of services included advancing five (5) test borings (B-1 through B-5) and two (2) auger probes (P-1 and P-2) within the proposed project area. Borings/probes were advanced to depths ranging from approximately 6.0 to 20.5 feet below the existing ground surface.

A Site Locus Map and a Subsurface Exploration Location Plan are included as **Figure 1** and **Figure 2**, respectively. Test boring logs are included in **Attachment A**.

The purpose of our services is to provide information and geotechnical engineering recommendations related to the following:

- ❖ Subsurface soil conditions
- ❖ Foundation design and construction
- ❖ Seismic design considerations
- ❖ Groundwater conditions
- ❖ Floor slab design and construction
- ❖ Earthwork construction

## 2.0 PROJECT INFORMATION

### 2.1 Site Location and Description

<b>Location</b>	The project site is located at the intersection of Province Lane and Route 9 in Barrington, New Hampshire.
<b>Existing improvements</b>	We understand the project site was historically developed with a building and associated parking, access drives, and playground areas. The existing building was historically used as school and subsequently used as Town offices. However, the building is currently vacant and not utilized by the town of Barrington. We understand moisture problems and poor indoor-air quality were the catalysts in vacating the structure.
<b>Current ground cover</b>	Within the project area, the ground cover is predominantly grassed with paved parking and landscaping.
<b>Existing topography</b>	Site topography generally slopes downward to the south from approximately elevation (El) 100 feet at Province Lane to El 74 feet at Route 9. Within the proposed building area the ground surface generally ranges from approximately El 96 feet to El 86 feet.
Note: 1. Ground surface elevations based on contours and elevations depicted on an undated, untitled topographic site plan provided by SMP Architecture, Inc. of Concord, New Hampshire.	

## 2.2 Project Description

<b>Proposed Structure</b>	The project will consist of demolishing the existing former school building and constructing a new single-story building and associated paved parking and access drives within the northeast portion of the property. The proposed building will have a footprint area of approximately 8,500 square feet.
<b>Building Construction</b>	The new building construction is not known at this time but anticipated to be either wood-framed or steel-framed with concrete masonry unit (CMU) construction. We understand consideration is being given to providing a partial walk-out basement below the meeting room area to support grounds equipment associated with the playground and fields.
<b>Lowest Finish Floor Elevation</b>	Finished floor elevation(s) are not known at this time; however, based on existing grades, the upper level, slab-on-grade area is anticipated around El 96 feet, with a lower-level walk-out-basement level around El 86 feet.
<b>Maximum Loads</b>	Building loads are not available at this time; however, based on our experience with buildings of similar size and use, anticipated structural loads are as follows: <i>Column Load:</i> 30 to 100 kips <i>Wall Load:</i> 1 to 3 kips/linear foot (klf) <i>Slab Load:</i> 200 pounds per square foot (psf)
<b>Maximum Allowable Settlement</b>	Total: 1-inch (assumed) Differential: ½-inch over 40 feet (assumed)

## 3.0 SUBSURFACE CONDITIONS

### 3.1 Typical Subsurface Profile

Based on the results of the explorations, subsurface conditions can be generalized as follows:

<b>Stratum</b>	<b>Approximate Depth to Bottom of Stratum (feet)</b>	<b>Material Description</b>	<b>Density / Consistency</b>
Granular Fill <sup>(1) (2)</sup>	1.0 to 4.0	Tan/brown, medium to fine SAND with varying amounts of gravel and silt	Medium Dense to Dense
Glacial Till <sup>(3)</sup>	6.0 to 20.5	Gray/brown, medium to fine SAND, some/little silt, little/trace gravel	Dense to Very Dense

*-continued from previous page-*

1. Surficial layers of topsoil or bituminous pavement were encountered, generally ranging from approximately 3.0 to 4.0 inches in thickness.
2. With the exception of base course materials immediately beneath asphalt pavement, the fill generally appears to be reused on-site soil.
3. Auger refusal, presumably on bedrock, was encountered in each boring/probe at depths ranging from 6.0 to 20.5 feet below existing grade. Based on available Bedrock Geological maps, bedrock is expected to consist of gray two-toned mica granite as part of the Concord Granite formation.

Visual soil classifications and conditions encountered at each exploration location are indicated on the individual test boring logs. Stratification boundaries on the logs represent the approximate location of changes in soil types; in-situ, the transition between materials may be gradual. Details for each of the explorations can be found on the test boring logs in **Attachment A**. A discussion of field sampling procedures is also included in **Attachment A**.

### **3.2 Groundwater**

Groundwater was encountered in two test borings (B-1 and B-4) during drilling at depths of approximately 10.0 and 8.5 feet below existing ground surface, respectively. However, iron staining and mottling was observed within discrete soil samples, suggesting that groundwater may be seasonally perched within the glacial till deposit at depths on the order of 2.0 to 7.0 feet below existing grade.

Groundwater level fluctuations will occur due to seasonal variations in the amount of rainfall, runoff, and other factors not evident at the time the borings were advanced. Therefore, groundwater levels during construction or at other times in the life of the structure may be higher or lower than the levels indicated on the boring logs. The possibility of groundwater level fluctuations should be considered when developing the design and construction plans for the project.

## **4.0 EVALUATION OF SUBSURFACE CONDITIONS**

It is our opinion that the subsurface conditions at the project site are suitable for supporting the proposed town hall on conventional shallow spread footing foundations bearing directly on proof-rolled existing granular fill or the natural glacial till deposit, or on compacted structural fill or crushed stone placed above these deposits. Although not anticipated, if unsuitable fill or other unsuitable materials are encountered below design footing or slab grade, they should be over-excavated and replaced with compacted structural fill or crushed stone. Over-excavation below foundations should include the footing bearing zone, defined as the area beneath 1 horizontal to 1 vertical (1H:1V) lines extending downward and outward from footing edges.

The lowest floor slab may be designed as a soil-supported slab bearing on a base course layer of compacted structural fill or crushed stone placed above proof-rolled existing granular fill or the natural till deposit. Subgrades should be properly prepared and observed as discussed herein.

Supporting foundations and floor slabs above existing granular fill is discussed in this report. The owner must understand and accept the risk associated with building over existing fill. Regardless of the extent of subsurface investigations, there is an inherent risk that compressible fill or unsuitable material within or buried by the fill may not be discovered. This risk of unforeseen conditions cannot be eliminated without completely removing the existing fill. However, the risk can be reduced by performing additional evaluations at the time of construction, such as performing additional test pits, observing conditions encountered in adjacent excavations, and proof-rolling fill subgrades. If the owner is not willing to accept the risk associated with leaving existing fill in-place, we recommend removing the existing fill from the building footprint and footing bearing zones and placing structural fill in controlled lifts to achieve design foundation and slab elevations.

As presented above, auger refusal was encountered in each exploration at depths ranging from approximately 6.0 to 20.5 feet below existing grade. Depending upon planned footing and finish floor elevations, bedrock excavation may be required to construct building foundations. Should bedrock be encountered at design footing grade, it should be over-excavated at least 12 inches below bottom of footing and replaced with compacted structural fill or crushed stone to provide a soil cushion and reduce the potential for differential settlement to occur.

Excavated granular fill and natural glacial till may be selectively reused as structural fill and common fill provided they are free of deleterious materials, are stable, and they can be adequately compacted. Boulders and cobbles larger than 6 inches in diameter (if encountered) are not suitable for reuse and should be culled out prior to placement.

Based on conditions encountered at the time of our subsurface investigation, temporary dewatering may be required to construct footings or install underground utilities. If a full or partial basement configuration is planned, foundation perimeter drains are recommended; the need for underslab drains should be evaluated once the finish floor elevation has been determined.

## **5.0 RECOMMENDATIONS FOR DESIGN AND CONSTRUCTION**

Geotechnical engineering recommendations for foundation systems and other earth-connected phases of the project are outlined below. The recommendations contained in this report are based upon the results of field testing, engineering analyses and our current understanding of the proposed development.

### **5.1 Foundations**

The proposed building can be supported by conventional shallow spread footing foundations bearing on properly prepared existing granular fill or natural glacial till subgrades, or on compacted structural fill or crushed stone placed above the prepared subgrade. Design

recommendations for shallow foundations for the proposed structure are presented in the following paragraphs.

### *5.1.1 Design Recommendations*

<b>Bearing Material</b>	Proof-rolled existing granular fill, natural glacial till, or compacted structural fill or crushed stone placed above the prepared fill or till. <sup>(1)</sup>
<b>Maximum Net Allowable Bearing Pressure <sup>(2)</sup></b>	4,000 psf
<b>Minimum Footing Depth <sup>(3)</sup></b>	48 inches (frost protection)
<b>Minimum Footing Width</b>	Strip Footings: 16 inches Isolated Spread Footings: 24 inches
<b>Estimated Settlement <sup>(4)</sup></b>	Total: < 1 inch Differential: < ½-inch over 40 ft.
<ol style="list-style-type: none"><li>1. Crushed stone, if used, should be separated from subgrade soil using a geotextile separation fabric such as Mirafi 140N, or equivalent.</li><li>2. The recommended net allowable bearing pressure is the pressure in excess of the minimum surrounding overburden pressure at the footing base elevation. Assumes unsuitable fill or soft soil, where present, will be replaced with compacted structural fill or crushed stone.</li><li>3. Perimeter footings and footings beneath unheated areas. Minimum recommended embedment for interior footings beneath heated areas is 18 inches below finish grade.</li><li>4. Foundation settlement will depend upon the variations within the subsurface soil profile, the structural loading conditions, the embedment depth of the footing, the thickness of compacted fill, and the quality of the earthwork operations.</li></ol>	

The allowable foundation bearing pressure applies to dead loads plus design live load conditions. The design bearing pressure may be increased by one-third when considering total loads that include wind or seismic conditions. The weight of the foundation concrete below grade may be neglected in dead load computations.

### *5.1.2 Construction Considerations*

Foundations for the proposed building and related structural elements should bear on proof-rolled existing granular fill, natural glacial till, or on compacted structural fill or crushed stone placed above the prepared fill or till deposit. Although not anticipated, if soft or unsuitable soil is encountered at design footing grade, it should be over-excavated from the footing bearing zone and replaced with compacted structural fill. If bedrock is encountered at or above design footing elevation, it should be over-excavated to provide a minimum 12-inch thick layer of compacted structural fill or crushed stone. Bedrock excavations should extent laterally at least 12 inches beyond edges of footing before sloping downward and outward at 1H:1V slopes.

Soil subgrades should be proof-rolled as described in **Section 6.4**. Following proof-rolling, structural fill or crushed stone can be placed (where required) to achieve design footing elevation. Following subgrade approval by the geotechnical engineer of record (GER),



structural fill or crushed stone can be placed (where required) to achieve design footing elevation. Structural fill or crushed stone should be placed and compacted as described in section **6.5 Fill Materials and Placement**.

Foundation excavations and subgrades should be observed by the GER and prepared as described in section **6.4 Subgrade Preparation**. If the soil conditions encountered differ significantly from those presented in this report, supplemental recommendations will be required.

## **5.2 Floor Slabs**

### *5.2.1 Design Recommendations*

<b>Lowest Floor Slab Support <sup>(1)</sup></b>	Minimum 8-inch thick layer of compacted structural fill or ¾-inch crushed stone placed above proof-rolled existing granular fill or natural glacial till.
<b>Modulus of Subgrade Reaction (k)</b>	200 pounds per square inch per inch (psi/in)
1. Floor slabs should be structurally independent of building footings or walls to reduce the possibility of floor slab cracking caused by differential movements between the slab and foundation.	

The use of a vapor retarder/barrier should be considered beneath concrete slabs on grade that will be covered with wood, tile, carpet, or other moisture-sensitive or impervious coverings, or when the slab will support equipment sensitive to moisture. When conditions warrant the use of a vapor retarder/barrier, the slab designer and slab contractor should refer to the American Concrete Institute (ACI) 302 and ACI 360 standards for procedures and cautions regarding the use and placement of a vapor retarder/barrier. Additional floor slab design and construction recommendations follow:

- ❖ Positive separations and/or isolation joints should be provided between slabs and all foundations, columns, or utility lines to allow independent movement.
- ❖ Control joints should be provided in slabs to control the location and extent of cracking.
- ❖ Other design and construction considerations, as outlined in the ACI Design Manual, Section 302.1R are recommended.

### *5.2.2 Construction Considerations*

The slab subgrade, comprised of existing granular fill or natural glacial till, should be reviewed by the GER and proof-rolled with a minimum 10-ton vibratory roller as described in **Section 6.4**. Following proof-rolling, compacted structural fill or crushed stone may be placed, if required, to achieve design slab grade.



### 5.3 Seismic Design Considerations

<b>Building Code</b>	2009 International Building Code
<b>Seismic Site Class</b>	Site Class C <sup>(1)</sup>
<b>Seismic Parameters</b>	S <sub>s</sub> = 0.373 g (0.2 second spectral response acceleration) S <sub>1</sub> = 0.082 g (1.0 second spectral response acceleration)
<b>Liquefaction Potential</b>	Not susceptible to liquefaction within depth of drilling
1. In general accordance with the 2009 International Building Code (IBC); Site Class is based on the average characteristics of the upper 100 feet of the subsurface profile. The IBC requires a site soil profile determination extending a depth of 100 feet for seismic site classification. The current scope does not include the required 100-foot soil profile determination. Boring B-4 encountered auger refusal at a depth of 20.5 feet below existing grade. The seismic site class definition considers that bedrock continues below the maximum depth of the subsurface explorations.	

### 5.4 Dampproofing and Foundation/Pavement Drainage

Below grade walls that retain earth and enclose interior spaces and floors below grade including elevator pits (if planned) should be dampproofed or waterproofed in accordance with Section 1805 of the 2009 *International Building Code* (IBC). If a full or partial basement is planned, foundation perimeter drains are recommended. The perimeter drain may also be hydraulically connected to the exterior sidewalk base course to provide drainage and reduce the potential effects of frost action.

Without knowing proposed finish floor slab elevation(s) at this time, it is difficult to evaluate whether under-slab drains are needed to help control groundwater. Consequently, it is recommended that the need for under-slab drains be evaluated once the finish floor slab elevation(s) has been determined.

Based on observed groundwater levels, pavement underdrains do not appear warranted. However, depending upon seasonal fluctuations and proposed finish grades, stabilized groundwater levels may or may not impact proposed pavements. It is recommended that pavement underdrains within proposed parking and access drive locations be evaluated at the time of construction, so that if required, they may be limited to specific areas of concern.

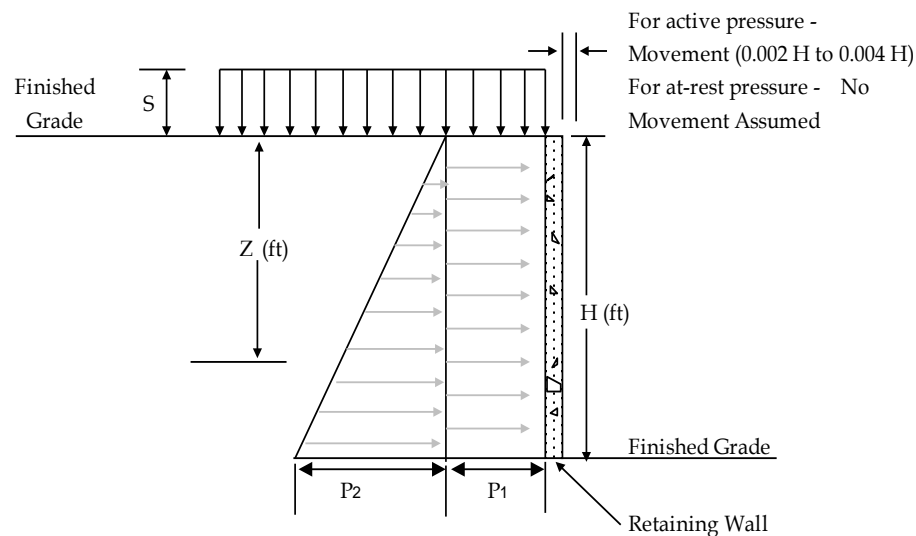
Foundation perimeter, under-slab, and pavement under drains may consist of a 4-inch diameter perforated polyvinyl chloride (PVC) or Advanced Drainage Systems (ADS) drain pipe enclosed within ¾-inch crushed stone containing not more than 10 percent material that passes the No. 4 sieve. Drains should be encapsulated with geotextile such as Mirafi 140N filter fabric, or equivalent. Underdrains should be sloped to allow for gravity flow and may discharge to daylight or an approved storm drain system.

## 5.5 Lateral Earth Pressures

Lateral earth pressure recommendations discussed in the following paragraphs are applicable to the design of basement foundation walls, elevator pit walls (if planned) and rigid retaining walls subject to slight rotation, such as cantilever or gravity type concrete walls. These recommendations are not applicable to the design of modular block/mechanically stabilized earth (MSE) walls.

Reinforced concrete walls with unbalanced backfill levels on opposite sides should be designed for earth pressures at least equal to those presented in the table below. Earth pressures will be influenced by structural design of the walls, conditions of wall restraint, methods of construction and/or compaction and the strength of the materials being restrained.

Two wall restraint conditions are shown. Active earth pressure is commonly used for design of free standing cantilever retaining walls that are "free to rotate" which assumes wall movement (Yielding walls). The "at-rest" condition assumes no wall movement (Non-Yielding walls). The recommended design lateral earth pressures do not include a factor of safety and do not provide for possible hydrostatic pressure on the walls.



Where:

S=Uniform surcharge at grade, load in psf

H=Height of wall (ft)

Z=Depth below finish grade (ft)

### EARTH PRESSURE COEFFICIENTS

Earth Pressure Conditions	Coefficient for Backfill Type	Equivalent Fluid Density (pcf)	Surcharge Pressure $P_1$ (psf)	Earth Pressure $P_2$ (psf)
Active ( $K_a$ )	Granular - 0.33	40	0.33(S)	40(H)
At-Rest ( $K_o$ )	Granular - 0.50	60	0.50(S)	60(H)
Passive ( $K_p$ )	Granular - 3.25	400	---	---

Applicable conditions to the above include:

- ❖ For active earth pressure, wall must rotate about base, with top lateral movements of about 0.002 H to 0.004 H, where H is the wall height
- ❖ For passive earth pressure to develop wall must move horizontally to mobilize resistance
- ❖ Soil backfill weight; assumes a maximum of weight of 125 pcf
- ❖ Assumes horizontal Backfill behind the wall
- ❖ Loading from heavy compaction equipment not included
- ❖ No hydrostatic pressures acting on wall
- ❖ No dynamic loading
- ❖ Ignore passive pressure in frost zone
- ❖ Equivalent fluid densities do not include a factor of safety
- ❖ Surcharge loads (S) should be considered where they are located within a horizontal distance equal to 1.5 times the height of the wall
- ❖ If drainage systems are not considered as part of the wall design the lateral pressures provided herein should be modified accordingly to account for hydrostatic pressures

Backfill placed against structures should consist of granular soil. For the granular values to be valid, the granular backfill must extend out from the base of the wall at angles of at least 45 and 60 degrees from vertical for the active and passive cases, respectively. Heavy equipment should not operate within a distance closer than the exposed height of retaining walls to reduce the likelihood of lateral pressures exceeding those provided.

To calculate the resistance to sliding, a value of 0.45 should be used as the ultimate coefficient of friction between the footing and existing granular fill or natural glacial till. Similarly, a value of 0.60 should be used as the ultimate coefficient of friction between the footing and compacted structural fill, or crushed stone. The recommended minimum factor of safety against sliding and overturning is 1.5 and 2.0, respectively.

To control hydrostatic pressure behind the walls we recommend a drain be installed at the base of retaining walls or foundation walls with a collection pipe leading to a reliable discharge point. If this is not possible, then combined hydrostatic and lateral earth pressures should be calculated for granular backfill using equivalent fluid weights of 85 and 90 pcf for active and at-rest conditions, respectively.

Drain pipes should be surrounded with at least 6 inches of ¾-inch-size crushed stone containing not more than 10 percent material that passes the No. 4 sieve. The stone should be wrapped with a geotextile such as Mirafi 140N, or equivalent. Drain pipes should consist of 4-inch diameter perforated polyvinyl chloride or Advanced Drainage Systems (ADS) pipe sloped to allow for gravity flow and discharge to daylight or an appropriate storm drainage structure.

## **5.6 Utilities**

We recommend site utilities be soil-supported bearing directly on a minimum 6-inch thick layer of compacted structural fill (imported), crushed stone, or other suitable pipe bedding materials. Fill placed as backfill for utilities should consist of compacted structural fill when located below building floor slabs, and compacted common fill elsewhere. Backfill should be compacted to the minimum requirements specified herein.

## **5.7 Sidewalks and Exterior Slabs**

Sidewalk and exterior slab subgrades are anticipated to consist of existing granular fill or glacial till. Portions of the on-site soil can be classified as having a moderate to high susceptibility to frost action, based on the expected range of fine-grained soil constituents. Consequently, it is recommended that sidewalks and exterior slabs be soil-supported bearing directly on a minimum 12-inch thick layer of free-draining material such as imported structural fill (meeting the gradation requirement recommended herein), or crushed stone, to reduce the potential effects of frost. Base course materials for sidewalks and exterior slabs should be compacted to at least 95 percent of the maximum dry density as determined by ASTM D 1557.

## **5.8 Permanent Soil Slopes**

Minor cut and fill slopes are anticipated as part of the proposed site development. Both cut and fill slopes are expected to be through soil. Permanent soil slopes should be designed no steeper than 3 horizontal (H) to 1 vertical (V). Steeper slopes should be engineered and evaluated for slope stability. Permanent slope surfaces should be vegetated to protect against erosion. Temporary sedimentation and erosion control methods should be implemented during construction and left in place until vegetation is established and the slope surface has been permanently stabilized.

## **6.0 GENERAL CONSTRUCTION CONSIDERATIONS**

The following presents recommendations for site preparation, excavation, subgrade preparation, and placement of fill for the project. The recommendations presented for design and construction of earth-supported elements are contingent upon the recommendations outlined in this section.

Earthwork on the project should be evaluated by the GER. The evaluation of earthwork should include review of engineered fill, subgrade preparation, foundation bearing soil and other

geotechnical conditions exposed during construction. The observation and testing of engineered fill should be accomplished by a qualified testing agency.

## **6.1 Initial Site Preparation**

Initial site preparation should commence with stripping of existing topsoil and pavement from the limits of the proposed building area. Minimum stripping depths of approximately 3 to 6 inches should be anticipated; however, stripping depths will likely vary across the site. A Sovereign representative or a qualified testing agency should monitor the stripping operations to observe that unsuitable materials have been adequately removed.

The existing vacant structure (former school building) will be demolished as part of the new development. Existing foundation elements, pavements, and underground utilities should be removed from within the proposed building area. Where existing foundation elements may conflict with proposed pavements or utilities, they should be removed to a depth of at least 2 feet below the affected utility or finish pavement grade. Areas disturbed during removal of foundations and utilities should be undercut and the excavations should be backfilled in compacted lifts. Fill materials and compaction efforts should be consistent with the intended future use.

## **6.2 Bedrock Excavation**

As discussed above, auger refusal presumably on bedrock was encountered in each of the test borings at depths ranging from approximately 6.0 to 20.5 feet below existing grade. Based on the depths of auger refusal, proposed finished floor slab elevation(s), and proposed utility locations and depths, limited rock removal may be required for installation of foundations and utilities.

Massive granitic rock is not expected to be rippable; however, weathered rock overlying the parent rock may be able to be excavated using conventional excavation and/or hoe-ramming equipment. The contractor should familiarize themselves with the bedrock excavation conditions before construction. In addition, project specifications should clearly define bedrock excavation, particularly as it pertains to the contractor's means and methods.

Where rock excavation is required, controlled blasting may be considered to aid in bedrock excavation; alternative methods of rock removal, including expansive agents or mechanical methods such as a hoe ram, may be employed if blasting is not permissible. The lateral extent of bedrock excavation should extend at least 12 inches beyond the edge of footings.

Controlled blasting methods should be specified to reduce over-break below subgrade elevation. Controlled blasting procedures are recommended to limit the charge weight using millisecond delays and limit the peak particle velocity at adjacent structures to a maximum 2.0 inches per second. The contractor should perform a pre-blast survey at structures and utilities

within a minimum distance of 500 feet of blasting, or as required by local and state agencies. If controlled blasting is used to excavate bedrock, care should be taken to limit the depth of over-blast in order to minimize the subgrade preparation efforts.

### **6.3 Earthwork in Wet Environments**

Excavated soil will generally consist of existing granular fill and natural glacial till. As previously described, portions of the fill and natural till are anticipated to have an elevated percentage of fines (material passing the #200 sieve). As recommended in **Section 6.5**, excavated granular fill and glacial till may be selectively reused as structural fill or common fill provided they are free of deleterious materials, are stable, and particles larger than 8 inches in diameter, and provided they are relatively dry such that they can be compacted to the requirements specified in **Section 6.6**. This recommendation for reusing the on-site soil is applicable during periods of construction when the climate and moisture are favorable for reusing a fine-grained soil.

During wet environments, excavated soil with an elevated silt content may be unsuitable for reuse or may require stabilization methods on subgrades, as recommended herein. Contractors experienced in earthwork construction in New England should be aware of silty soil behavior and the effects that moisture and season have on its workability. If a contractor bids construction knowing that earthwork must begin during seasonally wet months, the owner should expect a contingency by the contractor to create a suitable working surface for equipment, the use of off-site suitable fill and disposal of on-site soil.

Care must be taken by the contractor to avoid disturbance to silty subgrades by minimizing construction traffic (including foot traffic) on silty soil to the extent practical. Subgrades disturbed by construction traffic should be over-excavated and replaced with suitable backfill material. Excavated subgrades should not be left exposed overnight unless the forecast calls for above-freezing, clear conditions.

### **6.4 Subgrade Preparation**

Following the required stripping, excavation to rough grade and before placing new fill or constructing foundations, the existing granular fill or natural glacial till subgrades should be proof-rolled with at least six passes in perpendicular directions using a minimum 10-ton vibratory roller in open areas or a 1-ton vibratory roller or large plate compactor in trenches. The GER, or his/her representative, should review the subgrade during the proof-rolling process. Soft/unstable zones should be over-excavated to competent material and replaced with compacted structural fill or common fill, as appropriate for the intended use.

Over-excavation efforts, if warranted, should be accomplished in accordance with the recommendations presented herein. Following proof-rolling, structural fill or crushed stone may be placed and compacted to achieve design footing/slab subgrade. Where subgrades become wet, unstable and/or difficult to proof-roll, the use of crushed stone should be

considered in lieu of structural fill. Crushed stone, if used, should be separated from the excavation subgrade, sidewalls, and granular backfill above the stone with a geotextile separation fabric, such as Mirafi 140N or equivalent.

## 6.5 Fill Materials and Placement

Fill materials should consist of mineral soil free of organics, debris, or other deleterious materials. Frozen material should not be used and fill should not be placed on frozen subgrades. Recommended material property requirements for fill on the project, and their acceptable locations for placement, are as follows:

### Imported Structural Fill:

Placement/Location	Material Properties
Recommended below footings and floor slabs, within footing bearing zones, and under settlement-sensitive structures.	Imported structural fill should meet the following gradation:
	<b><u>Sieve Size</u></b> <b><u>Percent Passing by Weight</u></b>
	8-inch                                      100*
	3-inch                                      70 - 100**
	¾-inch                                      45 - 95
	No. 4                                        30 - 90
	No. 10                                       25 - 80
	No. 40                                       10 - 50
	No. 200                                      0 - 10
	* Maximum particle size limited to 2/3 the loose lift thickness.
	** Maximum 3-inch particle size within 12 inches of the underside of footings.

### Common Fill:

Placement/Location	Material Properties
May be used for site grading and fill outside building footprints and foundation bearing zones. Common fill should not be used under settlement sensitive structures.	The maximum particle size is recommended to be limited to 2/3 the loose lift thickness, and no more than 30 percent by weight should pass the No. 200 sieve.

### ¾-Inch Crushed Stone:

Placement/Location	Material Properties
Recommended below footings, within footing bearing zones, and under settlement-sensitive structures, and as backfill around drainage pipe.	Crushed stone shall be meet the requirements of a #4 Stone (Standard Stone Size) as specified in the NH Department of Transportation (NHDOT) <i>Standard Specifications for Road &amp; Bridge Construction</i> (Latest Edition), Section 703, Table 1E.
1. Crushed stone, if used, should be separated from subgrades and backfill soil (as appropriate) using a geotextile such as Mirafi 140N, or equivalent.	



## On-Site Soil: Reuse as Structural Fill

Excavated granular fill and glacial till intended for use as structural fill should be free of organics, wood, metal, or other deleterious materials. On-site soil intended for reuse as structural fill should meet the following material properties:

Placement/Location	Material Properties	
Recommended below footings, within footing bearing zones, and under settlement-sensitive structures.	Structural fill should meet the following gradation:	
	<u>Sieve Size</u>	<u>Percent Passing by Weight</u>
	8-inch	100*
	3-inch	70 – 100**
	¾-inch	45 - 95
	No. 4	30 - 90
	No. 10	25 - 80
	No. 40	10 - 50
	No. 200	0 - 20
	* Maximum particle size limited to 2/3 the loose lift thickness.	
** Maximum 3-inch particle size within 12 inches of the underside of footings and floor slabs.		
Note: Due to the elevated silt content within portions of the on-site soil, excavated material may be sensitive to moisture and easily disturbed when wet. Consequently, silty soil should only be reused when the conditions are favorable for placing and compacting soil sensitive to moisture.		

## 6.6 Compaction Requirements

The recommended compaction and moisture criteria for engineered fill materials follow:

<b>Fill Lift Thickness</b>	<i>Vibratory Rollers:</i> 12 inches or less in loose thickness <i>Plate Compactors:</i> 8 inches or less in loose thickness
<b>Compaction Requirements <sup>(1,2)</sup></b>	<u>Structural Fill:</u> 95% maximum dry density <u>Common Fill:</u> - <i>Pavement Areas:</i> 92% maximum dry density - <i>Landscaped Areas:</i> 90% maximum dry density
<b>Moisture Content – Granular Material</b>	± 3% of the Optimum Moisture Content
1. Maximum dry density as determined by ASTM D-1557, Method C (Modified Proctor). 2. Fill should be tested for moisture content and percent compaction during placement. If in-place density test results indicate the specified moisture or compaction limits have not been met, the area represented by the test should be reworked and retested, as required, until the specified moisture and compaction requirements are achieved.	



## **6.7 Temporary Excavations / Grading and Drainage**

The individual contractor(s) is responsible for designing and constructing stable, temporary excavations or temporary bracing, as required, to maintain stability of the excavation sides and the excavation bottom. Instability in the form of slope raveling, caving, and sloughing should be expected in all excavations and trenches which extend into the granular materials with little to no cohesion. Excavations should be sloped or shored in the interest of safety following local and federal regulations, including current Occupational Safety and Health Administration (OSHA) excavation and trench safety standards.

Construction slopes should be reviewed for signs of mass movement. If potential stability problems are observed, work should cease and the GER should be contacted immediately. The responsibility for excavation safety and stability of temporary construction slopes should lie solely with the contractor.

Stockpiles should be placed well away from the edge of the excavation and their height should be controlled so they do not surcharge the sides of the excavation. Positive drainage should be provided during construction and maintained throughout the life of the development. Infiltration of water into utility trenches or foundation excavations should be prevented during construction.

## **6.8 Dewatering**

Based on conditions encountered at the time of the subsurface investigation, dewatering may be necessary to facilitate the construction of foundations and site utilities depending upon proposed finish floor elevation(s). If dewatering becomes necessary, the contractor should select a dewatering method to lower groundwater at least 2 feet below the excavation subgrade in order to minimize bearing surface disturbance during construction of footings and utilities.

The contractor should be required to maintain a dewatered and stable subgrade during construction. Efforts should be made to prevent surface water runoff from collecting in excavations. Subgrade soil that becomes unstable should be replaced with crushed stone or structural fill as necessary. Crushed stone, if used, should be separated from the excavation subgrade, sidewalls, and granular backfill above the stone with a geotextile separation fabric. Discharge of groundwater to surface water during construction may require permits from the New Hampshire Department of Environmental Services (NHDES).

## **7.0 GENERAL COMMENTS**

Sovereign should be retained to review final design plans and specifications so comments can be made regarding interpretation and implementation of our geotechnical recommendations in the design and specifications. The GER and an independent testing agency should also be

retained to provide observation and testing services during grading, excavation, foundation construction and other earth-related construction phases of the project.

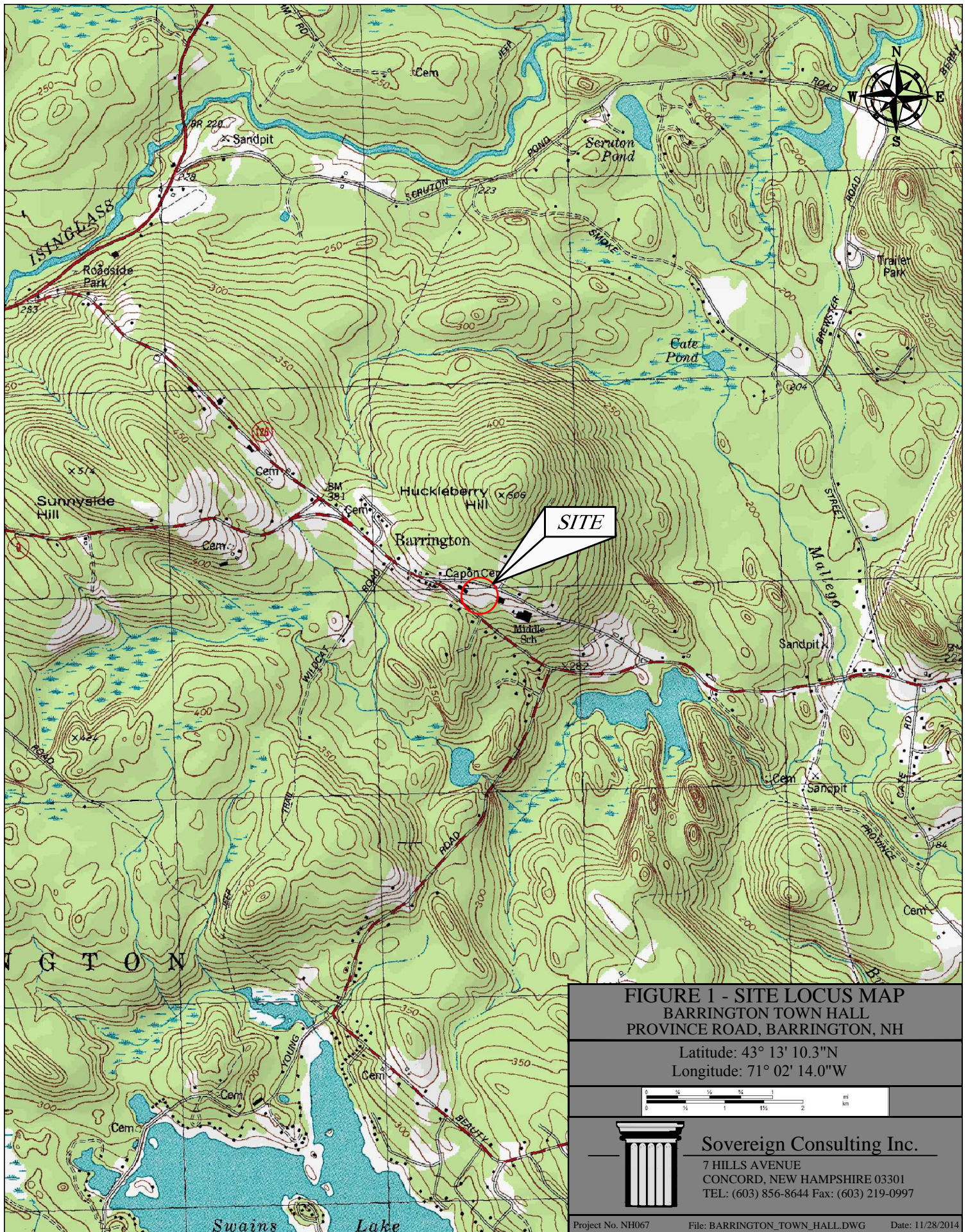
The analysis and preliminary recommendations presented in this report are based upon the data obtained from the borings performed at the indicated locations and from other information discussed in this report. This report does not reflect variations that may occur between borings, across the site, or due to the modifying effects of weather. The nature and extent of such variations may not become evident until during or after construction. If variations appear, we should be immediately notified so that further evaluation and supplemental recommendations can be provided.

The scope of services for this project does not include either specifically or by implication an environmental or biological (e.g., mold, fungi, bacteria) assessment of the site or identification or prevention of pollutants, hazardous materials or conditions. If the owner is concerned about the potential for such contamination or pollution, other studies should be undertaken.

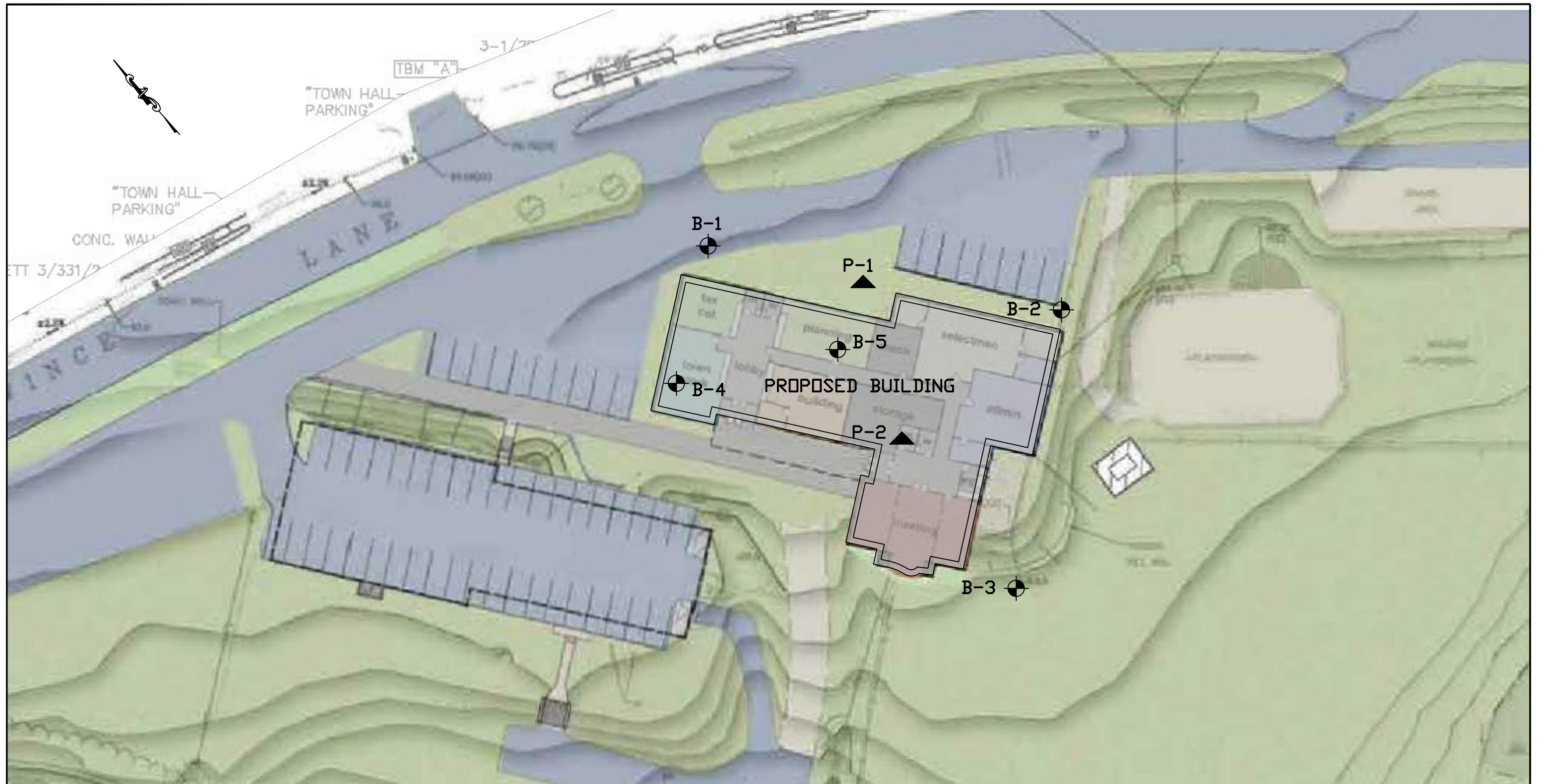
This report has been prepared for the exclusive use of the **Town of Barrington** and **SMP Architecture, Inc.** for specific application to the project discussed and has been prepared in accordance with generally accepted geotechnical engineering practices. No warranties, express or implied, are intended or made. Site safety, excavation support and dewatering requirements are the responsibility of others. In the event that changes in the nature, design or location of the project as outlined in this report are planned, the conclusions and recommendations contained in this report shall not be considered valid unless Sovereign reviews the changes and either verifies or modifies the conclusions of this report in writing.

## FIGURES









**NOTES:**

1. THIS FIGURE WAS PREPARED FROM AN UNDATED, UNTITLED PLAN AND AN UNDATED SCHEMATIC PLAN ENTITLED, "GRADING AND DRAINAGE IMPROVEMENT PLAN" PROVIDED BY SMP ARCHITECTURE, INC. OF CONCORD, NEW HAMPSHIRE.

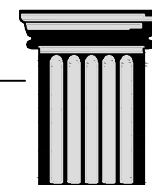
2. TEST BORINGS SHOWN AS B-1 THROUGH B-5 WERE ADVANCED ON OCTOBER 21, 2014 UNDER THE DIRECTION OF SOVEREIGN CONSULTING INC. WITH EQUIPMENT OWNED AND OPERATED BY NEW ENGLAND TEST BORING, INC. OF DERRY, NEW HAMPSHIRE.

3. THE APPROXIMATE LOCATION OF THE SUBSURFACE EXPLORATIONS WERE MEASURED BY TAPE MEASUREMENT REFERENCING EXISTING SITE FEATURES. THE LOCATIONS SHOULD BE CONSIDERED ACCURATE TO THE DEGREE IMPLIED BY THE METHOD USED.

4. USE OF THIS PLAN IS LIMITED TO THE APPROXIMATE LOCATIONS OF THE SUBSURFACE EXPLORATIONS AND OTHER PERTINENT SITE FEATURES. ANY OTHER USE OF THIS PLAN WITHOUT PERMISSION FROM SOVEREIGN CONSULTING INC. IS PROHIBITED.

**LEGEND**

- P-2** ▲ APPROXIMATE TEST PROBE LOCATION  
**B-3** ⊕ APPROXIMATE TEST BORING LOCATION



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Project No. NH067

File: BARRINGTON\_TOWN\_HALL.DWG

Date: 11/24/2014

0 40  
 APPROXIMATE SCALE IN FEET

**FIGURE 2**  
**SUBSURFACE EXPLORATION**  
**LOCATION PLAN**

**BARRINGTON TOWN HALL**  
**PROVINCE LANE**  
**BARRINGTON, NEW HAMPSHIRE**

## **ATTACHMENT A**

## **DESCRIPTION OF FIELD EXPLORATIONS**

In total, five (5) test borings (B-1 through B-5) and two (2) auger probes (P-1 and P-2) were drilled at the site on October 21, 2014 to depths ranging from approximately 6.0 to 20.5 feet below the ground surface within the project area at the approximate locations shown on the attached Subsurface Exploration Location Plan (**Figure 2**).

Test borings were advanced by New England Boring Contractors of Derry, New Hampshire using a truck-mounted drill rig and 2¼-inch inside-diameter hollow-stem augers. Borings were located in the field by using the site plans provided by SMP Architects, Inc. and tape measurement and line-of-site referencing existing site features. The accuracy of boring locations should only be assumed to the level implied by the method used.

Soil samples were generally obtained continuously from ground surface to a depth of approximately 10 feet, and at 5-foot intervals thereafter, using a standard 2-inch outside-diameter split-barrel sampler. Standard Penetration Tests (SPTs) were performed in general accordance with industry standards. Density of soil samples are based on N-values, which is determined by the number of hammer blows required to advance the sampler from 6 to 18 inches.

Visual classifications of soil are shown on test boring logs included in **Attachment A**. Groundwater conditions were evaluated in each boring at the time of site exploration.

## GENERAL NOTES

### DRILLING & SAMPLING SYMBOLS:

SB:	Split-Barrel sampler – 1-3/8" I.D., 2" O.D., unless otherwise noted	HSA:	Hollow Stem Auger
ST:	Thin-Walled Tube - 3" O.D., unless otherwise noted	AP:	Auger Probe
DB:	Diamond Bit Coring - 4", N, B	HA:	Hand Auger
BS:	Bulk Sample or Auger Sample	RB:	Rock Bit
S-1:	Sample Number	WB:	Wash Boring or Mud Rotary
C-1:	Core Number		

The number of blows required to advance a standard 2-inch O.D. split-barrel sampler (SB) between 6 to 18 inches of the total 24-inch penetration with a 140-pound hammer falling 30 inches is considered the "Standard Penetration" or "N-value."

### WATER LEVEL MEASUREMENT SYMBOLS:

WL:	Water Level	WS:	While Sampling	N/E:	Not Encountered
WCI:	Wet Cave in	WD:	While Drilling		
DCI:	Dry Cave in	BCR:	Before Casing Removal		
AB:	After Boring	ACR:	After Casing Removal		

### DESCRIPTIVE SOIL CLASSIFICATION:

Soils are visually classified using a modified Burmister system. The order of the visual-manual classification is as follows:

1. Density or Consistency
2. Color
3. Grain Size & Constituent percentages
4. Other pertinent descriptors

#### CONSISTENCY OF COHESIVE SOILS

#### RELATIVE DENSITY OF COHESIONLESS SOILS

<u>Standard Penetration</u>			<u>Standard Penetration Test or N-value</u>	
<u>Consistency</u>	<u>Test or N-value</u>	<u>Unconfined</u>	<u>(Blows/Ft.)</u>	<u>Relative Density</u>
	<u>(Blows/Ft.)</u>	<u>Compressive Strength,</u>		
		<u>Qu, (psf)</u>		
Very Soft	<2	< 500	0 – 4	Very Loose
Soft	2-4	500 – 1,000	4 – 10	Loose
Medium Stiff	4-8	1,000 – 2,000	10 – 30	Medium Dense
Stiff	8-15	2,000 – 4,000	30 – 50	Dense
Very Stiff	15-30	4,000 – 8,000	>50	Very Dense
Hard	>30	>8,000		

#### RELATIVE PROPORTIONS OF SAND AND GRAVEL

#### GRAIN SIZE TERMINOLOGY

<u>Descriptive Term(s) of other</u>		<u>Major Component</u>	
<u>Constituents</u>		<u>Particle Size</u>	
Noun (major component)	Percent of Dry Weight	Boulders	≥ 12 in. (300mm)
And	≥ 50%	Cobbles	12 in. to 3 in. (300mm to 75 mm)
Some	35 – 50%	Gravel	3 in. to #4 sieve (75mm to 4.75 mm)
Little	20 – 35%	Sand	#4 to #200 sieve (4.75mm to 0.075mm)
Trace	10 – 20%	Silt or Clay	Passing #200 Sieve (0.075mm)
With	1 – 10%		
	Amount not determined		

### PLASTICITY DESCRIPTION

<u>Degree of Plasticity</u>	<u>General Soil Type</u>
Non-plastic	SILT
Slightly	clayey SILT
Low	SILT, and Clay
Medium	CLAY, and Silt
Highly	silty CLAY
Very High	CLAY





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www.sovcon.com

**CLIENT** Town of Barrington

**PROJECT NAME** New Town Hall

**PROJECT NUMBER** NH067

**PROJECT LOCATION** Province Lane, Barrington, NH

**DATE STARTED** 10/21/14 **COMPLETED** 10/21/14

**GROUND ELEVATION** \_\_\_\_\_ **BORING DEPTH** 10.5 feet

**DRILLING CONTRACTOR** New England Test Boring, Inc.

**GROUND WATER LEVELS:** \_\_\_\_\_ **REFUSAL DEPTH** 10.5 feet

**DRILLING METHOD** Hollow Stem Auger 2 1/4"

**AT TIME OF DRILLING** ---

**LOGGED BY** IKC **CHECKED BY** MAC

**AT END OF DRILLING** ---

**SAMPLE HAMMER/DROP METHOD** Safety/Winch

**▼ AFTER DRILLING** 10.0 ft

SOVEREIGN BORING LOG 2014 1029 - SOVCON GEO LOG 2014 1029, GDT - 12/3/14 17:53 - P:\NEW HAMPSHIRE\BARRINGTON, NH\NH067 BARRINGTON TOWN HALL\FIELD DATA\NH067 BORING LOGS.GPJ

Depth	Sample	Sample Number	Blow Count (Rec./RQD)	PID (ppm)	Description	Graphic Log	Elev Depth (ft)	SPT DATA, N in blows/ft @	STRENGTH, psf
								1 10 20 30 50 80	▲ UC ⊗ PPT * TV.
					3" ASPHALT pavement		0.2		
		SS-1	73-39-41-23 (8")		(SS-1) Very dense, brown, medium to fine SAND, some to little Silt, trace gravel moist				
		SS-2	19-48-50/4" (8")		(FILL)		2.5		
					(SS-2) Similar to SS-1 except tan to brown				
5		SS-3	23-48-50/3" (14")		Note: drill action and auger cuttings suggest cobbles from 3 to 5 ft; cobbles in auger cuttings				
					(SS-3) Very dense, brown, medium to fine SAND, little Silt, trace gravel moist				
		SS-4	16-30-30-46 (18")		(SS-4) Similar to SS-3; iron staining observed				
					(TILL)		9.0		
10		SS-5	50/0" (0")		Note: drill action suggest cobbles or possible weathered rock from 9 to 10.5 foot				
					(SS-5) No recovery		10.5		
					(POSSIBLE WEATHERED ROCK)				
					Refusal at 10.5 feet.				
					Bottom of borehole at 10.5 feet.				



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**CLIENT** Town of Barrington

**PROJECT NAME** New Town Hall

**PROJECT NUMBER** NH067

**PROJECT LOCATION** Province Lane, Barrington, NH

**DATE STARTED** 10/21/14 **COMPLETED** 10/21/14

**GROUND ELEVATION** \_\_\_\_\_ **BORING DEPTH** 8.5 feet

**DRILLING CONTRACTOR** New England Test Boring, Inc.

**GROUND WATER LEVELS:** \_\_\_\_\_ **REFUSAL DEPTH** 8.5 feet

**DRILLING METHOD** Hollow Stem Auger 2 1/4"

**AT TIME OF DRILLING** ---

**LOGGED BY** IKC **CHECKED BY** MAC

**AT END OF DRILLING** ---

**SAMPLE HAMMER/DROP METHOD** Safety/Winch

**AFTER DRILLING** ---

SOVEREIGN BORING LOG 2014 1029 - SOVCON GEO LOG 2014 1029, GDT - 12/3/14 17:53 - P:\NEW HAMPSHIRE\BARRINGTON, NH\NH067 BARRINGTON TOWN HALL\FIELD DATA\NH067 BORING LOGS.GPJ

Depth	Sample	Sample Number	Blow Count (Rec./RQD)	PID (ppm)	Description	Graphic Log	Elev Depth (ft)	SPT DATA, N in blows/ft ©	STRENGTH, psf
								1 10 20 30 50 80	▲ UC ⊗ PPT * TV.
		SS-1	13-16-14-19 (10")		(SS-1) Dense, tan to orange, medium to fine SAND, little Gravel, trace Silt, moist				
		SS-2	21-25-19-15 (18")		(SS-2) Dense, tan to brown, medium to fine SAND, little Silt, trace Gravel, moist				
5					(FILL)		4.0		
		SS-3	20-49-49-46 (16")		(SS-3) Very dense, brown to gray, medium to fine SAND, little Silt, trace Gravel, moist, iron staining/mottling observed				
		SS-4	44-47-50/2" (14")		(SS-4) Similar to SS-3		8.0		
					(TILL)		8.5		
					Note: drill action suggest cobbles or weathered rock from 8 to 8.5 feet				
					(POSSIBLE WEATHERED ROCK)				
					Refusal at 8.5 feet.				
					Bottom of borehole at 8.5 feet.				



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**CLIENT** Town of Barrington

**PROJECT NAME** New Town Hall

**PROJECT NUMBER** NH067

**PROJECT LOCATION** Province Lane, Barrington, NH

**DATE STARTED** 10/21/14 **COMPLETED** 10/21/14

**GROUND ELEVATION** \_\_\_\_\_ **BORING DEPTH** 6 feet

**DRILLING CONTRACTOR** New England Test Boring, Inc.

**GROUND WATER LEVELS:** \_\_\_\_\_ **REFUSAL DEPTH** 6 feet

**DRILLING METHOD** Hollow Stem Auger 2 1/4"

**AT TIME OF DRILLING** ---

**LOGGED BY** IKC **CHECKED BY** MAC

**AT END OF DRILLING** ---

**SAMPLE HAMMER/DROP METHOD** Safety/Winch

**AFTER DRILLING** ---

SOVEREIGN BORING LOG 2014 1029 - SOVCON GEO LOG 2014 1029, GDT - 12/3/14 17:53 - P:\NEW HAMPSHIRE\BARRINGTON, NH\NH067 BARRINGTON TOWN HALL\FIELD DATA\NH067 BORING LOGS.GPJ

Depth	Sample	Sample Number	Blow Count (Rec.)/RQD	PID (ppm)	Description	Graphic Log	Elev Depth (ft)	SPT DATA, N in blows/ft ©	STRENGTH, psf
								1 10 20 30 50 80	▲ UC ⊗ PPT ✱ TV.
					4" TOPSOIL		0.3		
		SS-1	4-9-40-43 (16")		(SS-1) Dense, tan to brown, medium to fine SAND, some Gravel, little Silt, moist				
		SS-2	28-49-50/5" (14")		(SS-2) Very dense, brown, medium to fine SAND, little Silt, trace Gravel, moist, iron staining/mottling observed				
5		SS-3	16-50/4" (7")		(SS-3) Similar to SS-2				
					(TILL)		6.0		
					Refusal at 6.0 feet. Bottom of borehole at 6.0 feet.				



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**CLIENT** Town of Barrington

**PROJECT NAME** New Town Hall

**PROJECT NUMBER** NH067

**PROJECT LOCATION** Province Lane, Barrington, NH

**DATE STARTED** 10/21/14 **COMPLETED** 10/21/14

**GROUND ELEVATION** \_\_\_\_\_ **BORING DEPTH** 20.5 feet

**DRILLING CONTRACTOR** New England Test Boring, Inc.

**GROUND WATER LEVELS:** \_\_\_\_\_ **REFUSAL DEPTH** 20.5 feet

**DRILLING METHOD** Hollow Stem Auger 2 1/4"

▽ **AT TIME OF DRILLING** 8.5 ft

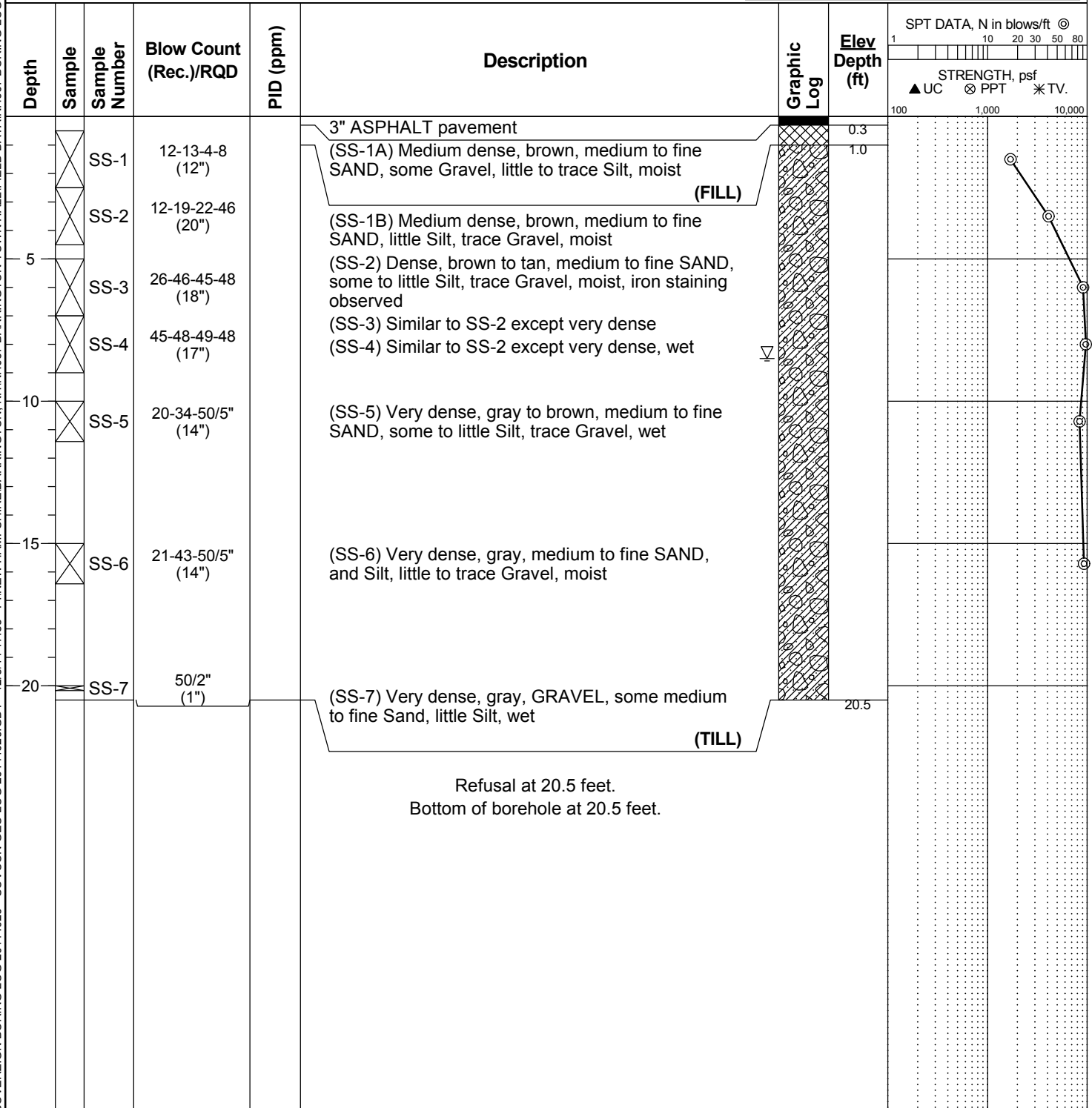
**LOGGED BY** IKC **CHECKED BY** MAC

**AT END OF DRILLING** ---

**SAMPLE HAMMER/DROP METHOD** Safety/Winch

**AFTER DRILLING** ---

SOVEREIGN BORING LOG 2014 1029 - SOVCON GEO LOG 2014 1029, GDT - 12/3/14 17:53 - P:\NEW HAMPSHIRE\BARRINGTON, NH\NH067 BARRINGTON TOWN HALL\FIELD DATA\NH067 BORING LOGS.GPJ





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**PROJECT NAME** New Town Hall

**PROJECT NUMBER** NH067

**PROJECT LOCATION** Province Lane, Barrington, NH

**DATE STARTED** 10/21/14 **COMPLETED** 10/21/14

**GROUND ELEVATION** \_\_\_\_\_ **BORING DEPTH** 13.5 feet

**DRILLING CONTRACTOR** New England Test Boring, Inc.

**GROUND WATER LEVELS:** \_\_\_\_\_ **REFUSAL DEPTH** 13.5 feet

**DRILLING METHOD** Hollow Stem Auger 2 1/4"

**AT TIME OF DRILLING** ---

**LOGGED BY** IKC **CHECKED BY** MAC

**AT END OF DRILLING** ---

**SAMPLE HAMMER/DROP METHOD** Safety/Winch

**AFTER DRILLING** ---

SOVEREIGN BORING LOG 2014 1029 - SOVCON GEO LOG 2014 1029, GDT - 12/3/14 17:53 - P:\NEW HAMPSHIRE\BARRINGTON, NH\NH067 BARRINGTON TOWN HALL\FIELD DATA\NH067 BORING LOGS.GPJ

Depth	Sample	Sample Number	Blow Count (Rec./RQD)	PID (ppm)	Description	Graphic Log	Elev Depth (ft)	SPT DATA, N in blows/ft @	STRENGTH, psf
								1 10 20 30 50 80	▲ UC ⊗ PPT * TV.
		SS-1	18-22-23-17 (16")		(SS-1) Dense, tan to brown, medium to fine SAND, some Gravel, little to trace Silt, moist				
		SS-2	10-6-10-23 (14")		(SS-2) Medium dense, brown, medium to fine SAND, some Silt, trace Gravel, moist				
5		SS-3	23-17-21-29 (18")		(SS-3) Dense, brown, medium to fine SAND, some Silt, trace Gravel, moist, iron staining/mottling observed		4.0		
		SS-4	21-43-50/5" (2")		(SS-4) Similar to SS-3				
					Note: drill action suggests cobbles/gravel from 8 to 10 ft.				
10		SS-5	50/3" (0")		(SS-5) No recovery				
					(TILL)		13.0		
					Note: Possible weathered rock at 13 ft		13.5		
					(POSSIBLE WEATHERED ROCK)				
					Refusal at 13.5 feet.				
					Bottom of borehole at 13.5 feet.				



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**CLIENT** Town of Barrington

**PROJECT NAME** New Town Hall

**PROJECT NUMBER** NH067

**PROJECT LOCATION** Province Lane, Barrington, NH

**DATE STARTED** 10/21/14 **COMPLETED** 10/21/14

**GROUND ELEVATION** \_\_\_\_\_ **BORING DEPTH** 13 feet

**DRILLING CONTRACTOR** New England Test Boring, Inc.

**GROUND WATER LEVELS:** \_\_\_\_\_ **REFUSAL DEPTH** 13 feet

**DRILLING METHOD** Hollow Stem Auger 2 1/4"

**AT TIME OF DRILLING** --- Not encountered

**LOGGED BY** IKC **CHECKED BY** MAC

**AT END OF DRILLING** ---

**SAMPLE HAMMER/DROP METHOD** Safety/Winch

**AFTER DRILLING** ---

SOVEREIGN BORING LOG 2014 1029 - SOVCON GEO LOG 2014 1029, GDT - 12/3/14 17:53 - P:\NEW HAMPSHIRE\BARRINGTON, NH\NH067 BARRINGTON TOWN HALL\FIELD DATA\NH067 BORING LOGS.GPJ

Depth	Sample	Sample Number	Blow Count (Rec.)/RQD	PID (ppm)	Description	Graphic Log	Elev Depth (ft)	SPT DATA, N in blows/ft © 1 10 20 30 50 80 STRENGTH, psf ▲ UC ⊗ PPT ✱ TV. 100 1,000 10,000
5					Advanced augers to refusal at 13 ft.  No samples collected			
10								
					Refusal at 13.0 feet. Bottom of borehole at 13.0 feet.		13.0	



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**CLIENT** Town of Barrington

**PROJECT NAME** New Town Hall

**PROJECT NUMBER** NH067

**PROJECT LOCATION** Province Lane, Barrington, NH

**DATE STARTED** 10/21/14 **COMPLETED** 10/21/14

**GROUND ELEVATION** **BORING DEPTH** 7.5 feet

**DRILLING CONTRACTOR** New England Test Boring, Inc.

**GROUND WATER LEVELS:** **REFUSAL DEPTH** 7.5 feet

**DRILLING METHOD** Hollow Stem Auger 2 1/4"

**AT TIME OF DRILLING** --- Not encountered

**LOGGED BY** IKC **CHECKED BY** MAC

**AT END OF DRILLING** ---

**SAMPLE HAMMER/DROP METHOD** Safety/Winch

**AFTER DRILLING** ---

SOVEREIGN BORING LOG 2014 1029 - SOVCON GEO LOG 2014 1029, GDT - 12/3/14 17:53 - P:\NEW HAMPSHIRE\BARRINGTON, NH\NH067 BARRINGTON TOWN HALL\FIELD DATA\NH067 BORING LOGS.GPJ

Depth	Sample	Sample Number	Blow Count (Rec.)/RQD	PID (ppm)	Description	Graphic Log	Elev Depth (ft)	SPT DATA, N in blows/ft ©	STRENGTH, psf
								1 10 20 30 50 80	▲ UC ○ PPT ✱ TV.
5					Advanced augers to refusal at 7.5 ft.  No samples collected				
					Refusal at 7.5 feet. Bottom of borehole at 7.5 feet.		7.5		

DOCUMENT 004113 - BID FORM - STIPULATED SUM (SINGLE-PRIME CONTRACT)

1.1 BID INFORMATION

- A. Bidder: \_\_\_\_\_.
- B. Project Name: Barrington Town Office
- C. Project Location: Ramsdell Lane, Barrington NH
- D. Owner: Town of Barrington New Hampshire
- E. Architect: Sheerr McCrystal Palson Architecture Inc. dba SMP Architecture
- F. Architect Project Number: 1312

1.2 CERTIFICATIONS AND BASE BID

- A. Base Bid, Single-Prime (All Trades) Contract: The undersigned Bidder, having carefully examined the Procurement and Contracting Requirements, Conditions of the Contract, Drawings, Specifications, and all subsequent Addenda, as prepared by Architect and Architect's consultants, having visited the site, and being familiar with all conditions and requirements of the Work, hereby agrees to furnish all material, labor, equipment and services, including all scheduled allowances, necessary to complete the construction of the above-named project, according to the requirements of the Procurement and Contracting Documents, for the stipulated sum of:
  - 1. \_\_\_\_\_ Dollars (\$\_\_\_\_\_).
  - 2. The above amount may be modified by amounts indicated by the Bidder on the attached Document 004323 "Alternates Form."

1.3 BID GUARANTEE

- A. The undersigned Bidder agrees to execute a contract for this Work in the above amount and to furnish surety as specified within 10 days after a written Notice of Award and successful approval of the public vote for funding to be held in March 2016; and on failure to do so agrees to forfeit to Owner the attached cash, cashier's check, certified check, U.S. money order, or bid bond, as liquidated damages for such failure, in the following amount constituting five percent (5%) of the Base Bid amount above:
  - 1. \_\_\_\_\_ Dollars (\$\_\_\_\_\_).
- B. In the event Owner does not offer Notice of Award, or public vote for funding fails, or both, Owner will return to the undersigned the cash, cashier's check, certified check, U.S. money order, or bid bond.



#### 1.4 SUBCONTRACTORS AND SUPPLIERS

A. The following companies shall execute subcontracts for the portions of the Work indicated:

1. Concrete Work:
2. Concrete work for insulating concrete walls:
3. Masonry Work:
4. Excavation/Earth Work:
5. Structural Steel Work:
6. Metal railings:
7. Wood Framing:
8. Roofing:
9. Drywall:
10. Flooring:
11. Casework and trim:
12. Windows:
13. Storefront:
14. Siding:
15. Plumbing Work:
16. HVAC Work:
17. Electrical Work:

#### 1.5 TIME OF COMPLETION

A. The undersigned Bidder proposes and agrees hereby to commence the Work of the Contract Documents no later than **April 18, 2016**, and shall fully complete the Work within the contractor's project schedule submitted with this bid.

#### 1.6 ACKNOWLEDGEMENT OF ADDENDA

A. The undersigned Bidder acknowledges receipt of and use of the following Addenda in the preparation of this Bid:

1. Addendum No. 1, dated \_\_\_\_\_.
2. Addendum No. 2, dated \_\_\_\_\_.
3. Addendum No. 3, dated \_\_\_\_\_.
4. Addendum No. 4, dated \_\_\_\_\_.

1.7 BID SUPPLEMENTS

- A. The following supplements are a part of this Bid Form and are attached hereto.
1. Bid Form Supplement - Alternates.
  2. Bid Form Supplement - Bid Bond Form (AIA Document A310).

1.8 SUBMISSION OF BID

- A. Respectfully submitted this \_\_\_\_ day of \_\_\_\_\_, 2016.
- B. Submitted By \_\_\_\_\_ (Name of bidding firm or corporation).
- C. Authorized Signature: \_\_\_\_\_ (Handwritten signature).
- D. Signed By: \_\_\_\_\_ (Type or print name).
- E. Title: \_\_\_\_\_ (Owner/Partner/President/Vice President).
- F. Street Address: \_\_\_\_\_.
- G. City, State, Zip \_\_\_\_\_.
- H. Phone: \_\_\_\_\_.

END OF DOCUMENT 004113

DOCUMENT 004323 - ALTERNATES FORM

1.1 BID INFORMATION

- A. Bidder: \_\_\_\_\_.
- B. Prime Contract: \_\_\_\_\_.
- C. Project Name: Barrington Town Office
- D. Project Location: Ramsdell Lane, Barrington NH
- E. Owner: Town of Barrington New Hampshire
- F. Architect: Sheerr McCrystal Palson Architecture Inc. dba SMP Architecture
- G. Architect Project Number: 1312

1.2 BID FORM SUPPLEMENT

- A. This form is required to be attached to the Bid Form.

1.3 DESCRIPTION

- A. The undersigned Bidder proposes the amount below be added to or deducted from the Base Bid if particular alternates are accepted by Owner. Amounts listed for each alternate include costs of related coordination, modification, or adjustment.
- B. If the alternate does not affect the Contract Sum, the Bidder shall indicate "NO CHANGE."
- C. If the alternate does not affect the Work of this Contract, the Bidder shall indicate "NOT APPLICABLE."
- D. The Bidder shall be responsible for determining from the Contract Documents the affects of each alternate on the Contract Time and the Contract Sum.
- E. Owner reserves the right to accept or reject any alternate, in any order, and to award or amend the Contract accordingly within [60] days of the Notice of Award unless otherwise indicated in the Contract Documents.
- F. Acceptance or non-acceptance of any alternates by the Owner shall have no affect on the Contract Time unless the "Schedule of Alternates" Article below provides a formatted space for the adjustment of the Contract Time.

## 1.4 SCHEDULE OF ALTERNATES

### A. Alternate no. 1 – Building Generator :

- a. Base bid requirements: electrical panel wiring and installation of automatic transfer switch as located on the drawings. Provide buried conduit(s) to location of generator for future installation of wiring.
- b. Alternate scope requirements: Install concrete pad, generator, fuel tank and associated piping and wiring as specified.

1. add\_\_\_\_ deduct\_\_\_\_ no change\_\_\_\_ not applicable\_\_\_\_.
2. \_\_\_\_\_ dollars (\$\_\_\_\_\_).
3. add\_\_\_\_ deduct\_\_\_\_ calendar days to adjust the contract time for this alternate.

### B. Alternate no. 2 – Alternate Siding:

- a. Base bid requirements: Install 1x furring and metal siding panels and trim per drawings.
- b. Alternate scope requirements: Delete metal siding panels and trim. Provide fiber cement siding with 8" exposure over 1x furring. Siding to be installed with mitered outside corners. Provide 5/4x3 PVC trim, painted to match fiber cement, at door and window openings. Metal covered window sills and transition to remain as shown on the drawings.

1. add\_\_\_\_ deduct\_\_\_\_ no change\_\_\_\_ not applicable\_\_\_\_.
2. \_\_\_\_\_ dollars (\$\_\_\_\_\_).
3. add\_\_\_\_ deduct\_\_\_\_ calendar days to adjust the contract time for this alternate.

### C. Alternate no. 3 – Folding Panel Partition:

- a. Base bid requirements: Provide and install steel beam support, track, hanger and folding panel partition as specified and drawn.
- b. Alternate scope requirements: Delete folding panel partition. Steel support beam and recessed track for partition shall still be installed as shown on the drawing

1. add\_\_\_\_ deduct\_\_\_\_ no change\_\_\_\_ not applicable\_\_\_\_.
2. \_\_\_\_\_ dollars (\$\_\_\_\_\_).
3. add\_\_\_\_ deduct\_\_\_\_ calendar days to adjust the contract time for this alternate.

### D. Alternate no. 4 – Flagpole and seat wall:

- a. Base bid requirements: Install modular block seat wall with integral lighting, pavers and flagpole per drawings.
- b. Alternate scope requirements: Delete flagpole, pavers, seat wall and lighting. Underground conduits to be installed and capped to facilitate future construction of the flag area. Grade area smooth to blend into adjacent lawn area. Topsoil and seed to match adjacent lawn area requirements.

1. add\_\_\_\_ deduct\_\_\_\_ no change\_\_\_\_ not applicable\_\_\_\_.
2. \_\_\_\_\_ dollars (\$\_\_\_\_\_).
3. add\_\_\_\_ deduct\_\_\_\_ calendar days to adjust the contract time for this alternate.

- E. Alternate no. 5 – Simultaneous Heating and Cooling:
- a. Base bid requirements: HVAC system and components as specified and drawn.  
Alternate scope requirements: Provide alternate outdoor heat pump units, piping system, and other components as required to allow some indoor units to be heating while others are cooling. See also section 231006-S1.
- 1. add\_\_\_\_ deduct\_\_\_\_ no change\_\_\_\_ not applicable\_\_\_\_.
  - 2. \_\_\_\_\_ dollars (\$\_\_\_\_\_).
  - 3. add\_\_\_\_ deduct\_\_\_\_ calendar days to adjust the contract time for this alternate.
- F. SUBMISSION OF BID SUPPLEMENT
- G. Respectfully submitted this \_\_\_\_ day of \_\_\_\_\_, 2016.
- H. Submitted By: \_\_\_\_\_(Name of bidding firm or corporation).
- I. Authorized Signature: \_\_\_\_\_(Handwritten signature).
- J. Signed By: \_\_\_\_\_(Type or print name).
- K. Title: \_\_\_\_\_(Owner/Partner/President/Vice President).

END OF DOCUMENT 004323

## DOCUMENT 004393 - BID SUBMITTAL CHECKLIST

### 1.1 BID INFORMATION

- A. Bidder: \_\_\_\_\_.
- B. Prime Contract: \_\_\_\_\_.
- C. Project Name: Barrington Town Office
- D. Project Location: Ramsdell Lane, Barrington NH
- E. Owner: Town of Barrington New Hampshire
- F. Architect: Sheerr McCrystal Palson Architecture Inc. dba SMP Architecture
- G. Architect Project Number: 1312

### 1.2 BIDDER'S CHECKLIST

- A. In an effort to assist the Bidder in properly completing all documentation required, the following checklist is provided for the Bidder's convenience. The Bidder is solely responsible for verifying compliance with bid submittal requirements.
- B. Attach this completed checklist to the outside of the Submittal envelope.
  - 1. Used the Bid Form provided in the Project Manual.
  - 2. Prepared the Bid Form as required by the Instructions to Bidders.
  - 3. Indicated on the Bid Form the Addenda received.
  - 4. Attached to the Bid Form: Bid Supplement Form - Alternates.
  - 5. Attached to the Bid Form: Bid Bond.
  - 6. Attached to the Bid Form: Project Schedule.
  - 7. Attached to the Bid Form: Contractors Qualification Statement and references.
  - 8. Bid envelope shows name and address of the Bidder.
  - 9. Bid envelope shows name of Project being bid.
  - 10. Verified that the Bidder can provide executed Performance Bond and Labor and Material Bond.
  - 11. Verified that the Bidder can provide Certificates of Insurance in the amounts indicated in section 002213, Article 10.

END OF DOCUMENT 004393



## DOCUMENT 006000 - FORMS

### 1.1 FORM OF AGREEMENT AND GENERAL CONDITIONS

- A. The following form of Owner/Contractor Agreement and form of the General Conditions shall be used for Project:
  - 1. AIA Document A101-2007, "Standard Form of Agreement between Owner and Contractor, Stipulated Sum." Subsequent to award, or notice of intent to award, Contractor shall prepare agreement for review and signature by owner.
  - 2. The General Conditions for Project are AIA Document A201, "General Conditions of the Contract for Construction" and are **included in the Project Manual following section 006000.**
  - 3. The Supplementary Conditions for Project **are separately prepared and included in the Project Manual, Section 006000, Article 1.3.**

### 1.2 ADMINISTRATIVE FORMS

- A. Administrative Forms: Additional administrative forms are specified in Division 01 General Requirements.
- B. Copies of AIA standard forms may be obtained from the American Institute of Architects; <http://www.aia.org/contractdocs/purchase/index.htm>; [docspurchases@aia.org](mailto:docspurchases@aia.org); (800) 942-7732.
- C. Preconstruction Forms:
  - 1. Form of Performance Bond and Labor and Material Bond: AIA Document A312, "Performance Bond and Payment Bond."
  - 2. Form of Certificate of Insurance: AIA Document G715, "Supplemental Attachment for ACORD Certificate of Insurance 25-S."
- D. Information and Modification Forms:
  - 1. Requests for Information (RFIs): AIA Document G716, "Request for Information (RFI)."
  - 2. Change Order Form: AIA Document G701, "Change Order."
- E. Payment Forms:
  - 1. Schedule of Values Form: AIA Document G703, "Continuation Sheet."
  - 2. Payment Application: AIA Document G702/703, "Application and Certificate for Payment and Continuation Sheet."
  - 3. Form of Affidavit of Release of Liens: AIA Document G706A, "Contractor's Affidavit of Payment of Release of Liens."
  - 4. Form of Consent of Surety: AIA Document G707, "Consent of Surety to Final Payment."

1.3 SUPPLEMENTARY CONDITIONS TO THE CONTRACT – AIA A101-2007

- A. Delete Article 3.3 in its entirety.
  - 1. Insert: 3.3 “The Contractor shall achieve substantial completion of the entire work no later than the date shown on the contractors schedule submitted with the bid.
- B. Article 5.1.3: Fill in the following in order found:
  - 1. Regarding Architects receipt of the application for payment, Fill in “last”
  - 2. Regarding Owner payment, fill in “30<sup>th</sup>” and “following”
  - 3. Fill in “thirty (30)”
- C. Article 5.1.6.1 and .2 – Retainage value shall be “Ten Percent” (10%)
- D. Article 6.2 – Arbitration shall be the selected method
- E. Article 9.1.2 – at end of sentence add “as modified and included in the project manual.”

END OF DOCUMENT 006000



**AIA®**

# Document A201™ – 2007

## ***General Conditions of the Contract for Construction***

for the following PROJECT:

*(Name and location or address)*

Barrington Town Office

Ramsdell Lane

Barrington NH

**THE OWNER:**

*(Name, legal status and address)*

Town of Barrington, NH

333 Calef Highway, Barrington NH 03825

**THE ARCHITECT:**

*(Name, legal status and address)*

Sheerr McCrystal Palson Architecture, Inc.

30 South Main Street, Building 2, Concord NH 03301

This document has important legal consequences.

Consultation with an attorney is encouraged with respect to its completion or modification.

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- 5 SUBCONTRACTORS
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## ARTICLE 1 GENERAL PROVISIONS

### § 1.1 BASIC DEFINITIONS

#### § 1.1.1 THE CONTRACT DOCUMENTS

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

#### § 1.1.2 THE CONTRACT

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

#### § 1.1.3 THE WORK

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

#### § 1.1.4 THE PROJECT

The Project is the total construction of which the Work performed under the Contract Documents may be the whole or a part and which may include construction by the Owner and by separate contractors.

#### § 1.1.5 THE DRAWINGS

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

#### § 1.1.6 THE SPECIFICATIONS

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

#### § 1.1.7 INSTRUMENTS OF SERVICE

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

#### § 1.1.8 INITIAL DECISION MAKER

The Initial Decision Maker is the person identified in the Agreement to render initial decisions on Claims in accordance with Section 15.2 and certify termination of the Agreement under Section 14.2.2.

### § 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.



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

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

### § 1.3 CAPITALIZATION

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

### § 1.4 INTERPRETATION

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

### § 1.5 OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment 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 this 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 material or equipment suppliers are authorized to use and reproduce the Instruments of Service provided to them 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 material or equipment suppliers may not use the Instruments of Service on other projects or for additions to this Project outside the scope of the Work without the specific written consent of the Owner, Architect and the Architect's consultants.

### § 1.6 TRANSMISSION OF DATA IN DIGITAL FORM

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall endeavor to establish necessary protocols governing such transmissions, unless otherwise already provided in the Agreement or the Contract Documents.

## ARTICLE 2 OWNER

### § 2.1 GENERAL

§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner's approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term "Owner" means the Owner or the Owner's authorized representative.

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

### § 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER

§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or



the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

§ 2.2.2 Except for permits and fees that are the responsibility of the Contractor under the Contract Documents, including those required under Section 3.7.1, the Owner shall secure and pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities.

§ 2.2.3 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.

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

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

### § 2.3 OWNER'S RIGHT TO STOP THE WORK

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

### § 2.4 OWNER'S RIGHT TO CARRY OUT THE WORK

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after receipt of 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 deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor shall pay the difference to the Owner.

## 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 obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect's administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.



## § 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

§ 3.2.4 If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make 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 as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

## § 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and 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 written notice to the Owner and Architect and shall not proceed with that portion of the Work without further written instructions from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

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

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

## § 3.4 LABOR AND MATERIALS

§ 3.4.1 Unless otherwise provided in the Contract Documents, the Contractor shall provide and pay for labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other



facilities and services necessary for proper execution and completion of the Work, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work.

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

§ 3.4.3 The Contractor shall enforce strict discipline and good order among the Contractor's employees and other persons carrying out the Work. The Contractor shall not permit employment of unfit persons or persons not properly skilled in tasks assigned to them.

### § 3.5 WARRANTY

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

### § 3.6 TAXES

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

### § 3.7 PERMITS, FEES, NOTICES AND COMPLIANCE WITH LAWS

§ 3.7.1 Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit as well as for other permits, fees, licenses, and inspections by government agencies necessary for proper execution and completion of the Work that are customarily secured after execution of the Contract and legally required at the time bids are received or negotiations concluded.

§ 3.7.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities applicable to performance of the Work.

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

§ 3.7.4 **Concealed or Unknown Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

§ 3.7.5 If, in the course of the Work, the Contractor encounters human remains or recognizes the existence of burial markers, archaeological sites or wetlands not indicated in the Contract Documents, the Contractor shall immediately suspend any operations that would affect them and shall notify the Owner and Architect. Upon receipt of such notice, the Owner shall promptly take any action necessary to obtain governmental authorization required to resume



the operations. The Contractor shall continue to suspend such operations until otherwise instructed by the Owner but shall continue with all other operations that do not affect those remains or features. Requests for adjustments in the Contract Sum and Contract Time arising from the existence of such remains or features may be made as provided in Article 15.

### § 3.8 ALLOWANCES

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

### § 3.9 SUPERINTENDENT

§ 3.9.1 The Contractor shall employ a competent superintendent and necessary assistants who shall be in attendance at the Project site during performance of the Work. The superintendent shall represent the Contractor, and communications given to the superintendent shall be as binding as if given to the Contractor.

§ 3.9.2 The Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of a proposed superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection.

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

### § 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, 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.

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

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

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### § 3.11 DOCUMENTS AND SAMPLES AT THE SITE

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

### § 3.12 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

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

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

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

§ 3.12.4 Shop Drawings, Product Data, Samples and similar submittals are not Contract Documents. Their purpose is to demonstrate the way by which the Contractor proposes to conform to the information given and the design concept expressed in the Contract Documents for those portions of the Work for which the Contract Documents require submittals. Review by the Architect is subject to the limitations of Section 4.2.7. Informational submittals upon which the Architect is not expected to take responsive action may be so identified in the Contract Documents. Submittals that are not required by the Contract Documents may be returned by the Architect without action.

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

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

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

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

§ 3.12.9 The Contractor shall direct specific attention, in writing or on resubmitted Shop Drawings, Product Data, Samples or similar submittals, to revisions other than those requested by the Architect on previous submittals. In the absence of such written 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. 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 cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, 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 Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

### **§ 3.13 USE OF SITE**

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

### **§ 3.14 CUTTING AND PATCHING**

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

**§ 3.14.2** The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's 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 or rubbish caused by operations under the Contract. At completion of the Work, the Contractor shall remove waste materials, rubbish, the Contractor's tools, construction equipment, machinery and surplus materials from and about the Project.

**§ 3.15.2** If the Contractor fails to clean up as provided in the Contract Documents, the Owner may do so and Owner shall be entitled to reimbursement from the Contractor.

### **§ 3.16 ACCESS TO WORK**

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

### **§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS**

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



### § 3.18 INDEMNIFICATION

§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect's consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), property, but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

## ARTICLE 4 ARCHITECT

### § 4.1 GENERAL

§ 4.1.1 The 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.

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

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

### § 4.2 ADMINISTRATION OF THE CONTRACT

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

§ 4.2.2 The Architect will visit the site at intervals appropriate to the stage of construction, or as otherwise agreed with the Owner, to become generally familiar with the progress and quality of the portion of the Work completed, and to determine in general if the Work observed is being performed in a manner indicating that the Work, when fully completed, will be in accordance with the Contract Documents. However, the Architect will not be required to make exhaustive or continuous on-site inspections to check the quality or quantity of the Work. The Architect will not have control over, charge of, or responsibility for, the construction means, methods, techniques, sequences or procedures, or for the safety precautions and programs in connection with the Work, since these are solely the Contractor's rights and responsibilities under the Contract Documents, except as provided in Section 3.3.1.

§ 4.2.3 On the basis of the site visits, the Architect will keep the Owner reasonably informed about the progress and quality of the portion of the Work completed, and report to the Owner (1) known deviations from the Contract Documents and from the most recent construction schedule submitted by the Contractor, and (2) defects and deficiencies observed in the Work. The Architect will not be responsible for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents. The Architect will not have control over or charge of and will not be responsible for acts or omissions of the Contractor, Subcontractors, or their agents or employees, or any other persons or entities performing portions of the Work.



#### § 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION

Except as otherwise provided in the Contract Documents or when direct communications have been specially authorized, the Owner and Contractor shall endeavor to communicate with each other through the Architect about matters arising out of or relating to the Contract. Communications by and with the Architect's consultants shall be through the Architect. Communications by and with Subcontractors and material suppliers shall be through the Contractor. Communications by and with separate contractors shall be through the Owner.

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

§ 4.2.6 The Architect has authority to reject Work that does not conform to the Contract Documents. Whenever the Architect considers it necessary or advisable, the Architect will have authority to require inspection or testing of the Work in accordance with Sections 13.5.2 and 13.5.3, whether or not such Work is fabricated, installed or completed. However, neither this authority of the Architect nor a decision made in good faith either to exercise or not to exercise such authority shall give rise to a duty or responsibility of the Architect to the Contractor, Subcontractors, material and equipment suppliers, their agents or employees, or other persons or entities performing portions of the Work.

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with the submittal schedule approved by the Architect or, in the absence of an approved submittal schedule, with reasonable promptness while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of determining the accuracy and completeness of other details such as dimensions and quantities, or for substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

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

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

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

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

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

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§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

## ARTICLE 5 SUBCONTRACTORS

### § 5.1 DEFINITIONS

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

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

### § 5.2 AWARD OF SUBCONTRACTS AND OTHER CONTRACTS FOR PORTIONS OF THE WORK

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

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

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

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

### § 5.3 SUBCONTRACTUAL RELATIONS

By appropriate agreement, written where legally required for validity, 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, which the Contractor, by these Documents, assumes toward the Owner and Architect. Each subcontract agreement shall preserve and protect the rights of the Owner and Architect under the Contract Documents with respect to the Work to be performed by the Subcontractor so that subcontracting thereof will not prejudice such rights, and shall allow to the Subcontractor, unless specifically provided otherwise in the subcontract agreement, the benefit of all rights, remedies and redress against the Contractor that the Contractor, by the Contract Documents, has against the Owner. Where appropriate, the Contractor shall require each Subcontractor to enter into similar agreements with Sub-subcontractors. The Contractor shall make available to each proposed Subcontractor, prior to the execution of the subcontract agreement, copies of the Contract Documents to which the Subcontractor will be bound, and, upon written request of the Subcontractor, identify to the Subcontractor terms and conditions of the proposed subcontract agreement that may



be at variance with the Contract Documents. Subcontractors will similarly make copies of applicable portions of such documents available to their respective proposed Sub-subcontractors.

#### **§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS**

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

- .1 assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; 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 such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall nevertheless remain legally responsible for all of the successor contractor's obligations under the subcontract.

### **ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**

#### **§ 6.1 OWNER'S RIGHT TO PERFORM CONSTRUCTION AND TO AWARD SEPARATE CONTRACTS**

**§ 6.1.1** The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions 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 other separate contractors and the Owner in reviewing their construction schedules. The Contractor shall make any revisions to the 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, the Owner shall be deemed to be subject to the same obligations and to have the same rights that apply to the Contractor under the Conditions of the Contract, including, without excluding others, those stated in Article 3, this Article 6 and Articles 10, 11 and 12.

#### **§ 6.2 MUTUAL RESPONSIBILITY**

**§ 6.2.1** The Contractor shall afford the Owner and separate contractors reasonable opportunity for introduction and storage of their materials and equipment and performance of their activities, and shall connect and coordinate the Contractor's construction and operations with theirs as required by the Contract Documents.

**§ 6.2.2** If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that

the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

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

§ 6.2.4 The Contractor shall promptly remedy damage the Contractor wrongfully causes to completed or partially completed construction or to property of the Owner or separate contractors as provided in Section 10.2.5.

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

### § 6.3 OWNER'S RIGHT TO CLEAN UP

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

## ARTICLE 7 CHANGES IN THE WORK

### § 7.1 GENERAL

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

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

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

### § 7.2 CHANGE ORDERS

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

- .1 The change in the Work;
- .2 The amount of the adjustment, if any, in the Contract Sum; and
- .3 The extent of the adjustment, if any, in the Contract Time.

### § 7.3 CONSTRUCTION CHANGE DIRECTIVES

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

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

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or



.4 As provided in Section 7.3.7.

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

§ 7.3.6 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.

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

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

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

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

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

#### § 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.

## 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, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 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 an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

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

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

## ARTICLE 9 PAYMENTS AND COMPLETION

### § 9.1 CONTRACT SUM

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.

### § 9.2 SCHEDULE OF VALUES

Where the Contract is based on a stipulated sum or Guaranteed Maximum Price, the Contractor shall submit to the Architect, before the first Application for Payment, a schedule of values allocating the entire Contract Sum to the various portions of the Work and prepared in such form and supported by such data to substantiate its accuracy as the Architect may require. This schedule, unless objected to by the Architect, shall be used as a basis for reviewing the Contractor's Applications for Payment.

### § 9.3 APPLICATIONS FOR PAYMENT

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



§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

§ 9.3.1.2 Applications for Payment shall not include requests for payment for portions of the Work for which the Contractor does not intend to pay a Subcontractor or material supplier, unless such Work has been performed by others whom the Contractor intends to pay.

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

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

#### § 9.4 CERTIFICATES FOR PAYMENT

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

§ 9.4.2 The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's evaluation of the Work and the data comprising the Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated and that the quality of the Work is in accordance with the Contract Documents. The foregoing representations are subject to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, to results of subsequent tests and inspections, to correction of minor deviations from the Contract Documents prior to completion and to specific qualifications expressed by the Architect. The issuance of a Certificate for Payment will further constitute a representation that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has (1) made exhaustive or continuous on-site inspections to check the quality or quantity of the Work, (2) reviewed construction means, methods, techniques, sequences or procedures, (3) reviewed copies of requisitions received from Subcontractors and material suppliers and other data requested by the Owner to substantiate the Contractor's right to payment, or (4) made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

#### § 9.5 DECISIONS TO WITHHOLD CERTIFICATION

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

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;

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- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or a separate contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay; or
- .7 repeated failure to carry out the Work in accordance with the Contract Documents.

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

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers 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 Architect 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 Architect.

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

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

§ 9.6.4 The Owner has the right to request written evidence from the Contractor that the Contractor has properly paid Subcontractors and 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 to ascertain whether they have been properly paid. Neither the Owner nor Architect shall have an obligation to pay or to see to the payment of money to a Subcontractor, except as may otherwise be required by law.

§ 9.6.5 Contractor 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 and 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, shall create any fiduciary liability or tort liability on the part of the Contractor for breach of trust or shall entitle any person or entity to an award of punitive damages against the Contractor for breach of the requirements of this provision.

## § 9.7 FAILURE OF PAYMENT

If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor's Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding



dispute resolution, then the Contractor may, upon seven additional days' written notice to the Owner and Architect, stop the Work until payment of the amount owing has been received. The Contract Time shall be extended appropriately and the Contract Sum shall be increased by the amount of the Contractor's reasonable costs of shut-down, delay and start-up, plus interest as provided for in the Contract Documents.

## **§ 9.8 SUBSTANTIAL COMPLETION**

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

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

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

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

**§ 9.8.5** The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such 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 as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Work and insurance, and have agreed in writing concerning the period for correction of the Work and commencement of warranties required by the Contract Documents. When the Contractor considers a portion substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Work shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

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



## § 9.10 FINAL COMPLETION AND FINAL PAYMENT

§ 9.10.1 Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with 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 conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

§ 9.10.2 Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial 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 and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, 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. If such lien 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 such lien, including all costs and reasonable attorneys' fees.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed 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 surety to payment of the balance due for that portion of the Work fully completed and accepted shall be submitted by the Contractor to the Architect prior to certification of such payment. Such payment shall be made under terms and conditions governing final payment, except that it shall not constitute a waiver of claims.

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

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents; or
- .3 terms of special warranties required by the Contract Documents.

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

## ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

### § 10.1 SAFETY PRECAUTIONS AND PROGRAMS

The Contractor shall be responsible for initiating, maintaining and supervising all safety precautions and programs in connection with the performance of the Contract.

### § 10.2 SAFETY OF PERSONS AND PROPERTY

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

- .1 employees on the Work and other persons who may be affected thereby;
- .2 the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and



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

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

§ 10.2.3 The Contractor shall 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 owners and users of adjacent sites and utilities.

§ 10.2.4 When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary for execution of the Work, the Contractor shall exercise utmost care and carry on such activities under supervision of properly qualified personnel.

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

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

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

#### § 10.2.8 INJURY OR DAMAGE TO PERSON OR PROPERTY

If either party suffers injury or damage to person or property because of an act or omission of the other party, or of others for whose acts such party is legally responsible, written notice of such 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. 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 report the condition to the Owner and Architect in writing.

§ 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 and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. 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 in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

~~§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect's consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.~~

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for 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 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 indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance 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 indemnify 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 LIABILITY INSURANCE

§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor's operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

- .1 Claims under workers' compensation, disability benefit and other similar employee benefit acts that are applicable to the Work to be performed;
- .2 Claims for damages because of bodily injury, occupational sickness or disease, or death of the Contractor's employees;
- .3 Claims for damages because of bodily injury, sickness or disease, or death of any person other than the Contractor's employees;
- .4 Claims for damages insured by usual personal injury liability coverage;
- .5 Claims for damages, other than to the Work itself, because of injury to or destruction of tangible property, including loss of use resulting therefrom;
- .6 Claims for damages because of bodily injury, death of a person or property damage arising out of ownership, maintenance or use of a motor vehicle;
- .7 Claims for bodily injury or property damage arising out of completed operations; and
- .8 Claims involving contractual liability insurance applicable to the Contractor's obligations under Section 3.18.



§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

§ 11.1.3 Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness.

§ 11.1.4 The Contractor shall cause the commercial liability coverage required by the Contract Documents to include (1) the Owner, the Architect and the Architect's consultants as additional insureds for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's operations; and (2) the Owner as an additional insured for claims caused in whole or in part by the Contractor's negligent acts or omissions during the Contractor's completed operations.

#### § 11.2 OWNER'S LIABILITY INSURANCE

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

#### § 11.3 PROPERTY INSURANCE

§ 11.3.1 Unless otherwise provided, the Owner shall purchase and maintain, in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located, property insurance written on a builder's risk "all-risk" or equivalent policy form in the amount of the initial Contract Sum, plus value of subsequent Contract Modifications and cost of materials supplied or installed by others, comprising total value for the entire Project at the site on a replacement cost basis without optional deductibles. Such property insurance shall be maintained, unless otherwise provided in the Contract Documents or otherwise agreed in writing by all persons and entities who are beneficiaries of such insurance, until final payment has been made as provided in Section 9.10 or until no person or entity other than the Owner has an insurable interest in the property required by this Section 11.3 to be covered, whichever is later. ~~This insurance shall include interests of the Owner, the Contractor, Subcontractors and Sub-subcontractors in the Project.~~

§ 11.3.1.1 Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including demolition occasioned by enforcement of any applicable legal requirements, ~~and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss requirements.~~

§ 11.3.1.2 If the Owner does not intend to purchase such property insurance required by the Contract and with all of the coverages in the amount described above, the Owner shall so inform the Contractor in writing prior to commencement of the Work. The Contractor may then effect insurance that will protect the interests of the Contractor, Subcontractors and Sub-subcontractors in the Work, and by appropriate Change Order the cost thereof shall be charged to the Owner. If the Contractor is damaged by the failure or neglect of the Owner to purchase or maintain insurance as described above, without so notifying the Contractor in writing, then the Owner shall bear all reasonable costs properly attributable thereto.

§ 11.3.1.3 If the property insurance requires deductibles, the Owner shall pay costs not covered because of such deductibles.



§ 11.3.1.4 This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit-transit, provided all such portions are owned by Owner

§ 11.3.1.5 Partial occupancy or use in accordance with Section 9.9 shall not commence until the insurance company or companies providing property insurance have consented to such partial occupancy or use by endorsement or otherwise. The Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

#### § 11.3.2 BOILER AND MACHINERY INSURANCE

The Owner shall purchase and maintain boiler and machinery insurance required by the Contract Documents or by law, which shall specifically cover such insured objects during installation and until final acceptance by the Owner; this insurance shall include interests of the Owner, Contractor, Subcontractors and Sub-subcontractors in the Work, and the Owner and Contractor shall be named insureds.

insuring Owner's interests.

#### § 11.3.3 LOSS OF USE INSURANCE

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused. The Owner waives all rights of action against the Contractor for loss of use of the Owner's property, including consequential losses due to fire or other hazards however caused.

§ 11.3.4 If the Contractor requests in writing that insurance for risks other than those described herein or other special causes of loss be included in the property insurance policy, the Owner shall, if possible, include such insurance, and the cost thereof shall be charged to the Contractor by appropriate Change Order.

§ 11.3.5 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, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

§ 11.3.6 Before an exposure to loss may occur, the Owner shall file with the Contractor a copy of each policy that includes insurance coverages required by this Section 11.3. Each policy shall contain all generally applicable conditions, definitions, exclusions and endorsements related to this Project. Each policy shall contain a provision that the policy will not be canceled or allowed to expire, and that its limits will not be reduced, until at least 30 days' prior written notice has been given to the Contractor.

#### § 11.3.7 WAIVERS OF SUBROGATION

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, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, 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 covered by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Owner as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

§ 11.3.8 A loss insured under the Owner's property insurance 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 11.3.10. The Contractor shall pay Subcontractors their just shares of



insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

**§ 11.3.9** If required in writing by a party in interest, the Owner as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Owner's duties. The cost of required bonds shall be charged against proceeds received as fiduciary. The Owner shall deposit in a separate account proceeds so received, which the Owner shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

**§ 11.3.10** The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement. If the Owner and Contractor have selected arbitration as the method of binding dispute resolution, the Owner as fiduciary shall make settlement with insurers or, in the case of a dispute over distribution of insurance proceeds, in accordance with the directions of the arbitrators.

#### **§ 11.4 PERFORMANCE BOND AND PAYMENT BOND**

**§ 11.4.1** The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

**§ 11.4.2** 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.

### **ARTICLE 12 UNCOVERING AND CORRECTION OF WORK**

#### **§ 12.1 UNCOVERING OF WORK**

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

**§ 12.1.2** If a portion of the Work has been covered that the Architect has not specifically requested to examine prior to its being covered, the Architect may request to see such Work and it shall be uncovered by the Contractor. If such Work is in accordance with the Contract Documents, costs of uncovering and replacement shall, by appropriate Change Order, be at the Owner's expense. If such Work is not in accordance with the Contract Documents, such costs and the cost of correction shall be at the Contractor's expense unless the condition was caused by the Owner or a separate contractor in which event the Owner shall be responsible for payment of such costs.

#### **§ 12.2 CORRECTION OF WORK**

##### **§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION**

The Contractor shall promptly correct Work rejected by the Architect or failing to conform to the requirements of the Contract Documents, whether discovered before or after Substantial Completion and whether or not fabricated, installed or completed. Costs of correcting such rejected Work, including additional testing and inspections, the cost of uncovering and replacement, and compensation for the Architect's services and expenses made necessary thereby, shall be at the Contractor's expense.

##### **§ 12.2.2 AFTER SUBSTANTIAL COMPLETION**

**§ 12.2.2.1** In addition to the Contractor's obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an 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 or Architect, the Owner may correct it in accordance with Section 2.4.

§ 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, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

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

#### § 12.3 ACCEPTANCE OF NONCONFORMING WORK

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

### ARTICLE 13 MISCELLANEOUS PROVISIONS

#### § 13.1 GOVERNING LAW

The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

#### § 13.2 SUCCESSORS AND ASSIGNS

§ 13.2.1 The Owner and Contractor respectively bind themselves, their partners, successors, assigns and legal representatives to covenants, agreements and obligations contained in the Contract Documents. Except as provided in Section 13.2.2, neither party to the Contract shall assign the Contract as a whole without written consent of the other. If either party attempts to make such 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 such assignment.

#### § 13.3 WRITTEN NOTICE

Written notice shall be deemed to have been duly served if delivered in person to the individual, to a member of the firm or entity, or to an officer of the corporation for which it was intended; or if delivered at, or sent by registered or certified mail or by courier service providing proof of delivery to, the last business address known to the party giving notice.



## § 13.4 RIGHTS AND REMEDIES

§ 13.4.1 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.

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

## § 13.5 TESTS AND INSPECTIONS

§ 13.5.1 Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals where building codes or applicable laws or regulations prohibit the Owner from delegating their cost to the Contractor.

§ 13.5.2 If the Architect, Owner or public authorities having jurisdiction determine that portions of the Work require additional testing, inspection or approval not included under Section 13.5.1, the Architect will, upon written authorization from the Owner, instruct the Contractor to make arrangements for such additional testing, inspection or approval by an entity acceptable to the Owner, and the Contractor shall give timely notice to the Architect of when and where tests and inspections are to be made so that the Architect may be present for such procedures. Such costs, except as provided in Section 13.5.3, shall be at the Owner's expense.

§ 13.5.3 If such procedures for testing, inspection or approval under Sections 13.5.1 and 13.5.2 reveal failure of the portions of the Work to comply with requirements established by the Contract Documents, all costs made necessary by such failure including those of repeated procedures and compensation for the Architect's services and expenses shall be at the Contractor's expense.

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

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

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

## § 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may 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.

## § 13.7 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, 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 13.7. law.

## 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 or a Subcontractor, Sub-subcontractor or 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 Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment on a Certificate for Payment within the time stated in the Contract Documents; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

§ 14.1.2 The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or 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' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

§ 14.1.4 If the Work is stopped for a period of 60 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor 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' written notice to the Owner and the Architect, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

## § 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

- .1 repeatedly refuses or fails to supply enough properly skilled workers or proper materials;
- .2 fails to make payment to Subcontractors for materials or labor in accordance with the respective agreements between the Contractor and the Subcontractors;
- .3 repeatedly disregards applicable laws, statutes, ordinances, codes, rules and regulations, or lawful orders of a public authority; or
- .4 otherwise is guilty of substantial breach of a provision of the Contract Documents.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, 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 Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case

may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

#### § 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.

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

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

#### § 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

§ 14.4.2 Upon receipt of 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 Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

### 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, 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.

##### § 15.1.2 NOTICE OF CLAIMS

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must 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 CONTINUING CONTRACT PERFORMANCE

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 CLAIMS FOR ADDITIONAL COST

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.



#### § 15.1.5 CLAIMS FOR ADDITIONAL TIME

§ 15.1.5.1 If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary.

§ 15.1.5.2 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 CLAIMS FOR CONSEQUENTIAL DAMAGES

The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes

- .1 damages incurred by the Owner for rental expenses, ~~for losses of use, income, profit, financing,~~ business and reputation, and for loss of management or employee productivity or of the services of such persons; and
- .2 damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

#### § 15.2 INITIAL DECISION

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, 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 final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no 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 such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

§ 15.2.5 The Initial Decision Maker will render an initial decision approving or rejecting the Claim, or indicating that the Initial Decision Maker is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties and the Architect, if the Architect is not serving as the Initial Decision Maker, of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding



on the parties but subject to mediation and, if the parties fail to resolve their dispute through mediation, to binding dispute resolution.

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

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.

§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor's default, the Owner may, but is not obligated to, notify the surety and request the surety's assistance in resolving the controversy.

§ 15.2.8 If a Claim relates to or is the subject of a mechanic's lien, the party asserting such Claim may proceed in accordance with applicable law to comply with the lien notice or filing deadlines.

### § 15.3 MEDIATION

§ 15.3.1 Claims, disputes, or other matters in controversy arising out of or related to the Contract except those waived as provided for in Sections 9.10.4, 9.10.5, and 15.1.6 shall be subject to mediation as a condition precedent to binding dispute resolution.

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

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

### § 15.4 ARBITRATION

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

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

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

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

**§ 15.4.4 CONSOLIDATION OR JOINDER**

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

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

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



## SECTION 011000 – SUMMARY

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Project information.
2. Work covered by Contract Documents.
3. Work under separate contracts.
4. Access to site.
5. Coordination with occupants.
6. Work restrictions.
7. Specification and drawing conventions.
8. Miscellaneous provisions.

##### B. Related Requirements:

1. Section 015000 "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

#### 1.2 PROJECT INFORMATION

##### A. Project Identification: Barrington Town Office, Barrington NH

1. Project Location: Ramsdell Lane, Barrington NH

##### B. Owner: Town of Barrington

1. Owner's Representative: John Scruton

##### C. Architect: Sheerr McCrystal Palson Architecture Inc. dba SMP Architecture

1. 30 South Main Street, Building two, Concord NH 03301
2. Phone: 603-228-8880
3. Sheerr.com

#### 1.3 WORK COVERED BY CONTRACT DOCUMENTS

##### A. The Work of Project is defined by the Contract Documents and consists of the following:

1. Project consists of a new one story 10,000 sf +/- building with partial walk-out storage basement. Project includes all sitework, utilities, excavation, retaining walls, ICF foundations and exterior walls, interior framing and GWB, roof trusses, insulation, storefront doors, fiberglass windows, siding, painting mechanical and electrical systems. Building is non-sprinklered.

B. Type of Contract.

1. Project will be constructed under a single prime contract.

1.4 WORK UNDER SEPARATE CONTRACTS

- A. General: Cooperate fully with separate contractors so work on those contracts may be carried out smoothly, without interfering with or delaying work under this Contract or other contracts. Coordinate the Work of this Contract with work performed under separate contracts.
- B. Concurrent Work: Owner **will award** separate contract(s) for the following construction operations at Project site. Those operations will be conducted simultaneously with work under this Contract.
1. Audio Visual wiring and equipment. Rough-in power and conduits are included in this contract and shall be installed by General contractor or their sub-contractor. Owners' vendor will provide and install devices.
  2. Data and Communications equipment, wiring and terminations. Rough-in boxes, conduits and wiring to a central location are included in this contract and shall be installed by the general contractor, or their sub-contractor. Owners vendor to provide device face plates and terminations. Locations as indicated on the drawings.
  3. Security system equipment and wiring for equipment. Any related door hardware, electric strikes, card swipes etc. and associated wiring is included in this contract and shall be installed by the general contractor, or their sub-contractor.
  4. Installation and set-up of new and relocated furnishings.

1.5 ACCESS TO SITE

- A. General: Contractor shall have full use of Project site for construction operations during construction period. Contractor's use of Project site is limited only by Owner's right to perform work or to retain other contractors on portions of Project.
- B. 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.
- C. 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 without Owner authorization.
1. Limits: Confine construction operations to area shown on the civil drawings
  2. Driveways, Walkways and Entrances: Keep driveways 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.

## 1.6 COORDINATION WITH OCCUPANTS

- A. Full Owner Occupancy: Owner will occupy site during summer months of construction period for a summer recreation program. 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 site access 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 Owner and approval of authorities having jurisdiction.
  - 2. Notify Owner not less than **72** hours in advance of activities that will affect Owner's operations.

## 1.7 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 in the existing building to normal business working hours of 7:00 a.m. to 7:00 p.m., Monday through Friday, unless otherwise indicated.
- 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:
- 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.
- E. Nonsmoking Building: Smoking is not permitted anywhere on the property.
- F. Controlled Substances: Use of tobacco products and other controlled substances **on Project site** is not permitted.

## 1.8 SPECIFICATION AND DRAWING CONVENTIONS

- A. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:
  - 1. Imperative mood and streamlined language are generally used in the Specifications. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.
  - 2. Specification requirements are to be performed by Contractor unless specifically stated otherwise.
- B. Division 01 General Requirements: Requirements of Sections in Division 01 apply to the Work of all Sections in the Specifications.



- C. Drawing Coordination: Requirements for materials and products identified on Drawings are described in detail in the Specifications. One or more of the following are used on Drawings to identify materials and products:
1. Terminology: Materials and products are identified by the typical generic terms used in the individual Specifications Sections.
  2. Abbreviations: Materials and products are identified by abbreviations **scheduled on Drawings**.
  3. Keynoting: Materials and products are identified by reference keynotes referencing Specification Section numbers found in this Project Manual.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000

## SECTION 012500 - SUBSTITUTION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for substitutions.
- B. Related Requirements:
  - 1. Section 016000 "Product Requirements" for requirements for submitting comparable product submittals for products by listed manufacturers.

#### 1.2 DEFINITIONS

- A. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.

#### 1.3 ACTION SUBMITTALS

- A. Substitution Requests: Submit three copies of each request for consideration. 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 **form acceptable to Owner and Architect**.
  - 2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified product or fabrication or installation cannot be provided, if applicable.
    - b. 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.
    - c. 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.
    - d. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - e. Samples, where applicable or requested.
    - f. Certificates and qualification data, where applicable or requested.
    - g. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    - h. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.

- i. Research reports evidencing compliance with building code in effect for Project.
  - j. 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.
  - k. Cost information, including a proposal of change, if any, in the Contract Sum.
  - l. 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.
  - m. 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 within **seven** days of receipt of a request for substitution. Architect will notify Contractor of acceptance or rejection of proposed substitution within **15** days of receipt of request, or **seven** days of receipt of additional information or documentation, whichever is later.
- a. Use product specified if Architect does not issue a decision on use of a proposed substitution within time allocated.

#### 1.4 QUALITY ASSURANCE

- A. Compatibility of Substitutions: Investigate and document compatibility of proposed substitution with related products and materials. Engage a qualified testing agency to perform compatibility tests recommended by manufacturers.

### PART 2 - PRODUCTS

#### 2.1 SUBSTITUTIONS

- A. Substitutions for Cause: Submit requests for substitution immediately on discovery of need for change, but not later than **15** days prior to time required for preparation and review of related submittals.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
    - a. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - b. Requested substitution provides sustainable design characteristics that specified product provided.
    - c. Requested substitution will not adversely affect Contractor's construction schedule.
    - d. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - e. Requested substitution is compatible with other portions of the Work.



- f. Requested substitution has been coordinated with other portions of the Work.
  - g. Requested substitution provides specified warranty.
  - h. 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 **60** days after **commencement of the Work and time has been allotted for review of associated submittals**.
  - 1. Conditions: Architect will consider Contractor's request for substitution when the following conditions are satisfied:
    - 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.
      - 1) Contractor shall be responsible for costs incurred by owner for the Architect to review substitution requests. Costs charged to the owner for these services will be deducted by change order from the contract value.
    - c. Requested substitution is consistent with the Contract Documents and will produce indicated results.
    - d. Requested substitution provides sustainable design characteristics that specified product provided.
    - e. Requested substitution will not adversely affect Contractor's construction schedule.
    - f. Requested substitution has received necessary approvals of authorities having jurisdiction.
    - g. Requested substitution is compatible with other portions of the Work.
    - h. Requested substitution has been coordinated with other portions of the Work.
    - i. Requested substitution provides specified warranty.
    - j. 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)

END OF SECTION 012500

## SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for handling and processing Contract modifications.

#### 1.2 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.

#### 1.3 PROPOSAL REQUESTS

- A. Owner-Initiated Proposal Requests: **Architect** will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
  - 1. Work Change Proposal Requests issued by **Architect** are not instructions either to stop work in progress or to execute the proposed change.
  - 2. Within **time specified in Proposal Request** or **20 days, when not otherwise specified** after receipt of Proposal Request, submit a quotation estimating cost 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.
- B. Contractor-Initiated Work Change Proposals: If latent or changed conditions require modifications to the Contract, Contractor may initiate a claim by submitting a request for a change to **Architect**.
  - 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 Section 012500 "Substitution Procedures" if the proposed change requires substitution of one product or system for product or system specified.

#### 1.4 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Work Changes Proposal Request, Contractor will prepare and issue a Change Order for signatures of Owner, Architect and Contractor on **AIA Document G701**.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600



## SECTION 012900 - PAYMENT PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Requirements:
  - 1. Section 012600 "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 2. Section 013200 "Construction Progress Documentation" for administrative requirements governing the preparation and submittal of the Contractor's construction schedule.

#### 1.2 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the schedule of values with preparation of Contractor's construction schedule.
  - 1. Coordinate line items in the schedule of values with other required administrative forms and schedules, including the following:
    - a. Application for Payment forms with continuation sheets.
    - b. Submittal schedule.
    - c. Items required to be indicated as separate activities in Contractor's construction schedule.
    - d. Schedule of Values shall provide break down of cost, so not individual line items exceeds 5% of the total contract value.
  - 2. Submit the schedule of values to Architect at earliest possible date but no later than **seven** days after Notice to proceed.
- B. Format and Content: Use Project Manual table of contents as a guide to establish line items for the schedule of values. Provide at least one line item for each Specification Section.
  - 1. Identification: Include the following Project identification on the schedule of values:
    - a. Project name and location.
    - b. Name of Architect.
    - c. Architect's project number.
    - d. Contractor's name and address.
    - e. Date of submittal.
  - 2. Arrange schedule of values consistent with format of **AIA Document G703**
  - 3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with Project Manual table of contents. Provide multiple line items for principal subcontract amounts in excess of **five percent** of the Contract Sum.

4. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
5. Provide a separate line item in the schedule of values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
6. Provide separate line items in the schedule of values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
7. Each item in the schedule of values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
8. Schedule Updating: Update and resubmit the schedule of values before the next Applications for Payment when Change Orders result in a change in the Contract Sum.

### 1.3 APPLICATIONS FOR PAYMENT

- A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.
  1. Initial Application for Payment, Application for Payment at time of Substantial Completion, and final Application for Payment involve additional requirements.
- B. Payment Application Times: Submit draft application for payment at least 5 days prior to submission of application for payment. Submit Application for Payment to Architect by the end of the month. The period covered by each Application for Payment is one month, ending on the **last day of the month**
- C. Application for Payment Forms: Use **AIA Document G702 and AIA Document G703** as form for Applications for Payment.
  1. Application for payment to reflect retainage in the amount of ten (10%) Percent.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. **Architect** will return incomplete applications without action.
  1. Entries shall match data on the schedule of values and Contractor's construction schedule. Use updated schedules if revisions were made.
  2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
- E. Transmittal: Submit **three** signed and notarized original copies of each Application for Payment to **Architect** by a method ensuring receipt. One copy shall include waivers of lien and similar required attachments.
  1. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.
- F. Waivers of Mechanic's Lien: With each Application for Payment, submit waivers of mechanic's lien from entities lawfully entitled to file a mechanic's lien arising out of the Contract and related to the Work covered by the payment.
  1. Submit partial waivers on each item for amount requested in previous application, after deduction for retainage, on each item.

2. When an application shows completion of an item, submit conditional final or full waivers.
  3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  4. Waiver Forms: Submit executed waivers of lien on forms acceptable to Owner.
- 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 (preliminary if not final).
  4. Submittal schedule (preliminary if not final).
  5. List of Contractor's staff assignments.
  6. List of Contractor's principal consultants.
- H. Application for Payment at Substantial Completion: After Architect issues the Certificate of Substantial Completion, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.
1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
  2. This application shall reflect Certificates of Partial Substantial Completion issued previously for Owner occupancy of designated portions of the Work.
- I. Final Payment Application: After completing Project closeout requirements, submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited, to the following:
1. Evidence of completion of Project closeout requirements.
  2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
  3. Updated final statement, accounting for final changes to the Contract Sum.
  4. AIA Document G706-1994, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706A-1994, "Contractor's Affidavit of Release of Liens."
  6. AIA Document G707-1994, "Consent of Surety to Final Payment."
  7. Evidence that claims have been settled.
  8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of Substantial Completion or when Owner took possession of and assumed responsibility for corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900



## SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination drawings.
  - 2. Requests for Information (RFIs).
  - 3. Project meetings.
- B. Related Requirements:
  - 1. Section 017300 "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.

#### 1.2 DEFINITIONS

- A. RFI: Request from Owner, Architect, or Contractor seeking information required by or clarifications of the Contract Documents.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. 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, and telephone number of entity performing subcontract or supplying products.
  - 2. Number and title of related Specification Section(s) covered by subcontract.
  - 3. Drawing number and detail references, as appropriate, covered by subcontract.

#### 1.4 GENERAL 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 that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.

- B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.
  - 1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.
- C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities **and activities of other contractors** to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
  - 1. Preparation of Contractor's construction schedule.
  - 2. Preparation of the schedule of values.
  - 3. Installation and removal of temporary facilities and controls.
  - 4. Delivery and processing of submittals.
  - 5. Progress meetings.
  - 6. Preinstallation conferences.
  - 7. Project closeout activities.
  - 8. Startup and adjustment of systems.

#### 1.5 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.
  - 1. Architect will return RFIs submitted to Architect by other entities controlled by Contractor with no response.
  - 2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.
- B. Content of the RFI: Include a detailed, legible description of item needing information or interpretation and the following:
  - 1. Project name.
  - 2. Project number.
  - 3. Date.
  - 4. Name of Contractor.
  - 5. Name of Architect
  - 6. RFI number, numbered sequentially.
  - 7. RFI subject.
  - 8. Specification Section number and title and related paragraphs, as appropriate.
  - 9. Drawing number and detail references, as appropriate.
  - 10. Field dimensions and conditions, as appropriate.
  - 11. Contractor's suggested resolution. If Contractor's solution(s) impacts the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  - 12. Contractor's signature.
  - 13. Attachments: Include sketches, descriptions, measurements, photos, Product Data, Shop Drawings, coordination drawings, and other information necessary to fully describe items needing interpretation.

- C. RFI Forms: **AIA Document G716** or **Software-generated form with substantially the same content as indicated above, acceptable to Architect.**
- D. Architect's Action: Architect will review each RFI, determine action required, and respond. Allow **seven** working days for Architect's response for each RFI. RFIs received by Architect after 1:00 p.m. will be considered as received the following working day.
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, in which case Architect's time for response will date from time of receipt of 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 Section 012600 "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within **10** days of receipt of the RFI response.
- E. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. **Include the following:**
1. Project name.
  2. Name and address of Contractor.
  3. Name and address of Architect.
  4. RFI number including RFIs that were dropped and not submitted.
  5. RFI description.
  6. Date the RFI was submitted.
  7. Date Architect's response was received.
- F. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within **seven** days if Contractor disagrees with response.
1. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.
  2. Identification of related Field Order, Work Change Directive, and Proposal Request, as appropriate.

## 1.6 PROJECT MEETINGS

- A. General: Meetings will occur at Project site unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.
  2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.
  3. Minutes: Entity responsible for conducting meeting will record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner, within **three** days of the meeting.
- B. Preconstruction Conference: Contractor to **Schedule and conduct** a preconstruction conference before starting construction, at a time convenient to Owner and Architect, but no later than **15** days after execution of the Agreement.
1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; 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. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. Designation of key personnel and their duties.
    - e. Procedures for processing field decisions and Change Orders.
    - f. Procedures for RFIs.
    - g. Procedures for testing and inspecting.
    - h. Procedures for processing Applications for Payment.
    - i. Distribution of the Contract Documents.
    - j. Submittal procedures.
    - k. Preparation of record documents.
    - l. Use of the premises
    - m. Work restrictions.
    - n. Working hours.
    - o. Owner's occupancy requirements.
    - p. Responsibility for temporary facilities and controls.
    - q. Procedures for moisture and mold control.
    - r. Procedures for disruptions and shutdowns.
    - s. Construction waste management and recycling.
    - t. Parking availability.
    - u. Office, work, and storage areas.
    - v. Equipment deliveries and priorities.
    - w. First aid.
    - x. Security.
    - y. Progress cleaning.
  3. Minutes: Entity responsible for conducting meeting will record and distribute meeting minutes.
- C. Progress Meetings: Architect to **conduct** progress meetings at **regular** intervals.
1. Attendees: In addition to representatives of Owner 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 and correct minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
  - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's construction schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
    - 1) Review schedule for next period.
  - b. Review present and future needs of each entity present, including the following:
    - 1) Status of submittals.
    - 2) Deliveries.
    - 3) Off-site fabrication.
    - 4) Quality and work standards.
    - 5) Status of correction of deficient items.
    - 6) Field observations.
    - 7) Status of RFIs.
    - 8) Status of proposal requests.
    - 9) Pending changes.
    - 10) Status of Change Orders.
    - 11) Pending claims and disputes.
    - 12) Documentation of information for payment requests.
3. Minutes: Entity responsible for conducting the meeting will record and distribute the meeting minutes to each party present and to parties requiring information.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100

## SECTION 013200 - CONSTRUCTION PROGRESS DOCUMENTATION

### PART 1 - GENERAL

#### 1.1 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. Construction schedule updating reports.
  - 3. Daily construction reports.
  - 4. Site condition reports.

#### 1.2 DEFINITIONS

- A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.
  - 1. Critical Activity: An activity on the critical path that must start and finish on the planned early start and finish times.
  - 2. Predecessor Activity: An activity that precedes another activity in the network.
  - 3. Successor Activity: An activity that follows another activity in the network.
- B. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.
- C. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Format for Submittals: Submit required submittals in the following format:
  - 1. PDF electronic file.
  - 2. **Three** paper copies.
- B. Contractor's Construction Schedule: Initial schedule, of size required to display entire schedule for entire construction period.
  - 1. Submit a working electronic copy of schedule, using software indicated, and labeled to comply with requirements for submittals. Include type of schedule (initial or updated) and date on label.
- C. Construction Schedule Updating Reports: Submit with Applications for Payment.

- D. Daily Construction Reports: Submit at regular intervals concurrent with progress meetings.
- E. Site Condition Reports: Submit at time of discovery of differing conditions.

#### 1.4 COORDINATION

- A. Coordinate Contractor's construction schedule with the schedule of values, submittal schedule, progress reports, payment requests, and other required schedules and reports.
  - 1. Secure time commitments for performing critical elements of the Work from entities involved.
  - 2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

### PART 2 - PRODUCTS

#### 2.1 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Time Frame: Extend schedule from date established for **the Notice to Proceed** to date of **final completion**.
  - 1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.
- B. Activities: Treat each story or separate area as a separate numbered activity for each main element of the Work. Comply with the following:
  - 1. Activity Duration: Define activities so no activity is longer than **20** days, unless specifically allowed by Architect.
  - 2. Procurement Activities: Include procurement process activities for long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
  - 3. Submittal Review Time: Include review and resubmittal times indicated in Section 013300 "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's construction schedule with submittal schedule.
  - 4. Building Flush-out; schedule time for building flush out period for each phase prior to owner occupancy, per section 017300, article 3.7.
  - 5. Startup and Testing Time: Include no fewer than **15** days for startup and testing.
  - 6. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.
  - 7. Punch List and Final Completion: Include not more than **30** days for completion of punch list items and final completion.
- C. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.
  - 1. Work under More Than One Contract: Include a separate activity for each contract.

2. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  3. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Uninterruptible services.
    - d. Partial occupancy before Substantial Completion.
    - e. Use of premises restrictions.
    - f. Provisions for future construction.
    - g. Seasonal variations.
    - h. Environmental control.
  4. Work Stages: Indicate important stages of construction for each major portion of the Work.
- D. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and final completion.
- E. Upcoming Work Summary: Prepare summary report indicating activities scheduled to occur or commence prior to submittal of next schedule update. Summarize the following issues:
1. Unresolved issues.
  2. Unanswered Requests for Information.
  3. Rejected or unreturned submittals.
  4. Notations on returned submittals.
  5. Pending modifications affecting the Work and Contract Time.
- F. Recovery Schedule: When periodic update indicates the Work is **14** or more calendar days behind the current approved schedule, submit a separate recovery schedule indicating means by which Contractor intends to regain compliance with the schedule.

## 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE (GANTT CHART)

- A. Gantt-Chart Schedule: Submit a comprehensive, fully developed, horizontal, Gantt-chart-type, Contractor's construction schedule within **30** days of date established for **the Notice of Award**.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.

## 2.3 REPORTS

- A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:
  1. List of subcontractors at Project site.
  2. List of separate contractors at Project site.
  3. Approximate count of personnel at Project site.
  4. Equipment at Project site.



5. Material deliveries.
6. High and low temperatures and general weather conditions, including presence of rain or snow.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events.
10. Stoppages, delays, shortages, and losses.
11. Meter readings and similar recordings.
12. Emergency procedures.
13. Orders and requests of authorities having jurisdiction.
14. Change Orders received and implemented.
15. Services connected and disconnected.
16. Equipment or system tests and startups.
17. Partial completions and occupancies.
18. Substantial Completions authorized.

- B. Site Condition Reports: Immediately on discovery of a difference between site conditions and the Contract Documents, prepare and submit a detailed report. Submit with a Request for Information. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

- A. Contractor's Construction Schedule Updating: At **monthly** intervals, update schedule to reflect actual construction progress and activities. Issue schedule before a regularly scheduled progress meeting.
1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
  2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
  3. As the Work progresses, indicate final completion percentage for each activity.
- B. Distribution: Distribute copies to Architect, Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.
1. Post copies in Project meeting rooms and temporary field offices.
  2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200

## SECTION 013300 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes requirements for the submittal schedule and administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 2. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 3. Section 017900 "Demonstration and Training" for submitting video recordings of demonstration of equipment and training of Owner's personnel.

#### 1.2 DEFINITIONS

- A. Action Submittals: Written and graphic information and physical samples that require Architect's responsive action.
- B. Informational Submittals: Written and graphic information and physical samples that do not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

#### 1.3 ACTION SUBMITTALS

- A. Submittal Schedule: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, ordering, manufacturing, fabrication, and delivery when establishing dates. Include additional time required for making corrections or revisions to submittals noted by Architect and additional time for handling and reviewing submittals required by those corrections.

#### 1.4 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. 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 reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.
- B. Processing Time: Allow time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. 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.
  1. Initial Review: Allow **15** days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.
  2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.
  3. Resubmittal Review: Allow **15** days for review of each resubmittal.
- C. Paper Submittals: Place a permanent label or title block on each submittal item for identification.
  1. Indicate name of firm or entity that prepared each submittal on label or title block.
  2. Provide a space approximately 6 by 8 inches (150 by 200 mm) on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  3. Include the following information for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Name of subcontractor.
    - f. Name of supplier.
    - g. Name of manufacturer.
    - h. Submittal number or other unique identifier, including revision identifier.
      - 1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).
  - i. Number and title of appropriate Specification Section.
  - j. Drawing number and detail references, as appropriate.
  - k. Location(s) where product is to be installed, as appropriate.
  - l. Other necessary identification.
4. Additional Paper Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.
5. Transmittal for Paper Submittals: Assemble each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect may return without review submittals received from sources other than Contractor.

D. Electronic Submittals:

1. Assemble complete submittal package into a **single indexed file incorporating** submittal requirements of a single Specification Section and transmittal form with links enabling navigation to each item.
2. Name file with submittal number or other unique identifier, including revision identifier.
  - a. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., BTO-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., BTO-061000.01.A).
3. Provide means for insertion to permanently record Contractor's review and approval markings and action taken by Architect.
4. Transmittal Form for Electronic Submittals: Use electronic form acceptable to Owner, containing the following information:
  - a. Project name.
  - b. Date.
  - c. Name and address of Architect.
  - d. Name of Construction Manager.
  - e. Name of Contractor.
  - f. Name of firm or entity that prepared submittal.
  - g. Names of subcontractor, manufacturer, and supplier.
  - h. Category and type of submittal.
  - i. Submittal purpose and description.
  - j. Specification Section number and title.
  - k. Specification paragraph number or drawing designation and generic name for each of multiple items.
  - l. Drawing number and detail references, as appropriate.
  - m. Location(s) where product is to be installed, as appropriate.
  - n. Related physical samples submitted directly.
  - o. Indication of full or partial submittal.
  - p. Transmittal number, numbered consecutively.
  - q. Submittal and transmittal distribution record.
  - r. Other necessary identification.
  - s. Remarks.
5. **Subject Line:** Include the following information as keywords in the electronic submittal file subject line:
  - a. Project name.
  - b. File name shall use project identifier and Specification Section number followed by a decimal point and then a sequential number (e.g., BTO-061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., BTO-061000.01.A).
  - c. Manufacturer name.
  - d. Product name.

E. Options: Identify options requiring selection by Architect.



- F. Deviations: Identify deviations from the Contract Documents on submittals.
- G. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.
  - 1. Note date and content of previous submittal.
  - 2. Note date and content of revision in label or title block and clearly indicate extent of revision.
  - 3. Resubmit submittals until they are marked with approval notation from Architect's action stamp.
- H. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.
- I. Use for Construction: Retain complete copies of submittals on Project site. Use only final action submittals that are marked with approval notation from Architect's action stamp.

## PART 2 - PRODUCTS

### 2.1 SUBMITTAL PROCEDURES

- A. General Submittal Procedure Requirements:
  - 1. Submit electronic submittals via email as singular PDF electronic file.
    - a. Architect will return review/comment sheet(s); annotated submittals will only be returned at architect's discretion and may be in whole or in part.
  - 2. Site office should be supplied with a complete printed set of approved shop drawings, including all electronic documents in full color.
    - a. Action Submittals: Submit **5** paper copies of each submittal unless otherwise indicated. Architect will return review/comment sheet(s); annotated submittals will only be returned at architect's discretion and may be in whole or in part.
  - 3. Informational Submittals: Submit **2** paper copies of each submittal unless otherwise indicated. Architect will return review/comment sheet(s);
- B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.
  - 1. If information must be specially prepared for submittal because standard published data are not suitable for use, submit as Shop Drawings, not as Product Data.
  - 2. Mark each copy of each submittal to show which products and options are applicable.
  - 3. Include the following information, as applicable:
    - a. Manufacturer's catalog cuts.
    - b. Manufacturer's product specifications.
    - c. Standard color charts.
    - d. Statement of compliance with specified referenced standards.

- e. Testing by recognized testing agency.
  - f. Application of testing agency labels and seals.
  - g. Notation of coordination requirements.
  - h. Availability and delivery time information.
- 4. For equipment, include the following in addition to the above, as applicable:
  - a. Wiring diagrams showing factory-installed wiring.
  - b. Printed performance curves.
  - c. Operational range diagrams.
  - d. Clearances required to other construction, if not indicated on accompanying Shop Drawings.
- 5. Submit Product Data before or concurrent with Samples.
- 6. Submit Product Data in the following format:
  - a. PDF electronic file.
  - b. **3** paper copies of Product Data unless otherwise indicated. Architect will return **2** copies.
- C. 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.
  - 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 coordination requirements.
    - e. Notation of dimensions established by field measurement.
    - f. Relationship and attachment to adjoining construction clearly indicated.
    - g. Seal and signature of professional engineer if specified.
  - 2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least **8-1/2 by 11 inches, but no larger than 24 by 36 inches.**
  - 3. Submit Shop Drawings in the format allowed in section 1.4
- D. 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.
  - a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
  - b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
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 **1** full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.
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 **1** set of Samples.
    - 1) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least **3** sets of paired units that show approximate limits of variations.
- E. Contractor's Construction Schedule: Comply with requirements specified in Section 013200 "Construction Progress Documentation."
- F. Application for Payment and Schedule of Values: Comply with requirements specified in Section 012900 "Payment Procedures."
- G. Test and Inspection Reports and Schedule of Tests and Inspections Submittals: Comply with requirements specified in Section 014000 "Quality Requirements."
- H. Closeout Submittals and Maintenance Material Submittals: Comply with requirements specified in Section 017700 "Closeout Procedures."
- I. Maintenance Data: Comply with requirements specified in Section 017823 "Operation and Maintenance Data."
- J. 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.

- K. 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 forms. Include names of firms and personnel certified.
- L. 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.
- M. 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.
- N. 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.
- O. 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.
- P. Schedule of Tests and Inspections: Comply with requirements specified in Section 014000 "Quality Requirements."
- Q. 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.
- R. 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.
- S. 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.

## 2.2 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.
- B. Delegated-Design Services Certification: In addition to Shop Drawings, Product Data, and other required submittals, submit **digitally signed PDF electronic file and 5 paper copies of**



certificate, signed and sealed by the responsible design professional, for each product and system specifically assigned to Contractor to be designed or certified by a design professional.

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.

## PART 3 - EXECUTION

### 3.1 CONTRACTOR'S REVIEW

- A. Action 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. Mark with approval stamp before submitting to Architect.
- B. Project Closeout and Maintenance Material Submittals: See requirements in Section 017700 "Closeout Procedures."
- C. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

### 3.2 ARCHITECT'S ACTION

- A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.
- B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or revisions required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action.
- C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.
- D. Incomplete submittals are unacceptable, will be considered nonresponsive, and will be returned for resubmittal without review.
- E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300

## Electronic File Release

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(Company Name)

At your request, architect will provide electronic files for your convenience and use in the preparation of shop drawings related to:

### **Town of Barrington New Hampshire – Town Office Project**

subject to the following terms and conditions:

Electronic files are compatible with AutoCAD 2014. Architect makes no representation as to the compatibility of these files with hardware or software beyond utilized by contractor.

Data contained on these electronic files are instruments of service and shall not be used for any purpose other than as a convenience in the preparation of shop drawings for the referenced project. Any use or reuse by contractor will be at contractor's sole risk and without liability or legal exposure to architect. Contractor agrees to make no claim and hereby waive, to the fullest extent permitted by law, any claim or cause of action of any nature against architect, our officers, directors, employees, agents or subconsultants that may arise out of or in connection with your use of electronic files.

Contractor shall, to the fullest extent permitted by law, indemnify and hold architect harmless against all damages, liabilities or costs, including reasonable attorneys' fees and defense costs, arising out of or resulting from use of these electronic files.

These electronic files are not construction documents. Differences may exist between these electronic files and corresponding hard-copy construction documents. Architect makes no representation regarding the accuracy or completeness of the electronic files you receive. In the event that a conflict arises between the signed or sealed hard-copy construction documents and the electronic files, the signed or sealed hard-copy construction documents shall govern. Contractor is responsible for determining if any conflict exists. Use of these electronic files does not relieve contractor's duty to fully comply with the contract documents, including, and without limitation, the need to check, confirm and coordinate all dimensions and details, take field measurements, verify field conditions and coordinate work for the project.

Because information presented on the electronic files can be modified, unintentionally or otherwise, Architect reserves the right to remove all indicia of ownership and/or involvement from each electronic display.

Under no circumstances shall delivery of the electronic files for use by contractor be deemed a sale by architect, and architect makes no warranties, either express or implied, of merchantability and fitness for any particular purpose. In no event shall architect be liable for any loss of profit or any consequential damages as a result of your use or reuse of these electronic files.

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(Signature)

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(Contractor Name)

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(Date)

## SECTION 014000 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 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. 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.
  - 2. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
  - 3. Specific test and inspection requirements are not specified in this Section.

#### 1.2 DEFINITIONS

- A. 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.
- B. 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. Services do not include contract enforcement activities performed by Architect.
- C. Mockups: Full-size physical assemblies that are constructed on-site. Mockups are constructed to verify selections made under Sample submittals; to demonstrate aesthetic effects and, where indicated, qualities of materials and execution; to review coordination, testing, or operation; to show interface between dissimilar materials; and to demonstrate compliance with specified installation tolerances. Mockups are not Samples. Unless otherwise indicated, approved mockups establish the standard by which the Work will be judged.
- D. Preconstruction Testing: Tests and inspections performed specifically for Project before products and materials are incorporated into the Work, to verify performance or compliance with specified criteria.
- E. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with specified requirements.

- F. Source Quality-Control Testing: Tests and inspections that are performed at the source, e.g., plant, mill, factory, or shop.
- G. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- H. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- I. 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.
  - 1. Use of trade-specific terminology in referring to a trade or entity does not require that certain construction activities be performed by accredited or unionized individuals, or that requirements specified apply exclusively to specific trade(s).
- J. Experienced: When used with an entity or individual, "experienced" means having successfully completed 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.

### 1.3 CONFLICTING REQUIREMENTS

- A. Referenced Standards: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer conflicting requirements that are different, but apparently equal, to Architect for a decision 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.

### 1.4 INFORMATIONAL SUBMITTALS

- A. Contractor's Statement of Responsibility: When required by authorities having jurisdiction, submit copy of written statement of responsibility sent to authorities having jurisdiction before starting work on the following systems:
  - 1. Seismic-force-resisting system, designated seismic system, or component listed in the designated seismic system quality-assurance plan prepared by Architect.
  - 2. Main wind-force-resisting system or a wind-resisting component listed in the wind-force-resisting system quality-assurance plan prepared by Architect.



- B. 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.

## 1.5 REPORTS AND DOCUMENTS

- A. 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.
- B. Manufacturer's Field Reports: Prepare written information documenting tests and inspections specified in other Sections. Include the following:
  - 1. Name, address, and telephone number of representative making report.
  - 2. Statement on condition of substrates and their acceptability for installation of product.
  - 3. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  - 4. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  - 5. Other required items indicated in individual Specification Sections.

## 1.6 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. **Specialists:** Certain Specification Sections require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.
  - 1. Requirements of authorities having jurisdiction shall supersede requirements for specialists.
- G. **Testing Agency Qualifications:** An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, 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.
- H. **Manufacturer's 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.
- I. **Preconstruction Testing:** Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:
  - 1. Contractor responsibilities include the following:
    - a. Provide test specimens representative of proposed products and construction.
    - b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
    - c. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - d. When testing is complete, remove test specimens, assemblies; do not reuse products on Project.
  - 2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect with copy to Owner and Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

- J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:
1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
  2. Notify Architect **seven** days in advance of dates and times when mockups will be constructed.
  3. Demonstrate the proposed range of aesthetic effects and workmanship.
  4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
    - a. Allow **seven** days for initial review and each re-review of each mockup.
  5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
  6. Demolish and remove mockups when directed unless otherwise indicated.

## 1.7 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. Where services are indicated as Contractor's responsibility, engage a qualified testing agency, not already engaged by the owner, to perform these quality-control services.
  2. Notify testing agencies at least **24** hours in advance of time when Work that requires testing or inspecting will be performed.
  3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.
  4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.
  5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.
- C. Manufacturer's Field Services: Where indicated, engage a manufacturer's representative to observe and inspect the Work. Manufacturer's representative's services include examination of substrates and conditions, verification of materials, inspection of completed portions of the Work, and submittal of written reports.

- D. 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.
- E. Testing Agency Responsibilities: Cooperate with Architect and Contractor in performance of duties. Provide qualified personnel to perform required tests and inspections.
  - 1. Notify Architect and Contractor promptly of irregularities or deficiencies observed in the Work during performance of its services.
  - 2. Determine the location 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 any duties of Contractor.
- F. Associated Services: Cooperate with agencies 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. Delivery of samples to testing agencies.
  - 6. Preliminary design mix proposed for use for material mixes that require control by testing agency.
  - 7. Security and protection for samples and for testing and inspecting equipment at Project site.
- G. 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.

## 1.8 SPECIAL TESTS AND INSPECTIONS

- A. Special Tests and Inspections: **Owner will engage** a qualified **testing agency** or **special inspector** to conduct special tests and inspections required by authorities having jurisdiction as the responsibility of Owner.
- B. Special Tests and Inspections: Conducted by a qualified **testing agency** or **special inspector** as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:



1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviews the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at Substantial Completion, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

## 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. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and revisions as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

### 3.2 REPAIR 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 Section 017300 "Execution."
- B. Protect construction exposed by or for quality-control service activities.
- C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000

## SECTION 014200 – REFERENCES

### PART 1 - GENERAL

#### 1.1 DEFINITIONS

- A. General: Basic Contract definitions are included in the Conditions of the Contract.
- B. "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.
- C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
- D. "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."
- E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
- F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
- G. "Install": Unload, temporarily store, unpack, assemble, erect, place, anchor, apply, work to dimension, finish, cure, protect, clean, and similar operations at Project site.
- H. "Provide": Furnish and install, complete and ready for the intended use.
- I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

#### 1.2 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.
- 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.

### 1.3 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 indicated in Gale's "Encyclopedia of Associations: National Organizations of the U.S." or in Columbia Books' "National Trade & Professional Associations of the United States."

B. 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.

1. AABC - Associated Air Balance Council; [www.aabc.com](http://www.aabc.com).
2. AAMA - American Architectural Manufacturers Association; [www.aamanet.org](http://www.aamanet.org).
3. AAPFCO - Association of American Plant Food Control Officials; [www.aapfco.org](http://www.aapfco.org).
4. AASHTO - American Association of State Highway and Transportation Officials; [www.transportation.org](http://www.transportation.org).
5. AATCC - American Association of Textile Chemists and Colorists; [www.aatcc.org](http://www.aatcc.org).
6. ABMA - American Bearing Manufacturers Association; [www.americanbearings.org](http://www.americanbearings.org).
7. ACI - American Concrete Institute; (Formerly: ACI International); [www.concrete.org](http://www.concrete.org).
8. ACPA - American Concrete Pipe Association; [www.concrete-pipe.org](http://www.concrete-pipe.org).
9. AEIC - Association of Edison Illuminating Companies, Inc. (The); [www.aeic.org](http://www.aeic.org).
10. AF&PA - American Forest & Paper Association; [www.afandpa.org](http://www.afandpa.org).
11. AGA - American Gas Association; [www.aga.org](http://www.aga.org).
12. AHAM - Association of Home Appliance Manufacturers; [www.aham.org](http://www.aham.org).
13. AHRI - Air-Conditioning, Heating, and Refrigeration Institute (The); [www.ahrinet.org](http://www.ahrinet.org).
14. AI - Asphalt Institute; [www.asphaltinstitute.org](http://www.asphaltinstitute.org).
15. AIA - American Institute of Architects (The); [www.aia.org](http://www.aia.org).
16. AISC - American Institute of Steel Construction; [www.aisc.org](http://www.aisc.org).
17. AISI - American Iron and Steel Institute; [www.steel.org](http://www.steel.org).
18. AITC - American Institute of Timber Construction; [www.aitc-glulam.org](http://www.aitc-glulam.org).
19. AMCA - Air Movement and Control Association International, Inc.; [www.amca.org](http://www.amca.org).
20. ANSI - American National Standards Institute; [www.ansi.org](http://www.ansi.org).
21. AOSA - Association of Official Seed Analysts, Inc.; [www.aosaseed.com](http://www.aosaseed.com).
22. APA - APA - The Engineered Wood Association; [www.apawood.org](http://www.apawood.org).
23. APA - Architectural Precast Association; [www.archprecast.org](http://www.archprecast.org).
24. API - American Petroleum Institute; [www.api.org](http://www.api.org).
25. ARI - Air-Conditioning & Refrigeration Institute; (See AHRI).
26. ARI - American Refrigeration Institute; (See AHRI).
27. ARMA - Asphalt Roofing Manufacturers Association; [www.asphaltroofing.org](http://www.asphaltroofing.org).
28. ASCE - American Society of Civil Engineers; [www.asce.org](http://www.asce.org).
29. ASCE/SEI - American Society of Civil Engineers/Structural Engineering Institute; (See ASCE).
30. ASHRAE - American Society of Heating, Refrigerating and Air-Conditioning Engineers; [www.ashrae.org](http://www.ashrae.org).
31. ASME - ASME International; (American Society of Mechanical Engineers); [www.asme.org](http://www.asme.org).
32. ASSE - American Society of Safety Engineers (The); [www.asse.org](http://www.asse.org).
33. ASSE - American Society of Sanitary Engineering; [www.asse-plumbing.org](http://www.asse-plumbing.org).

34. ASTM - ASTM International; (American Society for Testing and Materials International); [www.astm.org](http://www.astm.org).
35. ATIS - Alliance for Telecommunications Industry Solutions; [www.atis.org](http://www.atis.org).
36. AWEA - American Wind Energy Association; [www.awea.org](http://www.awea.org).
37. AWI - Architectural Woodwork Institute; [www.awinet.org](http://www.awinet.org).
38. AWMAC - Architectural Woodwork Manufacturers Association of Canada; [www.awmac.com](http://www.awmac.com).
39. AWPAA - American Wood Protection Association; (Formerly: American Wood-Preservers' Association); [www.awpa.com](http://www.awpa.com).
40. AWS - American Welding Society; [www.aws.org](http://www.aws.org).
41. AWWA - American Water Works Association; [www.awwa.org](http://www.awwa.org).
42. BHMA - Builders Hardware Manufacturers Association; [www.buildershardware.com](http://www.buildershardware.com).
43. BIA - Brick Industry Association (The); [www.gobrick.com](http://www.gobrick.com).
44. BICSI - BICSI, Inc.; [www.bicsi.org](http://www.bicsi.org).
45. BIFMA - BIFMA International; (Business and Institutional Furniture Manufacturer's Association); [www.bifma.com](http://www.bifma.com).
46. BISSC - Baking Industry Sanitation Standards Committee; [www.bissc.org](http://www.bissc.org).
47. BOCA - BOCA; (Building Officials and Code Administrators International Inc.); (See ICC).
48. BWF - Badminton World Federation; (Formerly: International Badminton Federation); [www.bwfbadminton.org](http://www.bwfbadminton.org).
49. CDA - Copper Development Association; [www.copper.org](http://www.copper.org).
50. CEA - Canadian Electricity Association; [www.electricity.ca](http://www.electricity.ca).
51. CEA - Consumer Electronics Association; [www.ce.org](http://www.ce.org).
52. CFFA - Chemical Fabrics & Film Association, Inc.; [www.chemicalfabricsandfilm.com](http://www.chemicalfabricsandfilm.com).
53. CFSEI - Cold-Formed Steel Engineers Institute; [www.cfsei.org](http://www.cfsei.org).
54. CGA - Compressed Gas Association; [www.cganet.com](http://www.cganet.com).
55. CIMA - Cellulose Insulation Manufacturers Association; [www.cellulose.org](http://www.cellulose.org).
56. CISCA - Ceilings & Interior Systems Construction Association; [www.cisca.org](http://www.cisca.org).
57. CISPI - Cast Iron Soil Pipe Institute; [www.cispi.org](http://www.cispi.org).
58. CLFMI - Chain Link Fence Manufacturers Institute; [www.chainlinkinfo.org](http://www.chainlinkinfo.org).
59. CPA - Composite Panel Association; [www.pbmdf.com](http://www.pbmdf.com).
60. CRI - Carpet and Rug Institute (The); [www.carpet-rug.org](http://www.carpet-rug.org).
61. CRRC - Cool Roof Rating Council; [www.coolroofs.org](http://www.coolroofs.org).
62. CRSI - Concrete Reinforcing Steel Institute; [www.crsi.org](http://www.crsi.org).
63. CSA - Canadian Standards Association; [www.csa.ca](http://www.csa.ca).
64. CSA - CSA International; (Formerly: IAS - International Approval Services); [www.csa-international.org](http://www.csa-international.org).
65. CSI - Construction Specifications Institute (The); [www.csinet.org](http://www.csinet.org).
66. CSSB - Cedar Shake & Shingle Bureau; [www.cedarbureau.org](http://www.cedarbureau.org).
67. CTI - Cooling Technology Institute; (Formerly: Cooling Tower Institute); [www.cti.org](http://www.cti.org).
68. CWC - Composite Wood Council; (See CPA).
69. DASMA - Door and Access Systems Manufacturers Association; [www.dasma.com](http://www.dasma.com).
70. DHI - Door and Hardware Institute; [www.dhi.org](http://www.dhi.org).
71. ECA - Electronic Components Association; [www.ec-central.org](http://www.ec-central.org).
72. ECAMA - Electronic Components Assemblies & Materials Association; (See ECA).
73. EIA - Electronic Industries Alliance; (See TIA).
74. EIMA - EIFS Industry Members Association; [www.eima.com](http://www.eima.com).
75. EJMA - Expansion Joint Manufacturers Association, Inc.; [www.ejma.org](http://www.ejma.org).
76. ESD - ESD Association; (Electrostatic Discharge Association); [www.esda.org](http://www.esda.org).
77. ESTA - Entertainment Services and Technology Association; (See PLASA).



78. EVO - Efficiency Valuation Organization; [www.evo-world.org](http://www.evo-world.org).
79. FIBA - Federation Internationale de Basketball; (The International Basketball Federation); [www.fiba.com](http://www.fiba.com).
80. FIVB - Federation Internationale de Volleyball; (The International Volleyball Federation); [www.fivb.org](http://www.fivb.org).
81. FM Approvals - FM Approvals LLC; [www.fmglobal.com](http://www.fmglobal.com).
82. FM Global - FM Global; (Formerly: FMG - FM Global); [www.fmglobal.com](http://www.fmglobal.com).
83. FRSA - Florida Roofing, Sheet Metal & Air Conditioning Contractors Association, Inc.; [www.floridarooft.com](http://www.floridarooft.com).
84. FSA - Fluid Sealing Association; [www.fluidsealing.com](http://www.fluidsealing.com).
85. FSC - Forest Stewardship Council U.S.; [www.fscus.org](http://www.fscus.org).
86. GA - Gypsum Association; [www.gypsum.org](http://www.gypsum.org).
87. GANA - Glass Association of North America; [www.glasswebsite.com](http://www.glasswebsite.com).
88. GS - Green Seal; [www.greenseal.org](http://www.greenseal.org).
89. HI - Hydraulic Institute; [www.pumps.org](http://www.pumps.org).
90. HI/GAMA - Hydronics Institute/Gas Appliance Manufacturers Association; (See AHRI).
91. HMMA - Hollow Metal Manufacturers Association; (See NAAMM).
92. HPVA - Hardwood Plywood & Veneer Association; [www.hpva.org](http://www.hpva.org).
93. HPW - H. P. White Laboratory, Inc.; [www.hpwhite.com](http://www.hpwhite.com).
94. IAPSC - International Association of Professional Security Consultants; [www.iapsc.org](http://www.iapsc.org).
95. IAS - International Approval Services; (See CSA).
96. ICBO - International Conference of Building Officials; (See ICC).
97. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
98. ICEA - Insulated Cable Engineers Association, Inc.; [www.icea.net](http://www.icea.net).
99. ICPA - International Cast Polymer Alliance; [www.icpa-hq.org](http://www.icpa-hq.org).
100. ICRI - International Concrete Repair Institute, Inc.; [www.icri.org](http://www.icri.org).
101. IEC - International Electrotechnical Commission; [www.iec.ch](http://www.iec.ch).
102. IEEE - Institute of Electrical and Electronics Engineers, Inc. (The); [www.ieee.org](http://www.ieee.org).
103. IES - Illuminating Engineering Society; (Formerly: Illuminating Engineering Society of North America); [www.ies.org](http://www.ies.org).
104. IESNA - Illuminating Engineering Society of North America; (See IES).
105. IEST - Institute of Environmental Sciences and Technology; [www.iest.org](http://www.iest.org).
106. IGMA - Insulating Glass Manufacturers Alliance; [www.igmaonline.org](http://www.igmaonline.org).
107. IGSHPA - International Ground Source Heat Pump Association; [www.igshpa.okstate.edu](http://www.igshpa.okstate.edu).
108. ILI - Indiana Limestone Institute of America, Inc.; [www.iliai.com](http://www.iliai.com).
109. Intertek - Intertek Group; (Formerly: ETL SEMCO; Intertek Testing Service NA); [www.intertek.com](http://www.intertek.com).
110. ISA - International Society of Automation (The); (Formerly: Instrumentation, Systems, and Automation Society); [www.isa.org](http://www.isa.org).
111. ISAS - Instrumentation, Systems, and Automation Society (The); (See ISA).
112. ISFA - International Surface Fabricators Association; (Formerly: International Solid Surface Fabricators Association); [www.isfanow.org](http://www.isfanow.org).
113. ISO - International Organization for Standardization; [www.iso.org](http://www.iso.org).
114. ISSFA - International Solid Surface Fabricators Association; (See ISFA).
115. ITU - International Telecommunication Union; [www.itu.int/home](http://www.itu.int/home).
116. KCMA - Kitchen Cabinet Manufacturers Association; [www.kcma.org](http://www.kcma.org).
117. LMA - Laminating Materials Association; (See CPA).
118. LPI - Lightning Protection Institute; [www.lightning.org](http://www.lightning.org).
119. MBMA - Metal Building Manufacturers Association; [www.mbma.com](http://www.mbma.com).
120. MCA - Metal Construction Association; [www.metalconstruction.org](http://www.metalconstruction.org).

121. MFMA - Maple Flooring Manufacturers Association, Inc.; [www.maplefloor.org](http://www.maplefloor.org).
122. MFMA - Metal Framing Manufacturers Association, Inc.; [www.metalframingmfg.org](http://www.metalframingmfg.org).
123. MHIA - Material Handling Industry of America; [www.mhia.org](http://www.mhia.org).
124. MIA - Marble Institute of America; [www.marble-institute.com](http://www.marble-institute.com).
125. MMPA - Moulding & Millwork Producers Association; (Formerly: Wood Moulding & Millwork Producers Association); [www.wmmpa.com](http://www.wmmpa.com).
126. MPI - Master Painters Institute; [www.paintinfo.com](http://www.paintinfo.com).
127. MSS - Manufacturers Standardization Society of The Valve and Fittings Industry Inc.; [www.mss-hq.org](http://www.mss-hq.org).
128. NAAMM - National Association of Architectural Metal Manufacturers; [www.naamm.org](http://www.naamm.org).
129. NACE - NACE International; (National Association of Corrosion Engineers International); [www.nace.org](http://www.nace.org).
130. NADCA - National Air Duct Cleaners Association; [www.nadca.com](http://www.nadca.com).
131. NAIMA - North American Insulation Manufacturers Association; [www.naima.org](http://www.naima.org).
132. NBGQA - National Building Granite Quarries Association, Inc.; [www.nbgqa.com](http://www.nbgqa.com).
133. NCAA - National Collegiate Athletic Association (The); [www.ncaa.org](http://www.ncaa.org).
134. NCMA - National Concrete Masonry Association; [www.ncma.org](http://www.ncma.org).
135. NEBB - National Environmental Balancing Bureau; [www.nebb.org](http://www.nebb.org).
136. NECA - National Electrical Contractors Association; [www.necanet.org](http://www.necanet.org).
137. NeLMA - Northeastern Lumber Manufacturers Association; [www.nelma.org](http://www.nelma.org).
138. NEMA - National Electrical Manufacturers Association; [www.nema.org](http://www.nema.org).
139. NETA - InterNational Electrical Testing Association; [www.netaworld.org](http://www.netaworld.org).
140. NFHS - National Federation of State High School Associations; [www.nfhs.org](http://www.nfhs.org).
141. NFPA - NFPA; (National Fire Protection Association); [www.nfpa.org](http://www.nfpa.org).
142. NFPA - NFPA International; (See NFPA).
143. NFRC - National Fenestration Rating Council; [www.nfrc.org](http://www.nfrc.org).
144. NHLA - National Hardwood Lumber Association; [www.nhla.com](http://www.nhla.com).
145. NLGA - National Lumber Grades Authority; [www.nlga.org](http://www.nlga.org).
146. NOFMA - National Oak Flooring Manufacturers Association; (See NWFA).
147. NOMMA - National Ornamental & Miscellaneous Metals Association; [www.nomma.org](http://www.nomma.org).
148. NRCA - National Roofing Contractors Association; [www.nrca.net](http://www.nrca.net).
149. NRMCA - National Ready Mixed Concrete Association; [www.nrmca.org](http://www.nrmca.org).
150. NSF - NSF International; (National Sanitation Foundation International); [www.nsf.org](http://www.nsf.org).
151. NSPE - National Society of Professional Engineers; [www.nspe.org](http://www.nspe.org).
152. NSSGA - National Stone, Sand & Gravel Association; [www.nssga.org](http://www.nssga.org).
153. NTMA - National Terrazzo & Mosaic Association, Inc. (The); [www.ntma.com](http://www.ntma.com).
154. NWFA - National Wood Flooring Association; [www.nwfa.org](http://www.nwfa.org).
155. PCI - Precast/Prestressed Concrete Institute; [www.pci.org](http://www.pci.org).
156. PDI - Plumbing & Drainage Institute; [www.pdionline.org](http://www.pdionline.org).
157. PLASA - PLASA; (Formerly: ESTA - Entertainment Services and Technology Association); [www.plasa.org](http://www.plasa.org).
158. RCSC - Research Council on Structural Connections; [www.boltcouncil.org](http://www.boltcouncil.org).
159. RFCI - Resilient Floor Covering Institute; [www.rfci.com](http://www.rfci.com).
160. RIS - Redwood Inspection Service; [www.redwoodinspection.com](http://www.redwoodinspection.com).
161. SAE - SAE International; (Society of Automotive Engineers); [www.sae.org](http://www.sae.org).
162. SCTE - Society of Cable Telecommunications Engineers; [www.scte.org](http://www.scte.org).
163. SDI - Steel Deck Institute; [www.sdi.org](http://www.sdi.org).
164. SDI - Steel Door Institute; [www.steeldoor.org](http://www.steeldoor.org).
165. SEFA - Scientific Equipment and Furniture Association; [www.sefalabs.com](http://www.sefalabs.com).

166. SEI/ASCE - Structural Engineering Institute/American Society of Civil Engineers; (See ASCE).
167. SIA - Security Industry Association; [www.siaonline.org](http://www.siaonline.org).
168. SJI - Steel Joist Institute; [www.steeljoist.org](http://www.steeljoist.org).
169. SMA - Screen Manufacturers Association; [www.smainfo.org](http://www.smainfo.org).
170. SMACNA - Sheet Metal and Air Conditioning Contractors' National Association; [www.smacna.org](http://www.smacna.org).
171. SMPTE - Society of Motion Picture and Television Engineers; [www.smpte.org](http://www.smpte.org).
172. SPFA - Spray Polyurethane Foam Alliance; [www.sprayfoam.org](http://www.sprayfoam.org).
173. SPIB - Southern Pine Inspection Bureau; [www.spib.org](http://www.spib.org).
174. SPRI - Single Ply Roofing Industry; [www.spri.org](http://www.spri.org).
175. SRCC - Solar Rating and Certification Corporation; [www.solar-rating.org](http://www.solar-rating.org).
176. SSINA - Specialty Steel Industry of North America; [www.ssina.com](http://www.ssina.com).
177. SSPC - SSPC: The Society for Protective Coatings; [www.sspc.org](http://www.sspc.org).
178. STI - Steel Tank Institute; [www.steeltank.com](http://www.steeltank.com).
179. SWI - Steel Window Institute; [www.steelwindows.com](http://www.steelwindows.com).
180. SWPA - Submersible Wastewater Pump Association; [www.swpa.org](http://www.swpa.org).
181. TCA - Tilt-Up Concrete Association; [www.tilt-up.org](http://www.tilt-up.org).
182. TCNA - Tile Council of North America, Inc.; (Formerly: Tile Council of America); [www.tileusa.com](http://www.tileusa.com).
183. TEMA - Tubular Exchanger Manufacturers Association, Inc.; [www.tema.org](http://www.tema.org).
184. TIA - Telecommunications Industry Association; (Formerly: TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance); [www.tiaonline.org](http://www.tiaonline.org).
185. TIA/EIA - Telecommunications Industry Association/Electronic Industries Alliance; (See TIA).
186. TMS - The Masonry Society; [www.masonrysociety.org](http://www.masonrysociety.org).
187. TPI - Truss Plate Institute; [www.tpinst.org](http://www.tpinst.org).
188. TPI - Turfgrass Producers International; [www.turfgrasssod.org](http://www.turfgrasssod.org).
189. TRI - Tile Roofing Institute; [www.tilerroofing.org](http://www.tilerroofing.org).
190. UBC - Uniform Building Code; (See ICC).
191. UL - Underwriters Laboratories Inc.; [www.ul.com](http://www.ul.com).
192. UNI - Uni-Bell PVC Pipe Association; [www.uni-bell.org](http://www.uni-bell.org).
193. USAV - USA Volleyball; [www.usavolleyball.org](http://www.usavolleyball.org).
194. USGBC - U.S. Green Building Council; [www.usgbc.org](http://www.usgbc.org).
195. USITT - United States Institute for Theatre Technology, Inc.; [www.usitt.org](http://www.usitt.org).
196. WASTEC - Waste Equipment Technology Association; [www.wastec.org](http://www.wastec.org).
197. WCLIB - West Coast Lumber Inspection Bureau; [www.wclib.org](http://www.wclib.org).
198. WCMA - Window Covering Manufacturers Association; [www.wcmanet.org](http://www.wcmanet.org).
199. WDMA - Window & Door Manufacturers Association; [www.wdma.com](http://www.wdma.com).
200. WI - Woodwork Institute; (Formerly: WIC - Woodwork Institute of California); [www.wicnet.org](http://www.wicnet.org).
201. WMMPA - Wood Moulding & Millwork Producers Association; (See MMPA).
202. WSRCA - Western States Roofing Contractors Association; [www.wsrca.com](http://www.wsrca.com).
203. WPA - Western Wood Products Association; [www.wwpa.org](http://www.wwpa.org).

C. 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.

1. DIN - Deutsches Institut für Normung e.V.; [www.din.de](http://www.din.de).

2. IAPMO - International Association of Plumbing and Mechanical Officials; [www.iapmo.org](http://www.iapmo.org).
  3. ICC - International Code Council; [www.iccsafe.org](http://www.iccsafe.org).
  4. ICC-ES - ICC Evaluation Service, LLC; [www.icc-es.org](http://www.icc-es.org).
- D. 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.
1. COE - Army Corps of Engineers; [www.usace.army.mil](http://www.usace.army.mil).
  2. CPSC - Consumer Product Safety Commission; [www.cpsc.gov](http://www.cpsc.gov).
  3. DOC - Department of Commerce; National Institute of Standards and Technology; [www.nist.gov](http://www.nist.gov).
  4. DOD - Department of Defense; <http://dodssp.daps.dla.mil>.
  5. DOE - Department of Energy; [www.energy.gov](http://www.energy.gov).
  6. EPA - Environmental Protection Agency; [www.epa.gov](http://www.epa.gov).
  7. FAA - Federal Aviation Administration; [www.faa.gov](http://www.faa.gov).
  8. FG - Federal Government Publications; [www.gpo.gov](http://www.gpo.gov).
  9. GSA - General Services Administration; [www.gsa.gov](http://www.gsa.gov).
  10. HUD - Department of Housing and Urban Development; [www.hud.gov](http://www.hud.gov).
  11. LBL - Lawrence Berkeley National Laboratory; Environmental Energy Technologies Division; <http://eetd.lbl.gov>.
  12. OSHA - Occupational Safety & Health Administration; [www.osha.gov](http://www.osha.gov).
  13. SD - Department of State; [www.state.gov](http://www.state.gov).
  14. TRB - Transportation Research Board; National Cooperative Highway Research Program; [www.trb.org](http://www.trb.org).
  15. USDA - Department of Agriculture; Agriculture Research Service; U.S. Salinity Laboratory; [www.ars.usda.gov](http://www.ars.usda.gov).
  16. USDA - Department of Agriculture; Rural Utilities Service; [www.usda.gov](http://www.usda.gov).
  17. USDJ - Department of Justice; Office of Justice Programs; National Institute of Justice; [www.ojp.usdoj.gov](http://www.ojp.usdoj.gov).
  18. USP - U.S. Pharmacopeia; [www.usp.org](http://www.usp.org).
  19. USPS - United States Postal Service; [www.usps.com](http://www.usps.com).
- E. 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.
1. CFR - Code of Federal Regulations; Available from Government Printing Office; [www.gpo.gov/fdsys](http://www.gpo.gov/fdsys).
  2. DOD - Department of Defense; Military Specifications and Standards; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
  3. DSCC - Defense Supply Center Columbus; (See FS).
  4. FED-STD - Federal Standard; (See FS).
  5. FS - Federal Specification; Available from Department of Defense Single Stock Point; <http://dodssp.daps.dla.mil>.
    - a. Available from Defense Standardization Program; [www.dsp.dla.mil](http://www.dsp.dla.mil).
    - b. Available from General Services Administration; [www.gsa.gov](http://www.gsa.gov).
    - c. Available from National Institute of Building Sciences/Whole Building Design Guide; [www.wbdg.org/ccb](http://www.wbdg.org/ccb).



6. MILSPEC - Military Specification and Standards; (See DOD).
  7. USAB - United States Access Board; [www.access-board.gov](http://www.access-board.gov).
  8. USATBCB - U.S. Architectural & Transportation Barriers Compliance Board; (See USAB).
- F. 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.
1. CBHF - State of California; Department of Consumer Affairs; Bureau of Electronic Appliance and Repair, Home Furnishings and Thermal Insulation; [www.bearhfti.ca.gov](http://www.bearhfti.ca.gov).
  2. CCR - California Code of Regulations; Office of Administrative Law; California Title 24 Energy Code; [www.calregs.com](http://www.calregs.com).
  3. CDHS - California Department of Health Services; (See CDPH).
  4. CDPH - California Department of Public Health; Indoor Air Quality Program; [www.cal-iaq.org](http://www.cal-iaq.org).
  5. CPUC - California Public Utilities Commission; [www.cpuc.ca.gov](http://www.cpuc.ca.gov).
  6. SCAQMD - South Coast Air Quality Management District; [www.aqmd.gov](http://www.aqmd.gov).
  7. TFS - Texas Forest Service; Forest Resource Development and Sustainable Forestry; <http://txforests.service.tamu.edu>.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for work restrictions and limitations on utility interruptions.

#### 1.2 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 to use temporary services and facilities without cost, including, but not limited to, **Owner's construction forces**, Architect, testing agencies, and authorities having jurisdiction.
- B. Water 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.
- C. Electric Power Service from Existing System: Electric power from Owner's existing system is available for use without metering and without payment of use charges. Provide connections and extensions of services as required for construction operations.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.
- B. Erosion- and Sedimentation-Control Plan: Show compliance with requirements of EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent.
- C. Fire-Safety Program: Show compliance with requirements of NFPA 241 and authorities having jurisdiction. Indicate Contractor personnel responsible for management of fire prevention program.

#### 1.4 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.

## 1.5 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Engage Installer of each permanent service to assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

## PART 2 - PRODUCTS

### 2.1 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
  - 1. Provide separate work office with in mobile unit for Owner's clerk of the works office area.

### 2.2 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.
  - 1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
  - 2. Heating 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.
  - 3. Permanent HVAC System: If Owner authorizes in writing the use of permanent HVAC system for temporary use during construction, provide filter with MERV of **8** at each return-air grille in system and remove at end of construction **and clean HVAC system as required in Section 017700 "Closeout Procedures"**.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.
  - 1. Locate facilities to limit site disturbance as specified in Section 011000 "Summary."

- 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.

### 3.2 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. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.
  - 1. Connect temporary sewers to **private system** as directed by authorities having jurisdiction.
- C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.
- D. Sanitary Facilities: Provide temporary toilets, wash facilities, and 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.
- E. Heating **and** Cooling: 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.
- F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.
- G. Electric Power Service: Connect to Owner's existing electric power service. Maintain equipment in a condition acceptable to Owner.
- H. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.
  - 1. Install electric power service **overhead** unless otherwise indicated.
  - 2. Connect temporary service to Owner's existing power source, as directed by Owner.
- I. Lighting: 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.



### 3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

1. Provide construction for temporary offices, shops, and sheds located within construction area or within 30 feet (9 m) of building lines that is noncombustible according to ASTM E 136. Comply with NFPA 241.
2. Maintain support facilities until Architect schedules Substantial Completion inspection. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Use of Permanent Roads and Paved Areas: Locate temporary roads and paved areas in same location as permanent roads and paved areas. Construct and maintain temporary roads and paved areas adequate for construction operations. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Civil Engineering drawings.
3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before Substantial Completion. Repair hot-mix asphalt base-course pavement before installation of final course according to Civil Engineering drawings.

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. Parking: Construction personnel may park **within designated construction limits on site**.

E. 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.

F. Project Signs: Provide Project signs as indicated. Unauthorized signs are not permitted.

1. Identification Signs: Provide Project identification signs as indicated on Drawings.
2. Temporary Signs: Provide other signs as indicated and as required to inform public and individuals seeking entrance to Project.
  - a. Provide temporary, directional signs for construction personnel and visitors.
3. Maintain and touchup signs so they are legible at all times.

- G. Waste Disposal Facilities: 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 Section 017300 "Execution."
- H. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.
  - 1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
- I. Temporary Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate.
- J. 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.
- K. Temporary Use of Permanent Stairs: Use of new stairs for construction traffic will be permitted, provided stairs are protected and finishes restored to new condition at time of Substantial Completion.

### 3.4 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.
- 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: Comply with **requirements of 2003 EPA Construction General Permit or authorities having jurisdiction, whichever is more stringent and** requirements specified on Civil Engineering drawings.
- D. Temporary Erosion and Sedimentation Control: 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 **erosion- and sedimentation-control Drawings**.
- E. 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.
- F. Tree and Plant Protection: Comply with requirements specified on Civil Engineering drawings.

- G. 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.
- H. 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 environmentally safe materials.
- I. Site Enclosure Fence: **Before construction operations begin**, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.
  - 1. Extent of Fence: **As indicated on Drawings.**
  - 2. Maintain security by limiting number of keys and restricting distribution to authorized personnel. **Furnish one set of keys to Owner.**
- J. Barricades, Warning Signs, and Lights: Comply with requirements of authorities having jurisdiction for erecting structurally adequate barricades, including warning signs and lighting.
- K. Temporary Egress: Maintain temporary egress from existing occupied facilities as indicated and as required by authorities having jurisdiction.
- 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.
  - 1. Where heating or cooling is needed and permanent enclosure is not complete, insulate temporary enclosures.
- M. Temporary Partitions: Provide floor-to-ceiling dustproof partitions to limit dust and dirt migration and to separate areas occupied by **Owner** from fumes and noise.

### 3.5 MOISTURE AND MOLD CONTROL

- A. Contractor's Moisture Protection Plan: Avoid trapping water in finished work. Document visible signs of mold that may appear during construction.
- B. Exposed Construction Phase: Before installation of weather barriers, when materials are subject to wetting and exposure and to airborne mold spores, protect materials from water damage and keep porous and organic materials from coming into prolonged contact with concrete.
- C. Partially Enclosed Construction Phase: 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. Discard or replace water-damaged and wet material.

4. Discard, replace, or clean stored or installed material that begins to grow mold.
  5. Perform work in a sequence that allows any wet materials adequate time to dry before enclosing the material in drywall or other interior finishes.
- D. Controlled Construction Phase of Construction: 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. Remove materials that cannot be completely restored to their manufactured moisture level within **48** hours.

### 3.6 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.
1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.
- 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. Owner reserves right to take possession of Project identification signs.
  2. At Substantial Completion, repair, renovate, and clean permanent facilities used during construction period. Comply with final cleaning requirements specified in Section 017700 "Closeout Procedures."

END OF SECTION 015000



## SECTION 016000 - PRODUCT REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 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.
- B. Related Requirements:
  - 1. Section 012500 "Substitution Procedures" for requests for substitutions.

#### 1.2 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. New Products: Items that have not previously been incorporated into another project or facility. Products salvaged or recycled from other projects are not considered new products.
  - 3. 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 of additional manufacturers named in the specification.

#### 1.3 ACTION SUBMITTALS

- A. Comparable Product Requests: 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. 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 of approval or rejection of proposed comparable

product request within **15** fifteen days of receipt of request, or **7** seven days of receipt of additional information or documentation, whichever is later.

- a. Form of Approval: As specified in Section 013300 "Submittal Procedures."
- b. Use product specified if Architect does not issue a decision on use of a comparable product request within time allocated.

- B. Basis-of-Design Product Specification Submittal: Comply with requirements in Section 013300 "Submittal Procedures." Show compliance with requirements.

#### 1.4 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.

#### 1.5 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 inspection 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.

## 1.6 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.
  - 2. Special Warranty: Written warranty required by the Contract Documents to provide specific rights for 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. Specified Form: When specified forms are included with the Specifications, prepare a written document using indicated form properly executed.
  - 3. Refer to other Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Section 017700 "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.
- B. Product Selection Procedures:
  - 1. Product: Where Specifications name a single manufacturer and product, provide the named product that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.

2. Manufacturer/Source: Where Specifications name a single manufacturer or source, provide a product by the named manufacturer or source that complies with requirements. Comparable products or substitutions for Contractor's convenience will not be considered.
  3. Products:
    - a. Restricted List: Where Specifications include a list of names of both manufacturers and products, provide one of the products listed that complies with requirements.
    - b. Nonrestricted List: Where Specifications include a list of names of both available manufacturers and products, provide one of the products listed.
  4. Manufacturers:
    - a. Restricted List: Where Specifications include a list of manufacturers' names, provide a product by one of the manufacturers listed that complies with requirements. Comparable products or substitutions for Contractor's convenience **will be considered only under the substitution procedures.**
    - b. Nonrestricted List: Where Specifications include a list of available manufacturers, provide a product by one of the manufacturers listed.
  5. 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. 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 by one of the other named manufacturers.
- 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 Section 012500 "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: 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 016000



## SECTION 017300 – EXECUTION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes general administrative and procedural requirements governing execution of the Work including, but not limited to, the following:
  - 1. Construction layout.
  - 2. Field engineering and surveying.
  - 3. Installation of the Work.
  - 4. Cutting and patching.
  - 5. Coordination of Owner-installed products.
  - 6. Indoor Air Quality control (IAQ) requirements.
  - 7. Progress cleaning.
  - 8. Starting and adjusting.
  - 9. Protection of installed construction.
- B. Related Requirements:
  - 1. Section 011000 "Summary" for limits on use of Project site.
  - 2. Section 017700 "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

#### 1.2 INFORMATIONAL SUBMITTALS

- A. Final Property Survey: Contractor to engage a licensed land surveyor to complete and submit 2 printed copies and electronic CAD format showing the completed Work performed and record survey data.

#### 1.3 QUALITY ASSURANCE

- A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
- B. 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, notify Architect of locations and details of cutting and await directions from Architect before proceeding. Shore, brace, and support structural element 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.

## 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 Section 013100 "Project Management and Coordination."

### 3.3 CONSTRUCTION LAYOUT

- A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.
- B. General: Engage a **land surveyor** to lay out the Work using accepted surveying practices.
1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
  2. Establish limits on use of Project site.
  3. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
  4. Inform installers of lines and levels to which they must comply.
  5. Check the location, level and plumb, of every major element as the Work progresses.
  6. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
  7. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

- C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and rim and invert elevations.
- D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.
- E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

### 3.4 FIELD ENGINEERING

- A. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.
- B. Benchmarks: Establish and maintain a minimum of **two** permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.
  - 1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- C. Certified Survey: On completion of foundation walls, major site improvements, and other work requiring field-engineering services, prepare a certified survey showing dimensions, locations, angles, and elevations of construction and sitework.
- D. Final Property Survey: Engage a **land surveyor** to prepare a final property survey showing significant features (real property) for completed Project.

### 3.5 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.
- 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. Sequence the Work and allow adequate clearances to accommodate movement of construction items on site and placement in permanent locations.
- F. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.
- G. 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.
- H. 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.
- I. 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.
- J. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

### 3.6 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 **minimize** 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. If possible, review proposed procedures with original Installer; comply with original Installer's written recommendations.
  - 1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots 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. **Concrete, Stone and 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. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate physical integrity of installation.
  - 2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will minimize evidence of patching and refinishing.
  - 3. Floors and Walls: Where walls or partitions that are removed extend one finished area into another, patch and repair floor and wall surfaces in the new space. Provide an even surface of uniform finish, color, texture, and appearance. Remove in-place floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
  - 4. Ceilings: Patch, repair, or rehang in-place ceilings as necessary to provide an even-plane surface of uniform appearance.
  - 5. Exterior Building Enclosure: Patch components in a manner that restores enclosure to a weathertight condition 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.

### 3.7 CONSTRUCTION INDOOR-AIR-QUALITY MANAGEMENT

- A. Comply with SMACNA's "SMACNA IAQ Guideline for Occupied Buildings under Construction."

1. If Owner authorizes use of permanent heating, cooling, and ventilating systems during construction period as specified in Section 015000 "Temporary Facilities and Controls," install filter media having a MERV 8 according to ASHRAE 52.2 at each return-air inlet for the air-handling system used during construction.
2. Replace all air filters immediately prior to occupancy.

B. Building Flush-out

1. After construction ends, prior to occupancy and with all interior finishes installed, perform a building flush-out by supplying a total volume of 14000 cu. ft. of outdoor air per sq. ft. of floor area while maintaining an internal temperature of at least 60 deg F and a relative humidity no higher than 60 percent.
2. Major work shall not be ongoing inside the building. Contractor to limit activities within building during flush out period to the following:
  - a. Minimal touch-up painting consisting of an area less than 10% of respective wall or ceiling surface.
  - b. Door hardware adjustment
  - c. Mechanical system start-up, testing and balancing of the system
  - d. Training of town personnel in the operations and maintenance of the building
  - e. Cleaning: Final cleaning shall be complete prior to start of building flush-out.
  - f. Minor punch list items not requiring the use of coatings, paints, adhesives etc. or significant replacement of defective materials.
3. Contractor to document and submit flush out procedure and log report a minimum of 2 times per day. Log report shall contain at a minimum:
  - a. Volume of air moved since last reading:
  - b. Indoor air Temperature
  - c. Outdoor air temperature
  - d. Indoor Relative Humidity
  - e. Outdoor relative humidity

### 3.8 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.
- 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.
- 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.

### 3.9 STARTING AND ADJUSTING

- A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.
- B. Adjust equipment for proper operation. Adjust operating components for proper operation without binding.
- C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Manufacturer's Field Service: Comply with qualification requirements in Section 014000 "Quality Requirements"

### 3.10 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.

END OF SECTION 017300

## SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for the following:
  - 1. Salvaging nonhazardous waste.
  - 2. Recycling nonhazardous waste.
  - 3. Disposing of nonhazardous waste.
- B. Related Requirements:
  - 1. Section 044313 "Stone Masonry Veneer" for disposal requirements for masonry waste.

#### 1.2 DEFINITIONS

- A. Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.
- B. Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.
- C. Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.
- D. Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.
- E. Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.
- F. Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the Work.

#### 1.3 PERFORMANCE REQUIREMENTS

- A. General: Achieve end-of-Project rates for salvage/recycling of 90 percent by weight of total non-hazardous solid waste generated by the Work. Facilitate recycling and salvage of materials.

#### 1.4 ACTION SUBMITTALS

- A. Waste Management Plan: Submit plan within 15 days of date established for **commencement of the Work**.

## 1.5 WASTE MANAGEMENT PLAN

- A. General: Develop a waste management plan according to ASTM E 1609 and requirements in this Section. Plan shall consist of waste identification, waste reduction work plan. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.
- B. Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.
  - 1. Salvaged Materials for Reuse: For materials that will be salvaged and reused in this Project, describe methods for preparing salvaged materials before incorporation into the Work.
  - 2. Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 3. Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.
  - 4. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
  - 5. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
  - 6. Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location where materials separation will be performed.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 PLAN IMPLEMENTATION

- A. General: Implement approved waste management plan. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.
- B. Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the Work occurring at Project site.
  - 1. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.
- C. Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.



2. Comply with Section 015000 "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

### 3.2 RECYCLING WASTE, GENERAL

- A. General: Recycle paper and beverage containers used by on-site workers.
- B. Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at Project site to the maximum extent practical according to approved construction waste management plan.
  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. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
  4. Store components off the ground and protect from the weather.
  5. Remove recyclable waste from Owner's property and transport to recycling receiver or processor.

### 3.3 RECYCLING CONSTRUCTION WASTE

- A. Packaging:
  1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
  2. Polystyrene Packaging: Separate and bag materials.
  3. Pallets: As much as possible, require deliveries using pallets to remove pallets from Project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.
  4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.
- B. Wood Materials:
  1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
  2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
- C. Gypsum Board: Stack large clean pieces on wood pallets or in container and store in a dry location. Remove from site to recycling receiver or processor.

### 3.4 DISPOSAL OF WASTE

- A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
  - 1. Except as otherwise specified, do not allow waste materials that are to be disposed of 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 waste materials.
- C. Disposal: Remove waste materials from Owner's property and legally dispose of them.

END OF SECTION 017419

## SECTION 017700 - CLOSEOUT PROCEDURES

### PART 1 - GENERAL

#### 1.1 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. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 2. Section 017839 "Project Record Documents" for submitting record Drawings, record Specifications, and record Product Data.
  - 3. Section 017900 "Demonstration and Training" for requirements for instructing Owner's personnel.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For cleaning agents.
- B. Contractor's List of Incomplete Items: Initial submittal at Substantial Completion.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Certificates of Release: From authorities having jurisdiction.
- B. Certificate of Insurance: For continuing coverage.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Schedule of Maintenance Material Items: For maintenance material submittal items specified in other Sections.

#### 1.5 SUBSTANTIAL COMPLETION PROCEDURES

- A. Contractor's List of Incomplete Items: Prepare and submit a list of items to be completed and corrected (Contractor's punch list), indicating the value of each item on the list and reasons why the Work is incomplete.

- B. Submittals Prior to Substantial Completion: Complete the following a minimum of **10** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
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, and similar releases.
  2. Submit closeout submittals specified in other Division 01 Sections, including project record documents, operation and maintenance manuals, final completion construction photographic documentation, damage or settlement surveys, property surveys, and similar final record information.
  3. Submit closeout submittals specified in individual Sections, including specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
  4. Submit maintenance material submittals specified in individual 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.
  5. Submit test/adjust/balance records.
  6. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
- C. Procedures Prior to Substantial Completion: Complete the following a minimum of **10** days prior to requesting inspection for determining date of Substantial Completion. List items below that are incomplete at time of request.
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.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems. Submit demonstration and training video recordings specified in Section 017900 "Demonstration and Training."
  6. Advise Owner of changeover in heat and other utilities.
  7. Participate with Owner in conducting inspection and walkthrough with local emergency responders.
  8. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  9. Complete final cleaning requirements, including touchup painting.
  10. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- D. Inspection: Submit a written request for inspection to determine Substantial Completion a minimum of **10** days prior to date the work will be completed and ready for final inspection and tests. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare the Certificate of Substantial Completion after inspection or will notify Contractor of items, either on Contractor's list or additional items identified by Architect, that must be completed or corrected before certificate will be issued.
1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

2. Results of completed inspection will form the basis of requirements for final completion.

## 1.6 FINAL COMPLETION PROCEDURES

- A. Preliminary Procedures: Before requesting final inspection for determining final completion, complete the following:
  1. Submit a final Application for Payment according to Section 012900 "Payment Procedures."
  2. Certified List of Incomplete Items: Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. Certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Certificate of Insurance: Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
  5. Submit reports on completion of Building flush out
- B. Inspection: Submit a written request for final inspection to determine acceptance. On receipt of request, Architect will either proceed with inspection or notify Contractor of unfulfilled requirements. Architect will prepare a final Certificate for Payment after inspection or will notify Contractor of construction that must be completed or corrected before certificate will be issued.
  1. Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

## 1.7 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Organization of List: Include name and identification of each space and area affected by construction operations for incomplete items and items needing correction including, if necessary, areas disturbed by Contractor that are outside the limits of construction.
  1. Organize list of spaces in sequential order.
  2. Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
  3. Submit list of incomplete items in the following format:
    - a. PDF electronic file.

## 1.8 SUBMITTAL OF PROJECT WARRANTIES

- A. Time of Submittal: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of Substantial Completion is indicated, or when delay in submittal of warranties might limit Owner's rights under warranty.
- B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.



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. Warranty Electronic File: Scan warranties and bonds and assemble complete warranty and bond submittal package into a single indexed electronic PDF file with links enabling navigation to each item. Provide bookmarked table of contents at beginning of document.
- C. 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.
1. Use cleaning products that comply with Green Seal's GS-37, or if GS-37 is not applicable, use products that comply with the California Code of Regulations maximum allowable VOC levels.

## 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 requesting 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. Remove snow and ice to provide safe access to building.
- f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
- g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
- h. Sweep concrete floors broom clean in unoccupied spaces.
- i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; clean according to manufacturer's recommendations if visible soil or stains remain.
- j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
- k. Remove labels that are not permanent.
- l. Wipe surfaces of mechanical and electrical equipment and similar equipment. Remove excess lubrication, paint and mortar droppings, and other foreign substances.
- m. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.
- n. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.
- o. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency.
- p. Leave Project clean and ready for occupancy.

### 3.2 REPAIR OF THE WORK

- A. Complete repair and restoration operations before requesting 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 specified condition.
  - 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 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.
4. Replace burned-out bulbs, bulbs noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

END OF SECTION 017700

## SECTION 017823 - OPERATION AND MAINTENANCE DATA

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:
  - 1. Operation and maintenance documentation directory.
  - 2. Emergency manuals.
  - 3. Operation manuals for systems, subsystems, and equipment.
  - 4. Product maintenance manuals.
  - 5. Systems and equipment maintenance manuals.

#### 1.2 CLOSEOUT SUBMITTALS

- A. Manual Content: Operations and maintenance manual content is specified in individual Specification Sections to be reviewed at the time of Section submittals. Submit reviewed manual content formatted and organized as required by this Section.
  - 1. Architect will comment on whether content of operations and maintenance submittals are acceptable.
  - 2. Where applicable, clarify and update reviewed manual content to correspond to revisions and field conditions.
- B. Format: Submit operations and maintenance manuals in the following format:
  - 1. PDF electronic file. Assemble each manual into a composite electronically indexed file. Submit on digital media acceptable to Architect.
    - a. Name each indexed document file in composite electronic index with applicable item name. Include a complete electronically linked operation and maintenance directory.
    - b. Enable inserted reviewer comments on draft submittals.

### PART 2 - PRODUCTS

#### 2.1 REQUIREMENTS FOR EMERGENCY, OPERATION, AND MAINTENANCE MANUALS

- A. Directory: Prepare a single, comprehensive directory of emergency, operation, and maintenance data and materials, listing items and their location to facilitate ready access to desired information.

- B. 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.
  2. Table of contents.
  3. Manual contents.
- C. Title Page: Include the following information:
1. Subject matter included in manual.
  2. Name and address of Project.
  3. Name and address of Owner.
  4. Date of submittal.
  5. Name and contact information for Contractor.
  6. Name and contact information for Construction Manager.
  7. Name and contact information for Architect.
  8. Name and contact information for Commissioning Authority.
  9. Names and contact information for major consultants to the Architect that designed the systems contained in the manuals.
  10. Cross-reference to related systems in other operation and maintenance manuals.
- D. 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.
- E. 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.
- F. 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: Enable bookmarking of 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.
- G. Manuals, Paper Copy: Submit manuals in the form of hard copy, bound and labeled volumes.
1. Binders: Heavy-duty, three-ring, vinyl-covered, 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 and with pockets inside covers to hold folded oversize sheets.



- a. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, **and** subject matter of contents, **and indicate Specification Section number on bottom of spine.** 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. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software storage media for computerized electronic equipment.
4. 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.
  - b. 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.

## 2.2 EMERGENCY MANUALS

- A. Content: Organize manual into a separate section for each of the following:
  1. Type of emergency.
  2. Emergency instructions.
  3. Emergency procedures.
- B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
  1. Fire.
  2. Flood.
  3. Gas leak.
  4. Water leak.
  5. Power failure.
  6. Water outage.
  7. System, subsystem, or equipment failure.
  8. Chemical release or spill.
- C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner's operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
- D. Emergency Procedures: Include the following, as applicable:
  1. Instructions on stopping.
  2. Shutdown instructions for each type of emergency.
  3. Operating instructions for conditions outside normal operating limits.
  4. Required sequences for electric or electronic systems.

5. Special operating instructions and procedures.

## 2.3 OPERATION MANUALS

- A. 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.
  2. Performance and design criteria if Contractor is delegated design responsibility.
  3. Operating standards.
  4. Operating procedures.
  5. Operating logs.
  6. Wiring diagrams.
  7. Control diagrams.
  8. Piped system diagrams.
  9. Precautions against improper use.
  10. License requirements including inspection and renewal dates.
- B. Descriptions: Include the following:
  1. Product name and model number. Use designations for products indicated on Contract Documents.
  2. Manufacturer's name.
  3. Equipment identification with serial number of each component.
  4. Equipment function.
  5. Operating characteristics.
  6. Limiting conditions.
  7. Performance curves.
  8. Engineering data and tests.
  9. Complete nomenclature and number of replacement parts.
- C. Operating Procedures: Include the following, as applicable:
  1. Startup procedures.
  2. Equipment or system break-in procedures.
  3. Routine and normal operating instructions.
  4. Regulation and control procedures.
  5. Instructions on stopping.
  6. Normal shutdown instructions.
  7. Seasonal and weekend operating instructions.
  8. Required sequences for electric or electronic systems.
  9. Special operating instructions and procedures.
- D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.
- E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

## 2.4 PRODUCT MAINTENANCE MANUALS

- A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.
- B. 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.
- C. Product Information: Include the following, as applicable:
  - 1. Product name and model number.
  - 2. Manufacturer's name.
  - 3. Color, pattern, and texture.
  - 4. Material and chemical composition.
  - 5. Reordering information for specially manufactured products.
- D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
  - 1. Inspection procedures.
  - 2. Types of cleaning agents to be used and methods of cleaning.
  - 3. List of cleaning agents and methods of cleaning detrimental to product.
  - 4. Schedule for routine cleaning and maintenance.
  - 5. Repair instructions.
- E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.
- F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

## 2.5 SYSTEMS AND EQUIPMENT MAINTENANCE MANUALS

- A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.
- B. Source Information: List each system, subsystem, and piece of equipment 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.
- C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
  - 1. Standard maintenance instructions and bulletins.

2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
  3. Identification and nomenclature of parts and components.
  4. List of items recommended to be stocked as spare parts.
- D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:
1. Test and inspection instructions.
  2. Troubleshooting guide.
  3. Precautions against improper maintenance.
  4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  5. Aligning, adjusting, and checking instructions.
  6. Demonstration and training video recording, if available.
- E. 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.
- F. 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.
- G. Maintenance Service Contracts: Include copies of maintenance agreements with name and telephone number of service agent.
- H. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

## PART 3 - EXECUTION

### 3.1 MANUAL PREPARATION

- A. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.
- B. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- C. 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.
- D. 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.

- E. 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.
- F. Comply with Section 017700 "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823



## SECTION 017839 - PROJECT RECORD DOCUMENTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes administrative and procedural requirements for project record documents, including the following:
  - 1. Record Drawings.
  - 2. Record Specifications.
  - 3. Record Product Data.
- B. Related Requirements:
  - 1. Section 017823 "Operation and Maintenance Data" for operation and maintenance manual requirements.

#### 1.2 CLOSEOUT SUBMITTALS TO OWNER

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit copies of record Drawings as follows:
    - a. Initial Submittal:
      - 1) Submit PDF electronic files of scanned record prints and **one** set of file prints.
      - 2) Architect will indicate whether general scope of changes, additional information recorded, and quality of drafting are acceptable.
    - b. Final Submittal:
      - 1) Submit PDF electronic files of scanned record prints and **three** set(s) of prints.
      - 2) Print each drawing, whether or not changes and additional information were recorded.
- B. Record Product Data: Submit **one paper copy** of each submittal, bound into large, heavy duty 3-ring binders with tabs for each division of work. Label each binder spine with contents.

### PART 2 - PRODUCTS

#### 2.1 RECORD DRAWINGS

- A. Record Prints: Contractor to maintain one set of marked-up paper copies of the Contract Drawings and Shop Drawings, incorporating new and revised Drawings as modifications are issued.

1. Preparation: Mark record prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to provide information for preparation of corresponding marked-up record prints.
    - a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
    - b. Record data as soon as possible after obtaining it.
    - c. Record and check the markup before enclosing concealed installations.
  2. Mark the Contract Drawings and Shop Drawings completely and accurately. Use personnel proficient at recording graphic information in production of marked-up record prints.
  3. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
  4. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.
- B. Format: Identify and date each record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

## 2.2 RECORD PRODUCT DATA

- A. Contractor to maintain owners' record copies of approved submittals to be turned over at project completion.
- B. Preparation: Mark Product Data to indicate the actual product installation where installation varies substantially from that indicated in Product Data submittal.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Include significant changes in the product delivered to Project site and changes in manufacturer's written instructions for installation.
  3. Note related Change Orders and record Drawings where applicable.

## PART 3 - EXECUTION

### 3.1 RECORDING AND MAINTENANCE

- A. Recording: Maintain one copy of each submittal during the construction period for project record document purposes. Post changes and revisions to project record documents as they occur; do not wait until end of Project.
- B. Maintenance of Record Documents and Samples: Store record documents and Samples 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 reference during normal working hours.

END OF SECTION 017839

## SECTION 017900 - DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

#### 1.1 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. Training in operation and maintenance of systems, subsystems, and equipment.

#### 1.2 INFORMATIONAL SUBMITTALS

- A. Instruction Program: Submit outline of instructional program for demonstration and training, including a list of training modules and a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module.
  - 1. Indicate proposed training modules using manufacturer-produced demonstration and training video recordings for systems, equipment, and products in lieu of video recording of live instructional module.

#### 1.3 QUALITY ASSURANCE

- A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.

#### 1.4 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.
- B. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed and approved by Architect.

## PART 2 - PRODUCTS

### 2.1 INSTRUCTION PROGRAM

- A. Program Structure: Develop an instruction program that includes individual training modules for each system and for equipment not part of a system, as required by individual Specification Sections.
- B. Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, 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. Performance and design criteria if Contractor is delegated design responsibility.
    - c. Operating standards.
    - d. Regulatory requirements.
    - e. Equipment function.
    - f. Operating characteristics.
    - g. Limiting conditions.
    - h. Performance curves.
  - 2. Documentation: Review the following items in detail:
    - a. Emergency manuals.
    - b. Operations manuals.
    - c. Maintenance manuals.
    - d. Project record documents.
    - e. Identification systems.
    - f. Warranties and bonds.
    - g. Maintenance service agreements and similar continuing commitments.
  - 3. Emergencies: Include the following, as applicable:
    - a. Instructions on meaning of warnings, trouble indications, and error messages.
    - b. Instructions on stopping.
    - c. Shutdown instructions for each type of emergency.
    - d. Operating instructions for conditions outside of normal operating limits.
    - e. Sequences for electric or electronic systems.
    - f. Special operating instructions and procedures.
  - 4. Operations: Include the following, as applicable:
    - a. Startup procedures.
    - b. Equipment or system break-in procedures.
    - c. Routine and normal operating instructions.
    - d. Regulation and control procedures.
    - e. Control sequences.

- f. Safety procedures.
  - g. Instructions on stopping.
  - h. Normal shutdown instructions.
  - i. Operating procedures for emergencies.
  - j. Operating procedures for system, subsystem, or equipment failure.
  - k. Seasonal and weekend operating instructions.
  - l. Required sequences for electric or electronic systems.
  - m. Special operating instructions and procedures.
- 5. Adjustments: Include the following:
  - a. Alignments.
  - b. Checking adjustments.
  - c. Noise and vibration adjustments.
  - d. Economy and efficiency adjustments.
- 6. Troubleshooting: Include the following:
  - a. Diagnostic instructions.
  - b. Test and inspection procedures.
- 7. Maintenance: Include 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. Procedures for routine cleaning
  - e. Procedures for preventive maintenance.
  - f. Procedures for routine maintenance.
  - g. Instruction on use of special tools.
- 8. Repairs: Include the following:
  - a. Diagnosis instructions.
  - b. Repair instructions.
  - c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
  - d. Instructions for identifying parts and components.
  - e. Review of spare parts needed for operation and maintenance.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a training manual organized in coordination with requirements in Section 017823 "Operation and Maintenance Data."



### 3.2 INSTRUCTION

- A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
- 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 with at least **seven** days' advance notice.
- C. Training Location and Reference Material: Conduct training on-site in the completed and fully operational facility using the actual equipment in-place. Conduct training using final operation and maintenance data submittals.

END OF SECTION 017900

## SECTION 033100 - INSULATING CONCRETE FORMING

### PART 1- GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Comply with the requirements for Division 1.
2. Furnish all labor, materials, tools and equipment to perform the complete erection/ installation of the Insulating Concrete Form System (ICF), installation of reinforcing steel, placement of concrete within formwork, and final cleanup.
3. Adequate bracing and false work shall be provided by the Installing Contractor to comply with all applicable Codes.

B. Products Supplied But Not Installed Under This Section:

1. EPS compatible modified bituminous sheet waterproofing membrane.

C. Related Requirements:

1. Section 033000- Cast-In-Place Concrete
2. Section 044313 – Adhered Stone Masonry Veneer
3. Section 074600- Siding

#### 1.2 REFERENCES

A. Abbreviations and Acronyms:

1. EPS- Acronym for “Expanded Polystyrene” when referencing the insulating foam component of the Insulating Concrete Form System.
2. ICF- Acronym for “Insulating (or Insulated) Concrete Form”

B. Definitions:

1. *Form Alignment System*- a form alignment & scaffold system designed exclusively for use with Insulating Concrete Forms.
2. *Trained Installer*- An installation contractor, who has received instructional training in the installation of the specified Insulating Concrete Form System and is capable of providing written verification of his designation as such by the specified manufacturer of the system being installed.
3. *Technical Associate*- A technical representative, usually a staff member of a Distribution Firm, who has received instructional training in the installation of Insulating Concrete Form system and is in the capacity of supervising an installation crew on site.
4. *Window or Door Opening Buck*- a pre-manufactured or site constructed frame assembly consisting of wood or plastic material (or combination thereof) used to frame a rough opening within the forming system that will retain concrete around the opening. The frame can also provide for subsequent anchorage of doors and windows within the wall assembly.

C. Reference Standards:

1. American Concrete Institute (ACI)
  - a. ACI 318 Building Code Requirements for Structural Concrete and Commentary
2. American Society for Testing and Materials (ASTM)

1.3 a. ASTM E2634: Standard Specification for Flat Wall Insulating Concrete Form  
ADMINISTRATIVE REQUIREMENTS

A. Pre-installation Meetings:

1. Ensure those materials listed under Sub-Sections 2.01 through 2.03 are provided to *Trained Installer* prior to commencement of work under this Section.
2. *Trained Installer* for this section shall provide list of known special requirements for interface of materials provided in this section as such may pertain to co-ordination with mechanical, electrical, plumbing, interior and exterior finish sub trades prior to commencement of work.

1.4 SUBMITTALS

A. Contractor shall submit with bid proposal for this section, written verification of credentials of the subcontractor responsible for the form system installation (*trained installer*) designated to be installing the ICF product as follows:

- a. That the installing contractor is either:
  - 1) An experienced ICF Contractor (*trained installer*) with minimum 3 years experience in commercial ICF construction or;
  - 2) A qualified masonry or traditional concrete forming contractor with minimum 5 years experience in commercial construction applications.
- b. That the installing contractor has demonstrated experience on supervising commercial construction projects of with gross floor areas of 10,000 ft<sup>2</sup> or greater. (Submit project name(s)/ location(s).

B. Test and Evaluation Reports:

1. *Technical Associate* for form system shall submit on request, relevant laboratory tests or data that validate product compliance with performance criteria specified prior to commencement of work under this Section (See Section 2.03 B Regulatory Requirements).
2. Submit copy of valid product evaluation report, demonstrating compliance with this specification and applicable codes for site condition. (See Section 2.03 B Regulatory Requirements).

C. Manufacturers' Instructions:

1. Submit copy of manufacturer's product installation manual.

D. *Form Alignment System* Engineering:

1. For wall heights above 10 feet of unsupported wall height, the contractor shall provide scaffold engineering for support of the *Form Alignment System* or shall ensure this engineering is included by the engineer of record for support of the form system and the *Form Alignment System* assemblies during construction.

1.5 CLOSEOUT SUBMITTALS

A. Warranty Documentation:

1. Product warranty documentation specified under Section 1.11 shall be supplied to contractor (for subsequent provision to building owner) upon completion of building construction.

1.06 MAINTENANCE MATERIAL SUBMITTALS

A. Maintenance:

1. *Trained Installer* shall supply to contractor (for subsequent provision to building owner) copy of pertinent documentation as relates to instruction on post repair, renovation, modification or service work with respect to the form system once occupancy commences.

#### 1.07 QUALITY ASSURANCE

##### A. Qualification- Installers / Applicators / Erectors:

1. Contractor shall engage the services of a *Trained Installer* or *Technical Associate* for the duration of the work under this Section who has been trained in procedures pertaining to the correct installation of the specified form system (*Trained installer* may already be the designated ICF Installing Contractor if providing credentials as such).
2. *Trained Installer/Technical Associate* shall furnish proof of training documentation to Contractor prior to commencement of work under this Section.

#### 1.08 DELIVERY, STORAGE, AND HANDLING

##### A. Delivery and Acceptance Requirements:

1. *Trained Installer/Technical Associate* to meet with Contractor prior to material delivery on site to co-ordinate provision of access, storage area, and protection of insulating concrete form product and spatial requirements for *Form Alignment System* placement steel storage & forming.
2. Deliver products in original factory packaging, bearing identification of product, manufacturer and batch/lot number.
3. *Trained Installer* shall furnish product packaging labels to contractor as required to maintain traceability of product for duration of contract.
4. Bulk of form shipment shall be delivered as pre-assembled units and folded flat to maximize shipping space. Only form panels and insert webs as may be required for floor interfaces or specialized construction on site are to be shipped unassembled but in labeled packages for traceability

##### B. Storage and Handling Requirements:

1. Handle and store products in location to prevent damaging and soiling.
2. Maintain form materials and accessories in original packaging (or provide similar protection to unpackaged form materials -should on-site storage prior to installation extend beyond 3 months).
3. Form units and related form installation materials and equipment to be stored flat until time of use.

#### 1.09 SITE CONDITIONS

##### A. Ambient Conditions:

1. Use appropriate measures for protection and supplementary heating when required to ensure proper curing conditions in accordance with manufacturer's recommendations if installation is carried out during periods of weather where temperatures are below minimum specified by governing Building Code for concrete and masonry.

#### 1.10 WARRANTY

##### A. Manufacturer Warranty:

1. *Technical Associate* shall supply of written copy of specific warranties of the product.

## *PART 2 PRODUCTS*

### 2.01 MANUFACTURERS

#### A. Manufacturer List:

1. Provide insulating concrete form system materials from one of the following Manufacturers assuring that system selected complies in all respects with performance requirements of Section 2.03.

a. NUDURA® Corporation [www.nudura.com](http://www.nudura.com)

### 2.02 INSULATING CONCRETE FORMING SYSTEM (ICF)

- A. Where project scope permits, form units shall be supplied through an authorized distributor of the Manufacturer listed.. The distributor shall be capable of providing product on site within 24 hours notice.
- B. The Manufacturer's authorized distributor shall have available local to the region, technical sales staff that can be contacted or even contracted (under separate contract) as may be required to provide timely on site problem resolution as installation or product supply issues may arise.
- C. Where local distribution cannot service to the requirements of the contract scope and product is to be supplied directly by the manufacturer, the manufacturer shall provide on-site technical assistance as specified under Clause D of this section.
- D. Where product is supplied direct, technical assistance supplied by the manufacturer shall include the provision of a technical consultant direct from or contracted by the manufacturer for first week of contract that form product is to be erected on the site to coordinate form system installation, crew organization and set-up. During installation, (as agreed to with terms of contractor), the manufacturer's technical consultant shall provide periodic site visits (as may required under separate contract) at key stages of form installation, to assure continued product installation quality.

### 2.03 DESCRIPTION

#### A. General:

1. Insulating concrete form system shall consist of two (2) flame resistant panels of expanded polystyrene (EPS) connected by either high-density polypropylene hinged pin foldable webs or EPS embedded polystyrene fastening strips interconnected with slide in format - high density polypropylene web connectors. EPS foam panels shall feature continuous vertical dove tail grooves on interior panel surfaces to provide integral surface bonding to concrete core once filled and concrete is cured. Dove tail grooves shall also facilitate structural linkage with end cap forms placed into the form cavity where required as part of the overall architectural design layout.
2. All web fastening strips to run full height of form and be fitted top and bottom with reversible fitting, "triple-tooth" interlocking mechanisms to enable positive vertical interlocking of forms with each other. Wall system webs to provide minimum 1 1/2" (38mm)



- wide fastening strips at 8-inches (203mm) on center approx. 5/8-inch (15.9 mm) below insulation face to facilitate finish fastening of both interior and exterior finishes.
3. Insulating concrete form system shall be capable of forming ALL of following concrete core thicknesses: 4, 6, 8, 10 or 12-inches (102, 152, 203, 254 or 305 mm) wall sections (as required for various locations throughout project scope with standard form line-up) (See form dimensions summary Attachments Table A at end of Section.
  4. Insulating concrete form system shall provide a minimum insulation panel thickness of 2 5/8-inches (66.7mm) throughout ALL forms and panels forming the form system product inventory (with exception of variance required for brick ledge and tapered top forms).
  5. All form units of wall forming system shall be capable of being shipped to site in folded condition to minimize shipping cost and site storage space requirement and be capable of being deployed to installation ready condition by simply unfolding the unit in a single pull motion or pull motion combined with insertion of a single web (at corner condition).
  6. Standards, corner forms and stand alone panels of form system shall provide fully reversible interlocks along top and bottom edges to assure minimum product waste on site. EPS foam panels shall be molded with 1-inch (25mm) wide by 1/2-inch (12.7mm) high/deep alternating male/female reversible projection/socket interlocks positioned in pairs along both top and bottom edges of all panels.
  7. Wall system shall be capable of providing horizontal and vertical lock positioning of steel within form cavity to conform to all reinforcing requirements of ACI 318.

**B. Regulatory Requirements:**

1. Form system manufacturer shall provide on request, written documentation verifying active compliance to ICC-ES Acceptance Criteria AC-308 “Stay-in-place, Foam Plastic Insulating Concrete Form (ICF) Systems for Solid Concrete”, with valid listing in the report verifying qualification of form system for use in Types I through V construction as qualified under the governing Building Code for this project and additional compliances as outlined in Section 2.03.1.B.3 (below).
2. As alternate to above, Form system manufacturer shall provide IAS Accredited 3<sup>rd</sup> Party Certification confirming compliance to ASTM E 2634 – “Standard Specification for Flat Wall Insulating Concrete Forms” and verification that the system meets all testing and documentation requirements for use in Types I through V construction as qualified under the governing Building Code for this project as well as additional compliances as outlined in Section 2.03.1.B.3 (below)
3. Documentation as provided per Section 2.03.1.B.1 or 2 above: shall verify compliance to the following regulatory documents and standards:
  - a) Form system structural, and general performance assessment of properties of EPS foam and polypropylene materials assessment in accordance with the following standards:
    1. ASTM C578: Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation (which includes results for);
    - a. ASTM C165: Standard Test Method for Measuring Compressive Properties of Thermal Insulation
    - b. ASTM C177: Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus

- c. ASTM C203: Standard Test Methods for Breaking Load and Flexural Properties of Block-Type Thermal Insulation
  - d. ASTM C272: Standard Test Method for Water Absorption of Core Materials for Structural Sandwich Constructions
  - e. ASTM C303: Standard Test Method for Dimensions and Density of Preformed Block and Board-Type Thermal Insulation
  - f. ASTM C518: Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus
  - g. ASTM D1621: Standard Test Method for Compressive Properties Of Rigid Cellular Plastics
  - h. ASTM D1622: Standard Test Method for Apparent Density of Rigid Cellular Plastics
  - i. ASTM D2126: Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging
  - j. ASTM D2863: Standard Test Method for Measuring the Minimum Oxygen Concentration to Support Candle-Like Combustion of Plastics (Oxygen Index)
  - k. ASTM E96: Standard Test Methods for Water Vapor Transmission of Materials
- b) Finish attachment testing in accordance with:
- 1. ASTM D1761: Standard Test Methods for Mechanical Fasteners in Wood (Modified for Polypropylene Web assessment)
- c) Surface Burning, Flash Ignition and Self Ignition Temperature Characteristics assessment of both plastic web and EPS form materials in accordance with:
- 1. ASTM D635: Standard Test Method for Rate of Burning and/or Extent and of Burning of Plastics in a Horizontal Position
  - 2. ASTM E84: Standard Test Method for Surface Burning Characteristics of Building Materials
  - 3. ASTM D1929: Standard Test Method for Determining Ignition Temperature of Plastics
- d) Verification of performance and compliance of finishes for provision thermal barrier protection to foam plastic.
- 1. NFPA 286: Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth or...
  - 2. UBC 26-3: Room Fire Test Standard for Interior Foam Plastic Systems
- e) Crawl Space Installation Evaluation in accordance with:
- 1. SwRI 99-02: Crawl Space Insulation Evaluation Protocol
- f) Fire Resistance Rated Construction assessment in accordance with:
- 1. UL 263: Fire Tests of Building Construction and Materials  
(See also Sections 2.01 and 2.04.A. 4 through 9)
- g) Non-Combustible Construction assessment (i.e. approved non-combustible material finish requirement documentation) in accordance with:
- 1. NFPA 259: Standard Test Method for Potential Heat of Building Materials
  - 2. NFPA 268: Standard Test Method for Determining Ignitibility of Exterior Wall Assemblies Using a Radiant Heat Energy Source.

- h) Assessment of non-combustible finishes verifying exterior protection of foam plastic insulation in accordance with one of the following standards:
  - 1. NFPA 285: Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components.
  - 2. UBC 26-4: Method of Test for the Evaluation of Flammability Characteristics of Exterior, Non-load-bearing Wall Panel Assemblies Using Foam Plastic Insulation or...
  - 3. UBC 26-9: Method of Test for the Evaluation of Flammability Characteristics of Exterior, Non-load-bearing Wall Assemblies Containing Combustible Components Using the Intermediate-Scale, Multi-Story Test Apparatus
- i) Additional Testing and engineering documentation to verify qualification of EPS foam panels as a Vapor Retarder in conjunction with testing to:
  - 1. ASTM E-96 Standard Test Methods for Water Vapor Transmission of Materials
- j) Testing and engineering documentation to verify qualification of fully assembled wall system as an air barrier element in accordance with:
  - 1. ASTM E1677 Standard Specification for an Air Retarder (AR) Material or System for Low-Rise Framed Building Walls
- k) Testing and engineering documentation to verify qualification of the form system as meets the minimum STC performance requirements of 50 in accordance with:
  - 1. ASTM E 90: Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements, or;
  - 2. ASTM E 336: Standard Test Method for Measurement of Airborne Sound Attenuation between Rooms in Buildings.

## 2.04 PERFORMANCE / DESIGN CRITERIA

### A. Capacities:

- 1. Selected system in conjunction with concrete and designated exterior and interior finishes shall provide minimum insulation level of R 23.59 (hr.ft<sup>2</sup>.F/Btu) or (RSI 4.158 (m<sup>2</sup>.K/W) -U Factor 0.2405 W/m<sup>2</sup>.K) across full line of form unit cavity widths.
- 2. EPS foam panels forming part of wall system shall provide maximum vapor permeation rate of 0.78 Perm-inch.(36 ng/Pa.s.m<sup>2</sup>) based on 2 5/8-inches (66.7 mm) singles thickness of foam on interior surface of concrete core.

## 2.05 MATERIALS

### A. Insulating Concrete Forming:

- 1. Provide Insulating Concrete Forming as listed in Appendix A as may be required for proper execution of the work.

### B. Concrete:

- 1. Recommended concrete slump is 4 to 6-inches +/- 1-inch (102 to 152mm +/- 25mm) (subject to design revision to suit application).

2. Where required by engineer of record, recommended slump specification shall be attained through addition of super plasticizer/mid-range water reducing agents to achieve design mix strength and concrete flow-ability.

C. Reinforcing Steel:

1. Reinforcing steel shall be as specified in Section 03 21 00 and shall be supplied under that Section for placement by the Form System's *Trained Installer*.

D. Waterproofing:

1. Where specified, waterproofing shall be self-adhesive modified bituminous sheet waterproofing membrane as supplied by concrete form system manufacturer specific to the form system specified under this section. Material to be supplied under this Section & installed as specified under Section 07 13 52 (Modified Bituminous Sheet Waterproofing).
2. Waterproofing material shall be *EPS* foam compatible.

## 2.06 ACCESSORIES

*Form Alignment System*

1. The *Trained Installer* shall furnish and utilize the Wall Access and *Form Alignment System* (as supplied by the Manufacturer or approved equivalent) to facilitate construction of the wall assembly, and to provide adjustment for ensuring plumbness and straightness of the wall system during construction, just prior to concrete placement and immediately after concrete placement while form system is still adjustable to final finished position.
2. *Form Alignment System* shall be OSHA compliant. *Technical Associate* shall supply engineering documentation pertaining to the "base" *Form Alignment System* components to verify compliance upon request.
3. As specified under Section 1.05 Submittals, for wall heights above 10-feet, the contractor shall provide scaffold engineering for *Form Alignment System* support or shall ensure this engineering is included by the engineer of record for support of the form system during construction.

## PART 3 EXECUTION

### 3.01 EXAMINATION

A. Verification of Conditions:

1. Inspect all areas included in Part 1 Section 1.01 Summary to establish extent of work and verify site access conditions.
2. Verify that site conditions are as set out in Part 1- Section 1.10 Site Conditions.

B. Evaluation and Assessment:

1. Examine footings are within +/-1/4-inch (6mm) of level and that steps footing increments are 18-inches (457 mm) in height.
2. Where partial or half course is intended for starting course elevation, ensure step footing increment is equal to cut form unit less 1/2-inch (13 mm).
3. When specified, ensure reinforcing steel dowels are in place at specified centers along footing lengths.

4. Ensure reinforcement steel dowels have OSHA compliant protection installed until formwork is erected above dowel level.

### 3.02 PREPARATION

#### A. Surface Preparation:

1. Clean all debris from top of footings prior to commencement of insulating concrete form system installation.
2. Sequence installation of concrete formwork with related work specified in other sections to ensure that wall assemblies, including window and door accessories, trim, service penetrations, transition changes, and mechanical service are protected against damage from effects of weather, corrosion, and adjacent construction activity.

### 3.03 ERECTION / INSTALLATION / APPLICATION

#### A. Installation Procedures:

1. Installation of forms to be in strict accordance with manufacturer's product installation manual as supplied in evidence to contractor under Part 1 Section 1.05 of this Section.
2. The *trained installer* shall ensure all manufacturer's procedures for the following work are employed on site (as outlined in the manufacturer's product Installation manual) Additional to all required procedures being followed, the trained Installer shall specifically assure cross checks with respect to layout, leveling and vertical alignment are executed as noted below in each section:
  - a) First Course Placement – perform cross checks for accuracy of plan layout to survey pins, marks or grid lines as set by the contractor.
  - b) Horizontal Reinforcement Placement – assure reinforcement diameter, grade and positioning is accurate to engineering specifications on structural drawings and installed in correct axis of wall for each course placed.
  - c) Successive Course Placement – assure system is accurately leveled subsequent to 2<sup>nd</sup> course placement.
  - d) Door & Window Opening Construction – when specified, assure bucks have been prepared for anchorage with concrete and/or fitted with mesh attachments as may be required for subsequent exterior finishes such as acrylic stuccos or similar architectural coatings for non-combustible construction. *Trained Installer* shall also assure all top, bottom and stirrup steel fittings are installed per engineering specifications.
  - e) *Form Alignment System* /Installation – assure *Form Alignment System* is regularly checked for crew safety, anchorage to form system as specified, vertical alignment checks at both pre-placement of concrete as well.
  - f) Vertical Reinforcement Placement- assure reinforcement diameter, grade and positioning is accurate to engineering specifications on structural drawings and installed in correct axis of wall, prior to placement of concrete.
  - g) Pre-Concrete Placement Inspection- trained installer shall assure string lines are place at top of all pours and wall system aligned for placement, cross check and assure that all required service penetration sleeves, embed plates, anchor bolts, fittings, beam pocket preparations, as specified on drawings are in place prior to commencement of concrete placement.
  - h) Concrete Placement- trained installer shall assure concrete tickets retained for contractor records and that slump, strength and aggregate size are as specified per Section 2.04 of this Section. *Trained installer* to assure truck delivery timed for rate of placement and that placement does rate not exceed ACI recommended practices. *Trained installer* shall



also assure that concrete during lift placement is mechanically and internally vibrated per ACI Standards to assure full monolithic concrete placement for all areas of formwork.

- i) *Form Alignment System* and Scaffold Access Assembly, adjustment & removal. *Trained installer* shall assure entire wall lengths aligned to vertical plumb by string line and screeded to horizontal level as required for finished wall height prior to concrete set. Subsequent to initial concrete cure, contractor shall assure that scaffold access and *Form Alignment System* remains in place until removal is directed accordingly by engineer of record for the project.

B. Interface with Other Work:

1. Service penetrations (electrical service conduits, water service pipes, air supply and exhaust ducts etc.) shall be installed at the required locations as indicated by the appropriate trade.
2. Service penetrations exceeding 16" x 16" (400 mm x 400 mm) in area shall be reinforced per engineer specifications
3. Prior to concrete placement, install service penetration sleeves (supplied by others) at designated locations to create voids for service placement at later date.
4. Instructions for exterior finish application to be reviewed with each trade. Contractor shall contact *Trained Installer* for specific instructions where sub trade has insufficient information or specialty requirements not addressed in specification specific to ICF applications.

### 3.04 CLEANING

A. Waste Management

1. Clean up and properly dispose of all debris remaining on job site related to the installation of the insulated concrete forms.

### 3.05 PROTECTION

- A. Assure final finishes are installed over form product or provide temporary coverage of installation to reduce EPS foam surface exposure to ultra violet light should final finish application be delayed longer than 18 months after form product installation.
- B. Consult with exterior finish contractor concerning exposure of EPS to ultraviolet light to ensure proper finish to ICF walls.

END OF SECTION 033100

## SECTION 044313 - ADHERED STONE MASONRY VENEER

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Stone masonry adhered to Insulating Concrete Form backup.
2. Stone masonry adhered to wood framing and sheathing.

B. Related Requirements:

1. Section 033100 "Insulating Concrete Form

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each variety of stone, stone accessory, and manufactured product.

B. Samples:

1. For each stone type indicated.
2. For each color of mortar required.

#### 1.3 FIELD CONDITIONS

A. Protection of Stone Masonry: During construction, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work.

B. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Comply with cold-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F (4 deg C) and above and will remain so until masonry has dried.

C. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in TMS 602/ACI 530.1/ASCE 6.

### PART 2 - PRODUCTS

#### 2.1 GRANITE

A. Material Standard: Comply with ASTM C 615/C 615M.

- B. Varieties and Sources: Subject to compliance with requirements, provide selected stone veneer as noted on the drawings.

## 2.2 MORTAR MATERIALS

- A. Portland Cement: ASTM C 150/C 150M, Type I or Type II, except Type III may be used for cold-weather construction; natural color or white cement may be used as required to produce mortar color indicated.
  - 1. Low-Alkali Cement: Not more than 0.60 percent total alkali when tested according to ASTM C 114.
- B. Hydrated Lime: ASTM C 207, Type S.
- C. Masonry Cement: ASTM C 91/C 91M.
- D. Aggregate: ASTM C 144 and as follows:
  - 1. For pointing mortar, use aggregate graded with 100 percent passing No. 16 (1.18-mm) sieve.
  - 2. White Aggregates: Natural white sand or ground white stone.
  - 3. Colored Aggregates: Natural-colored sand or ground marble, granite, or other sound stone; of color necessary to produce required mortar color.
- E. Latex Additive: **Manufacturer's standard** water emulsion, serving as replacement for part or all of gaging water, of type specifically recommended by latex-additive manufacturer for use with field-mixed portland cement mortar bed, and not containing a retarder.
- F. Water: Potable.

## 2.3 EMBEDDED FLASHING MATERIALS

- A. Metal Flashing: Provide metal flashing complying with **SMACNA's "Architectural Sheet Metal Manual** and as follows:
  - 1. Copper: ASTM B 370, Temper H00 or H01, cold-rolled copper sheet, 10-oz./sq. ft. (3-kg/sq. m) weight or 0.0135 inch (0.34 mm) thick for fully concealed flashing; 16-oz./sq. ft. (5-kg/sq. m) weight or 0.0216 inch (0.55 mm) thick elsewhere.
- B. Flexible Flashing: For flashing unexposed to the exterior, use **one of** the following unless otherwise indicated:
  - 1. Copper-Laminated Flashing: **7-oz./sq. ft. (2-kg/sq. m)** copper sheet bonded with asphalt between two layers of glass-fiber cloth. Use only where flashing is fully concealed in masonry.
  - 2. Rubberized-Asphalt Flashing: Composite flashing product consisting of a pliable, adhesive, rubberized-asphalt compound, bonded to a high-density, cross-laminated, polyethylene film to produce an overall thickness of not less than **0.040 inch (1.0 mm)**.

## 2.4 MISCELLANEOUS MASONRY ACCESSORIES

- A. Weather Resistant Barrier (WRB): provide barrier material and installation compliant with the requirements of the stone manufacturer.
- B. Expanded Metal Lath: 3.4 lb/sq. yd. (1.8 kg/sq. m), self-furring, diamond-mesh lath complying with ASTM C 847. Fabricate from structural-quality, zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G60 (Z180).

## 2.5 MASONRY CLEANERS

- A. Proprietary Acidic Cleaner: Manufacturer's standard-strength cleaner designed for removing mortar and grout stains, efflorescence, and other new construction stains from stone masonry surfaces without discoloring or damaging masonry surfaces; expressly approved for intended use by cleaner manufacturer and stone producer.

## 2.6 FABRICATION

- A. **Select** stone to produce pieces of thickness, size, and shape indicated, including details on Drawings and pattern specified in "Setting Stone Masonry" Article.
  - 1. Shape stone specified to be laid in three-course, random range ashlar pattern with **sawed** beds.
- B. Gage backs of stones for adhered veneer if more than 81 sq. in. (522 sq. cm) in area.
- C. Thickness of Stone: Provide thickness indicated, but not less than the following:
  - 1. Thickness: 1 inch (25 mm) plus or minus **1/4 inch (6 mm)**.
- D. Finish exposed stone faces and edges to comply with requirements indicated for finish and to match approved samples **and mockups**.
  - 1. Finish: **Mixed split face, seam face, and rock face (pitched face)**
  - 2. Finish for Sills and caps: **Thermal**
  - 3. Finish for Lintels: **Thermal**
  - 4. Finish for Copings: **Thermal**
    - a. Finish exposed ends of copings same as front and back faces.

## 2.7 MORTAR MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
  - 1. Do not use calcium chloride.
  - 2. Mixing Pointing Mortar: Thoroughly mix cementitious and aggregate materials together before adding water. Then mix again, adding only enough water to produce a damp,

unworkable mix that will retain its form when pressed into a ball. Maintain mortar in this dampened condition for one to two hours. Add remaining water in small portions until mortar reaches required consistency. Use mortar within 30 minutes of final mixing; do not retemper or use partially hardened material.

- B. Mortar for Stone Masonry: Comply with ASTM C 270, Proportion Specification.
  - 1. Mortar for Setting Stone: **Type N**.
  - 2. Mortar for Pointing Stone: **Type N**.
- C. Latex-Modified Portland Cement Setting Mortar: Proportion and mix portland cement, aggregate, and latex additive to comply with latex-additive manufacturer's written instructions.
- D. Cement-Paste Bond Coat: Mix either neat cement and water or cement, sand, and water to a consistency similar to that of thick cream.
  - 1. For latex-modified portland cement, setting-bed mortar, substitute latex admixture for part or all of water, according to latex-additive manufacturer's written instructions.
- E. Mortar for Scratch Coat over Metal Lath: 1 part portland cement, 1/2 part lime, 5 parts loose damp sand, and enough water to produce a workable consistency.
- F. Mortar for Scratch Coat over Unit Masonry: 1 part portland cement, 1 part lime, 7 parts loose damp sand, and enough water to produce a workable consistency.

### PART 3 - EXECUTION

#### 3.1 SETTING STONE MASONRY

- A. Perform necessary field cutting and trimming as stone is set.
  - 1. Use power saws to cut stone that is fabricated with saw-cut surfaces. Cut lines straight and true, with edges eased slightly to prevent snapping.
  - 2. Use hammer and chisel to split stone that is fabricated with split surfaces. Make edges straight and true, matching similar surfaces that were shop or quarry fabricated.
  - 3. Pitch face at field-split edges as needed to match stones that are not field split.
- B. Sort stone before it is placed in wall to remove stone that does not comply with requirements relating to aesthetic effects, physical properties, or fabrication, or that is otherwise unsuitable for intended use.
- C. Arrange stones in three-course, random-range ashlar pattern with random course heights, random lengths (interrupted coursed), and uniform joint widths.
- D. Arrange stones with color and size variations uniformly dispersed for an evenly blended appearance.
- E. Maintain uniform joint widths, except for variations due to different stone sizes and where minor variations are required to maintain bond alignment if any. Lay walls with joints not less than **1/4 inch (6 mm)** at narrowest points or more than **5/8 inch (16 mm)** at widest points.



- F. Provide sealant joints of widths and at locations indicated.
1. Keep sealant joints free of mortar and other rigid materials.
  2. Sealant joints are specified in Section 079200 "Joint Sealants."
- G. Install embedded flashing at shelf angles, lintels, ledges, other obstructions to downward flow of water in wall, and where indicated.
1. At stud-framed walls, extend flashing through stone masonry, up sheathing face at least **12 inches (300 mm)**, and behind weather barrier.
  2. At lintels and shelf angles, extend flashing full length of angles but not less than 6 inches (150 mm) into masonry at each end.
  3. At sills, extend flashing not less than 4 inches (100 mm) at ends.
  4. At ends of head and sill flashing, turn up not less than 2 inches (50 mm) to form end dams.
  5. Extend sheet metal flashing 1/2 inch (13 mm) beyond masonry face at exterior, and turn flashing down to form a drip.
  6. Install metal drip edges beneath flexible flashing at exterior wall face. Stop flexible flashing 1/2 inch (13 mm) back from exterior wall face, and adhere flexible flashing to top of metal drip edge.
  7. Install metal flashing termination beneath flexible flashing at exterior wall face. Stop flexible flashing 1/2 inch (13 mm) back from exterior wall face, and adhere flexible flashing to top of metal flashing termination.
  8. Cut flexible flashing flush with wall face after completing masonry wall construction.

### 3.2 CONSTRUCTION TOLERANCES

- A. Variation from Level: For **bed joints and** lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/2 inch in 40 feet (13 mm in 12 m) or more.
- B. Variation of Linear Building Line: For position shown in plan, do not exceed 1/2 inch in 20 feet (13 mm in 6 m) or 3/4 inch in 40 feet (19 mm in 12 m).

### 3.3 INSTALLATION OF ADHERED STONE MASONRY VENEER

- A. Install flashing over sheathing and behind building paper or wrap **and drainage material** by fastening through sheathing into framing.
- B. Install lath over building paper or wrap **and drainage material** by fastening through sheathing into framing to comply with ASTM C 1063.
- C. Install scratch coat over metal lath 3/8 inch (10 mm) thick to comply with ASTM C 926.
- D. Coat backs of stone units and face of **scratch coat** with cement-paste bond coat, then butter both surfaces with setting mortar. Use sufficient setting mortar, so a slight excess will be forced out the edges of stone units as they are set. Tap units into place, completely filling space between units and **scratch coat**.

- E. Rake out joints for pointing with mortar to depth of not less than **1/2 inch (13 mm)** before setting mortar has hardened. Rake joints to uniform depths with square bottoms and clean sides.

### 3.4 POINTING

- A. Prepare stone-joint surfaces for pointing with mortar by removing dust and mortar particles. Where setting mortar was removed to depths greater than surrounding areas, apply pointing mortar in layers not more than 3/8 inch (10 mm) deep until a uniform depth is formed.
- B. Point stone joints by placing and compacting pointing mortar in layers of not more than 3/8 inch (10 mm) deep. Compact each layer thoroughly, and allow to it become thumbprint hard before applying next layer.
- C. Tool joints, when pointing mortar is thumbprint hard, with a smooth jointing tool to produce the following joint profile:
  - 1. Joint Profile: **Smooth, flat face recessed 1/2 inch below edges of stone (raked joint)**

### 3.5 ADJUSTING AND CLEANING

- A. In-Progress Cleaning: Clean stone masonry as work progresses. Remove mortar fins and smears before tooling joints.
- B. Final Cleaning: After mortar is thoroughly set and cured, clean stone masonry as follows:
  - 1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
  - 2. Test cleaning methods on mockup; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before cleaning stone masonry.
  - 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
  - 4. Wet wall surfaces with water before applying cleaner; remove cleaner promptly by rinsing thoroughly with clear water.
  - 5. Clean stone masonry by bucket and brush hand-cleaning method described in BIA Technical Note No. 20, Revised II, using job-mixed detergent solution.
  - 6. Clean stone masonry with proprietary acidic cleaner applied according to manufacturer's written instructions.

### 3.6 EXCESS MATERIALS AND WASTE

- A. Excess Stone: Stack excess stone where directed by Owner for Owner's use.
- B. Disposal as Fill Material: Dispose of clean masonry waste.
  - 1. Do not dispose of masonry waste as fill on site.

END OF SECTION 044313.16

## SECTION 055100 - METAL RAILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. **Steel** railings and posts for non-structural applications
2. **Galvanized exterior Steel** railings cast into exterior concrete.

#### 1.2 PERFORMANCE REQUIREMENTS

##### A. Structural Performance of Railings: Railings shall withstand the effects of gravity loads and the following loads and stresses within limits and under conditions indicated.

##### 1. Handrails and Top Rails of Guards:

- a. Uniform load of 50 lbf/ ft. (0.73 kN/m) applied in any direction.
- b. Concentrated load of 200 lbf (0.89 kN) applied in any direction.
- c. Uniform and concentrated loads need not be assumed to act concurrently.

##### 2. Infill of Guards:

- a. Concentrated load of 50 lbf (0.22 kN) applied horizontally on an area of 1 sq. ft. (0.093 sq. m).
- b. Infill load and other loads need not be assumed to act concurrently.

#### 1.3 ACTION SUBMITTALS

##### A. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

##### B. Delegated-Design Submittal: For installed products indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

### PART 2 - PRODUCTS

#### 2.1 METALS

##### A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For components exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.

- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 60 percent.
- C. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.

## 2.2 MISCELLANEOUS MATERIALS

- A. Fasteners: Provide zinc-plated fasteners with coating complying with ASTM B 633 or ASTM F 1941 (ASTM F 1941M), Class Fe/Zn 12 for exterior use, and Class Fe/Zn 5 where built into exterior walls. Select fasteners for type, grade, and class required.
- B. Concrete Materials and Properties: Comply with requirements in Section 033000 "Cast-in-Place Concrete" for normal-weight, air-entrained, ready-mix concrete with a minimum 28-day compressive strength of 3000 psi (20 MPa) unless otherwise indicated.

## 2.3 FABRICATION, GENERAL

- A. Provide complete stair assemblies, including metal framing, hangers, struts, railings, clips, brackets, bearing plates, and other components necessary to support and anchor stairs and platforms on supporting structure.
  - 1. Join components by welding unless otherwise indicated.
  - 2. Use connections that maintain structural value of joined pieces.
  - 3. Fabricate treads and platforms of exterior stairs so finished walking surfaces slope to drain.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without impairing work.
- D. Weld connections to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. Weld exposed corners and seams continuously unless otherwise indicated.
  - 5. At exposed connections, finish exposed welds to comply with NOMMA's "Voluntary Joint Finish Standards" for **Type 2 welds: completely sanded joint, some undercutting and pinholes okay.**
- E. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners where possible. Locate joints where least conspicuous.
- F. Fabricate joints that will be exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.

## 2.4 RAILINGS

- A. Steel Railings: Fabricate railings to comply with requirements indicated for design, dimensions, details, finish, and member sizes, including size and profiles, post spacing, and anchorage, but not less than that needed to withstand indicated loads.
  - 1. Guardrail Posts: 4x4 Hollow Structural Sections as indicated on the drawings
  - 2. Picket Infill: as indicated on the drawings.
  - 3. Rails: as indicated on the drawings
  - 4. Handrails: 1 1/4" pipe rail, turned down to concrete at ends. Intermediate posts as required to withstand indicated loads but in no case to exceed 5'-0" o/c.
- B. Welded Connections: Fabricate railings with welded connections. Cope components at connections to provide close fit, or use fittings designed for this purpose. Weld all around at connections, including at fittings.
  - 1. Finish welds to comply with NOMMA's "Voluntary Joint Finish Standards" for **Type 1 welds: no evidence of a welded joint**
- C. Form changes in direction of railings by bending.
- D. Form curves by bending members in jigs to produce uniform curvature without buckling.
- E. Close exposed ends of railing members with prefabricated end fittings.
- F. Provide wall returns at ends of wall-mounted handrails.
- G. Brackets, Flanges, Fittings, and Anchors: Provide wall brackets, end closures, flanges, miscellaneous fittings, and anchors for interconnecting components and for attaching to other work.
- H. Fillers: Provide fillers made from steel plate, or other suitably crush-resistant material, to transfer wall bracket loads through wall finishes. Size fillers to suit wall finish thicknesses.

## 2.5 FINISHES

- A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Galvanizing: Hot-dip galvanize items to be installed on the exterior to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
- C. Preparation for Shop Priming: Prepare uncoated ferrous-metal surfaces to comply with **SSPC-SP 3, "Power Tool Cleaning."**



## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal stairs. Set units accurately in location, alignment, and elevation, measured from established lines and levels and free of rack.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication.
- C. Field Welding: Comply with requirements for welding in "Fabrication, General" Article.
- D. Place and finish concrete fill for treads and platforms to comply with Section 033000 "Cast-in-Place Concrete."

### 3.2 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780.

END OF SECTION 055100

## SECTION 062013 - EXTERIOR FINISH CARPENTRY

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Exterior **cellular PVC** trim.
  - 2. Shingle siding.
  - 3. **Lumber** soffits.

### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of process and factory-fabricated product.
- B. Samples: For each type of product involving selection of colors, profiles, or textures.

### 1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For the following, from ICC-ES:
  - 1. Wood-preservative-treated wood.
  - 2. Cellular PVC trim.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated.
- B. Factory mark each piece of lumber with grade stamp of inspection agency, indicating grade, species, moisture content at time of surfacing, and mill.
  - 1. For exposed lumber, mark grade stamp on end or back of each piece, **or omit grade stamp and provide certificates of grade compliance issued by inspection agency.**
- C. Softwood Plywood: DOC PS 1.

### 2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. Preservative Treatment by Pressure Process: AWWPA U1; Use Category **UC3a**.
  - 1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 18 percent, respectively.
  - 2. Preservative Chemicals: Acceptable to authorities having jurisdiction **and containing no arsenic or chromium.**

## 2.3 EXTERIOR TRIM

- A. Cellular PVC Trim: Extruded, expanded PVC with a small-cell microstructure, recommended by manufacturer for exterior use, made from UV- and heat-stabilized rigid material.
  - 1. Edge treatment: At board products provide material with factory finish on 4 sides.
  - 2. Density: Not less than 31 lb/cu. ft. (500 kg/cu. m).
  - 3. Heat Deflection Temperature: Not less than 130 deg F (54 deg C), according to ASTM D 648.
  - 4. Water Absorption: Not more than 1 percent, according to ASTM D 570.
  - 5. Flame-Spread Index: 75 or less, according to ASTM E 84.

## 2.4 SHINGLE SIDING

- A. Provide kiln-dried shingle siding complying with DOC PS 20, **coated (dipped) with exterior clear oil sealer prior to installation.**
  - 1. Provide second coat of oil sealer after installation.
- B. Species and Grade: Eastern White Cedar
  - 1. Basis of design is Dow's Eastern White Cedar Shingles (207-884-8299), Wall Grade
- C. Size: 18" long, 1/2" thick at butt

## 2.5 LUMBER SOFFITS

- A. Provide kiln-dried lumber siding complying with DOC PS 20, **coated with exterior clear oil sealer prior to installation.**
- B. Species and Grade: Fir, Clear Vertical Grain (CVG)
- C. Pattern: V-edge, smooth-faced tongue and groove, actual face width (coverage) and thickness of **5-1/8 by 23/32 inch (130 by 18 mm).**

## 2.6 MISCELLANEOUS MATERIALS

- A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches (38 mm) into wood substrate.
  - 1. For siding, provide ringed-shank split proof stainless steel siding nails.
  - 2. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is required.
  - 3. For applications not otherwise indicated, provide **stainless-steel** fasteners.
- B. Flashing: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.
  - 1. Horizontal Joint Flashing for Panel Siding: Preformed, **prefinished-aluminum** Z-shaped flashing.

- C. Insect Screening for Soffit Vents: **PVC-coated glass-fiber fabric, 18-by-14-inch (1.8-by-1.4-mm).**
- D. Sealants: Latex, complying with ASTM C 834 **Type OP, Grade NF** and applicable requirements in Section 079200 "Joint Sealants" and recommended by sealant and substrate manufacturers for intended application.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Section 099113 "Exterior Painting."

### 3.2 INSTALLATION, GENERAL

- A. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Install stairs with no more than 3/16-inch (4.7-mm) variation between adjacent treads and risers and with no more than 3/8-inch (9.5-mm) variation between largest and smallest treads and risers within each flight.

### 3.3 STANDING AND RUNNING TRIM INSTALLATION

- A. Install cellular PVC trim to comply with manufacturer's written instructions.
- B. Install trim with minimum number of joints as is practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary.
  - 1. Use scarf joints for end-to-end joints.
  - 2. Stagger end joints in adjacent and related members.
- C. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints, with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

### 3.4 LUMBER SOFFIT INSTALLATION

- A. Install lumber soffits, including porch ceiling and interior wood ceilings with concealed fasteners.

- B. At locations where lumber changes direction, install each row in a consecutive step fashion to create a herringbone appearance.
- C. At ceiling coffers, both interior and exterior, install full length material with no butt joints.

### 3.5 SIDING INSTALLATION

- A. Install siding to comply with manufacturer's written instructions **and warranty requirements**.
- B. Shingle Siding: Apply starter strip with joints staggered along bottom edge of sheathing or sill. Install first course of siding, with lower edge at least 1/8 inch (3 mm) below starter strip and subsequent courses lapped over course below.
  - 1. Install subsequent shingles so vertical joints are separated a minimum of 1" from adjacent joints.

END OF SECTION 062013

## SECTION 064113 - INTERIOR TRIM AND WOOD-VENEER-FACED CABINETS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Architectural Trim and Paneling
2. Architectural wood cabinets.
3. Wood furring, blocking, shims, and hanging strips for installing architectural wood cabinets unless concealed within other construction before cabinet installation.
4. Shop finishing of architectural wood cabinets.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each type of product, **including cabinet hardware and accessories and finishing materials and processes.**

##### B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.

##### C. Samples:

1. Lumber for transparent finish, for each species and cut, finished on one side and one edge.
2. Veneer leaves representative of and selected from flitches to be used for transparent-finished cabinets.
3. Exposed cabinet hardware and accessories, one unit for each type.

#### 1.3 QUALITY ASSURANCE

##### A. Fabricator Qualifications: **Certified participant in AWI's Quality Certification Program**

#### 1.4 FIELD CONDITIONS

##### A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.



## PART 2 - PRODUCTS

### 2.1 INTERIOR TRIM

#### A. Hardwood Lumber Trim:

1. Species and Grade: **White oak, Quarter sawn, Clear; NHLA.**
2. Maximum Moisture Content: **10** percent.
3. Finger Jointing: Not allowed.

### 2.2 PANELING

#### A. Hardwood Veneer Plywood Paneling: Manufacturer's hardwood plywood panels complying with HPVA HP-1.

1. Face Veneer Species and Cut: White oak, Quarter Sawn
2. Veneer Matching: **Selected for similar color and grain.**
3. Finish: **Match selected door finish.**

### 2.3 ARCHITECTURAL WOOD CABINETS, GENERAL

#### A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural wood cabinets indicated for construction, finishes, installation, and other requirements.

1. Provide **certificates** from **AWI** certification program indicating that woodwork complies with requirements of grades specified.

### 2.4 WOOD CABINETS FOR TRANSPARENT FINISH

#### A. Grade: **Premium**

#### B. Type of Construction: **Frameless**

#### C. Cabinet and Door and Drawer Front Interface Style: **Flush overlay**

#### D. Wood for Exposed Surfaces:

1. Species: **White oak**
2. Cut: **Quarter cut/quarter sawn.**
3. Grain Direction: **Vertically for doors and fixed panels, horizontally for drawer fronts.**
4. Matching of Veneer Leaves: **Book** match.
5. Veneer Matching within Panel Face: **Running** match.

#### E. Semiexposed Surfaces: Provide surface materials indicated below:

1. Surfaces Other Than Drawer Bodies: **Same species and cut indicated for exposed surfaces.**

2. Drawer Subfronts, Backs, and Sides: **Solid-hardwood lumber, same species indicated for exposed surfaces.**
  3. Drawer Bottoms: **Hardwood plywood**
- F. Dust Panels: 1/4-inch (6.4-mm) plywood or tempered hardboard above compartments and drawers unless located directly under tops.

## 2.5 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Wood Moisture Content: **5 to 10** percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Medium-Density Fiberboard: ANSI A208.2, **Grade 130**
  2. Softwood Plywood: DOC PS 1, **medium-density overlay.**
  3. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1.
  4. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

## 2.6 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets.
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, **135** degrees of opening.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid **metal**, **4 inches (100 mm) long, 5/16 inch (8 mm) in diameter.**
- E. Adjustable Shelf Standards and Supports: **BHMA A156.9, B04071; with shelf rests, B04081**
- F. Shelf Rests: BHMA A156.9, B04013; **metal**
- G. Drawer Slides: BHMA A156.9.
1. Grade 1 and Grade 2: Side mounted; **full-extension** type; **zinc-plated steel** with polymer rollers.
  2. Grade 1HD-100 and Grade 1HD-200: Side mounted; **full-extension** type; zinc-plated-steel ball-bearing slides.
  3. For drawers not more than 3 inches (75 mm) high and not more than 24 inches (600 mm) wide, provide **Grade 2.**

4. For drawers more than 3 inches (75 mm) high but not more than 6 inches (150 mm) high and not more than 24 inches (600 mm) wide, provide **Grade 1**
  5. For drawers more than 6 inches (150 mm) high or more than 24 inches (600 mm) wide, provide **Grade 1HD-100**.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Door and Drawer Silencers: BHMA A156.16, L03011.
- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.

## 2.7 FABRICATION

- A. Complete fabrication, including assembly, **finishing**, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

## 2.8 SHOP FINISHING

- A. General: Finish architectural wood cabinets at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.
- B. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural wood cabinets, as applicable to each unit of work.
  1. Backpriming: Apply one coat of sealer or primer, compatible with finish coats, to concealed surfaces of cabinets.
- C. Transparent Finish:
  1. Grade: **Same as item to be finished**.
  2. Finish: System - 5, conversion varnish.
  3. Staining: **Match Architect's sample**.
  4. Open Finish for Open-Grain Woods: Do not apply filler to open-grain woods.
  5. Sheen: **Satin, 31-45** gloss units measured on 60-degree gloss meter per ASTM D 523.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition materials to average prevailing humidity conditions in installation areas.

### 3.2 INSTALLATION, GENERAL

- A. Install interior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
  - 1. Scribe and cut interior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
  - 2. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.
  - 3. Install to tolerance of 1/8 inch in 96 inches (3 mm in 2438 mm) for level and plumb. Install adjoining interior finish carpentry with 1/32-inch (0.8-mm) maximum offset for flush installation and 1/16-inch (1.5-mm) maximum offset for reveal installation.

### 3.3 STANDING AND RUNNING TRIM INSTALLATION

- A. Install with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches (610 mm) long, except where necessary. Stagger joints in adjacent and related standing and running trim. **Cope** at returns, miter at outside corners, and cope at inside corners to produce tight-fitting joints with full-surface contact throughout length of joint. Use scarf joints for end-to-end joints.

### 3.4 PANELING INSTALLATION

- A. Plywood Paneling: Select and arrange panels on each wall to minimize noticeable variations in grain character and color between adjacent panels. Leave 1/4-inch (6-mm) gap to be covered with trim at top, bottom, and openings. Install with uniform tight joints between panels.
  - 1. Attach panels to supports with manufacturer's recommended panel adhesive and fasteners. Space fasteners and adhesive as recommended by panel manufacturer.
  - 2. Conceal fasteners to greatest practical extent.

### 3.5 CABINET INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails **or finishing screws** for exposed fastening, countersunk and filled flush with woodwork.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c. with **No. 10 wafer-head screws sized for not less than 1-1/2-inch (38-mm) penetration into wood framing, blocking, or hanging strips**
- F. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with matching filler where exposed.

END OF SECTION 064113

## SECTION 064116 - PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Plastic-laminate-faced architectural cabinets.
2. Wood furring, blocking, shims, and hanging strips for installing plastic-laminate-faced architectural cabinets unless concealed within other construction before cabinet installation.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product, **including high-pressure decorative laminate, adhesive for bonding plastic laminate and cabinet hardware and accessories.**
- B. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
- C. Samples:
  1. Plastic laminates, for each color, pattern, and surface finish.
  2. Thermoset decorative panels, for each color, pattern, and surface finish.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Woodwork Quality Standard Compliance Certificates: **AWI Quality Certification Program certificates.**

#### 1.4 QUALITY ASSURANCE

- A. Fabricator Qualifications: **Certified participant in AWI's Quality Certification Program.**
- B. Installer Qualifications: **Fabricator of products**

#### 1.5 FIELD CONDITIONS

- A. Environmental Limitations: Do not deliver or install cabinets until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.



## PART 2 - PRODUCTS

### 2.1 PLASTIC-LAMINATE-FACED ARCHITECTURAL CABINETS

- A. Quality Standard: Unless otherwise indicated, comply with the "Architectural Woodwork Standards" for grades of architectural plastic-laminate cabinets indicated for construction, finishes, installation, and other requirements.
- B. Grade: **Premium**
- C. Type of Construction: **Frameless**
- D. Cabinet, Door, and Drawer Front Interface Style: **Flush overlay**
- E. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or if not indicated, as required by woodwork quality standard.
  - 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
    - a. Abet Laminati, Inc.
    - b. Formica Corporation.
    - c. Wilsonart International; Div. of Premark International, Inc.
- F. Laminate Cladding:
  - 1. Horizontal Surfaces: **Grade HGL.**
  - 2. Postformed Surfaces: **Grade HGP.**
  - 3. Vertical Surfaces: **Grade HGS**
  - 4. Pattern Direction: **As indicated**
- G. Materials for Semiexposed Surfaces:
  - 1. Surfaces Other Than Drawer Bodies: **High-pressure decorative laminate, NEMA LD 3, Grade VGS**
  - 2. Drawer Sides and Backs: **Solid-hardwood lumber**
  - 3. Drawer Bottoms: **Hardwood plywood**
- H. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:
  - 1. As indicated by laminate manufacturer's designations.
  - 2. Match Architect's sample.
  - 3. As selected by Architect from laminate manufacturer's full range.

### 2.2 WOOD MATERIALS

- A. Wood Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.

1. Wood Moisture Content: **5 to 10** percent.
- B. Composite Wood and Agrifiber Products: Provide materials that comply with requirements of referenced quality standard for each type of woodwork and quality grade specified unless otherwise indicated.
1. Recycled Content of Medium-Density Fiberboard and Particleboard: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **<Insert number>** percent.
  2. Composite Wood and Agrifiber Products: Products 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."
  3. Particleboard: ANSI A208.1, **Grade M-2, made with binder containing no urea formaldehyde.**
  4. Softwood Plywood: DOC PS 1, **medium-density overlay.**
  5. Veneer-Faced Panel Products (Hardwood Plywood): HPVA HP-1, **made with adhesive containing no urea formaldehyde.**
  6. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper and complying with requirements of NEMA LD 3, Grade VGL, for test methods 3.3, 3.4, 3.6, 3.8, and 3.10.

## 2.3 CABINET HARDWARE AND ACCESSORIES

- A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets except for items specified in Section 087111 "Door Hardware (Descriptive Specification)."
- B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, **135** degrees of opening.
- C. Back-Mounted Pulls: BHMA A156.9, B02011.
- D. Wire Pulls: Back mounted, solid **metal, 4 inches (100 mm) long, 5/16 inch (8 mm) in diameter**
- E. Catches: **Magnetic catches, BHMA A156.9, B03141**
- F. Shelf Rests: BHMA A156.9, B04013; **metal, two-pin type with shelf hold-down clip.**
- G. Drawer Slides: BHMA A156.9.
  1. Grade 1: Side mounted **and extending under bottom edge of drawer; full-extension type; zinc-plated steel** with polymer rollers.
- H. Door Locks: BHMA A156.11, E07121.
- I. Drawer Locks: BHMA A156.11, E07041.
- J. Door and Drawer Silencers: BHMA A156.16, L03011.

- K. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18 for BHMA finish number indicated.
  - 1. Satin Chromium Plated: BHMA 626 for brass or bronze base; BHMA 652 for steel base.
  - 2. Satin Stainless Steel: BHMA 630.

## 2.4 MISCELLANEOUS MATERIALS

- A. Furring, Blocking, Shims, and Hanging Strips: **Softwood or hardwood lumber** kiln dried to less than 15 percent moisture content.
- B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide metal expansion sleeves or expansion bolts for post-installed anchors. Use nonferrous-metal or hot-dip galvanized anchors and inserts at inside face of exterior walls and at floors.
- C. Adhesives: Do not use adhesives that contain urea formaldehyde.
- D. Adhesives: Use adhesives that meet 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. Adhesive for Bonding Plastic Laminate: **Unpigmented contact cement**
  - 1. Adhesive for Bonding Edges: Hot-melt adhesive **or adhesive specified above for faces.**

## 2.5 FABRICATION

- A. Complete fabrication, including assembly and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.
- B. Shop-cut openings to maximum extent possible to receive hardware, appliances, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.
- C. Install glass to comply with applicable requirements in Section 088000 "Glazing" and in GANA's "Glazing Manual." For glass in wood frames, secure glass with removable stops.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Before installation, condition cabinets to average prevailing humidity conditions in installation areas.

### 3.2 INSTALLATION

- A. Grade: Install cabinets to comply with same grade as item to be installed.
- B. Install cabinets level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb to a tolerance of 1/8 inch in 96 inches (3 mm in 2400 mm).
- C. Scribe and cut cabinets to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.
- D. Anchor cabinets to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing. Use fine finishing nails **or finishing screws** for exposed fastening, countersunk and filled flush with woodwork.
- E. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.
  - 1. Install cabinets with no more than 1/8 inch in 96-inch (3 mm in 2400-mm) sag, bow, or other variation from a straight line.
  - 2. Fasten wall cabinets through back, near top and bottom, and at ends not more than 16 inches (400 mm) o.c.

END OF SECTION 064116

## SECTION 071326 - SELF-ADHERING SHEET WATERPROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes self-adhering modified bituminous sheet waterproofing.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show locations and extent of waterproofing and details of substrate joints and cracks, sheet flashings, penetrations, inside and outside corners, tie-ins with adjoining waterproofing, and other termination conditions.

#### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by waterproofing manufacturer.

#### 1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer's standard materials-only warranty in which manufacturer agrees to furnish replacement waterproofing material for waterproofing that does not comply with requirements or that fails to remain watertight within specified warranty period.
  - 1. Warranty Period: **Five** years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 MODIFIED BITUMINOUS SHEET WATERPROOFING

- A. Modified Bituminous Sheet: Minimum 40-mil (1.5-mm) nominal thickness, self-adhering sheet consisting of rubberized asphalt laminated on one side to a polyethylene-film reinforcement, and with release liner on adhesive side; **formulated for compatibility and adherence to EPS foam insulation with or without application with primer or surface conditioner that complies with VOC limits of authorities having jurisdiction.**
  - 1. Products: Subject to compliance with requirements, **provide one of the following.**
    - a. Carlisle Coatings & Waterproofing Inc; CCW MiraDRI 860/861.
    - b. Protecto Wrap Company; PW 100/60.

- c. Nudura waterproof membrane, Nudura Corporation
2. Physical Properties:
- a. Tensile Strength, Membrane: 250 psi (1.7 MPa) minimum; ASTM D 412, Die C, modified.
  - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.
  - c. Low-Temperature Flexibility: Pass at minus 20 deg F (minus 29 deg C); ASTM D 1970.
  - d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch (3-mm) movement; ASTM C 836.
  - e. Puncture Resistance: 40 lbf (180 N) minimum; ASTM E 154.
  - f. Water Absorption: 0.2 percent weight-gain maximum after 48-hour immersion at 70 deg F (21 deg C); ASTM D 570.
  - g. Water Vapor Permeance: 0.05 perms (2.9 ng/Pa x s x sq. m) maximum; ASTM E 96/E 96M, Water Method.
  - h. Hydrostatic-Head Resistance: **200 feet** minimum; ASTM D 5385.
3. Sheet Strips: Self-adhering, rubberized-asphalt strips of same material and thickness as sheet waterproofing.

## 2.2 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with sheet waterproofing.
  - 1. Furnish liquid-type auxiliary materials that comply with VOC limits of authorities having jurisdiction.
- B. Primer: Liquid primer recommended for substrate by sheet-waterproofing material manufacturer.
- C. Surface Conditioner: Liquid, waterborne surface conditioner recommended for substrate by sheet-waterproofing material manufacturer.
- D. Liquid Membrane: Elastomeric, two-component liquid, cold fluid applied, of trowel grade or low viscosity.
- E. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch (25 by 3 mm) thick, predrilled at 9-inch (229-mm) centers.
- F. Protection Course: Molded-sheet Drainage Panel

## 2.3 MOLDED-SHEET DRAINAGE PANELS

- A. Woven-Geotextile-Faced, Molded-Sheet Drainage Panel: Composite subsurface drainage panels consisting of a studded, nonbiodegradable, molded-plastic-sheet drainage core; with a woven-geotextile facing with an apparent opening size not exceeding No. 40 (0.425-mm) sieve



laminated to one side of the core and with a horizontal flow rate not less than 2.8 gpm per ft. (35 L/min. per m).

1. Products: Subject to compliance with requirements, **provide one of the following:**
  - a. Carlisle Coatings & Waterproofing Inc; CCW MiraDRAIN 9000
  - b. Protecto Wrap Company; Protecto Drain 2000-H.
  - c. Tremdrain 2000, Tremco Corporation

## PART 3 - EXECUTION

### 3.1 MODIFIED BITUMINOUS SHEET-WATERPROOFING APPLICATION

- A. Prepare surfaces and install modified bituminous sheets according to waterproofing manufacturer's written instructions and recommendations in ASTM D 6135.
- B. Apply primer to substrates at required rate and allow it to dry. Limit priming to areas that will be covered by sheet waterproofing in same day. Reprime areas exposed for more than 24 hours.
- C. Apply and firmly adhere sheets over area to receive waterproofing. Accurately align sheets and maintain uniform 2-1/2-inch- (64-mm-) minimum lap widths and end laps. Overlap and seal seams, and stagger end laps to ensure watertight installation.
  1. When ambient and substrate temperatures range between 25 and 40 deg F (minus 4 and plus 5 deg C), install self-adhering, modified bituminous sheets produced for low-temperature application. Do not use low-temperature sheets if ambient or substrate temperature is higher than 60 deg F (16 deg C).
- D. Horizontal Application: Apply sheets from low to high points of decks to ensure that laps shed water.
- E. Apply continuous sheets over already-installed sheet strips, bridging substrate cracks, construction, and contraction joints.
- F. Seal edges of sheet-waterproofing terminations with mastic.
- G. Install sheet-waterproofing and auxiliary materials to tie into adjacent waterproofing.
- H. Repair tears, voids, and lapped seams in waterproofing not complying with requirements. Slit and flatten fishmouths and blisters. Patch with sheet waterproofing extending 6 inches (150 mm) beyond repaired areas in all directions.
- I. Immediately install protection course with butted joints over waterproofing membrane.
  1. **Molded-sheet drainage panels** may be used in place of a separate protection course to vertical applications when approved by waterproofing manufacturer and installed immediately.

### 3.2 MOLDED-SHEET DRAINAGE-PANEL INSTALLATION

- A. Place and secure molded-sheet drainage panels, with geotextile facing away from wall or deck substrate, according to manufacturer's written instructions. Use adhesives or other methods that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed molded-sheet drainage panels during subsequent construction.

### 3.3 PROTECTION, REPAIR, AND CLEANING

- A. Do not permit foot or vehicular traffic on unprotected membrane.
- B. Protect installed insulation drainage panels from damage due to UV light, harmful weather exposures, physical abuse, and other causes. Provide temporary coverings where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.
- C. Correct deficiencies in or remove waterproofing that does not comply with requirements; repair substrates, reapply waterproofing, and repair sheet flashings.
- D. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 071326

## SECTION 072100 - THERMAL INSULATION

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Foam-plastic board insulation.
2. Mineral-wool blanket insulation.
3. Loose-fill insulation.
4. Spray polyurethane foam insulation.

#### 1.2 RELATED SECTIONS

##### A. 033100 – Insulating Concrete Forms

#### 1.3 ACTION SUBMITTALS

##### A. Product Data: For each type of product indicated.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Research/evaluation reports.

### PART 2 - PRODUCTS

#### 2.1 FOAM-PLASTIC BOARD INSULATION

- A. Extruded-Polystyrene (XPS) Board Insulation: ASTM C 578, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Dow Chemical Company (The).
    - b. Owens Corning.
    - c. Pactiv Building Products.
  - 2. Type IV, 25 psi (173 kPa).

## 2.2 MINERAL-WOOL BLANKET INSULATION

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Fibrex Insulations Inc.
  - 2. Owens Corning.
  - 3. Roxul Inc.
  - 4. Thermafiber.
- B. Recycled Content: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 10 percent.
- C. Unfaced, Mineral-Wool Blanket Insulation: ASTM C 665, Type I (blankets without membrane facing); consisting of fibers; with maximum flame-spread and smoke-developed indexes of 25 and 50, respectively, per ASTM E 84; passing ASTM E 136 for combustion characteristics.

## 2.3 LOOSE-FILL INSULATION

- A. Cellulosic-Fiber Loose-Fill Insulation: ASTM C 739, chemically treated for flame-resistance, processing, and handling characteristics.

## 2.4 SPRAY POLYURETHANE FOAM INSULATION

- A. Closed-Cell Polyurethane Foam Insulation: ASTM C 1029, Type II, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively, per ASTM E 84.
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. BASF Corporation.
    - b. BaySystems NorthAmerica, LLC.
    - c. Dow Chemical Company (The).
    - d. ERSystems, Inc.
    - e. Gaco Western Inc.
    - f. Henry Company.
    - g. NCFI; Division of Barnhardt Mfg. Co.
  - 2. Minimum density of 2.0 lb/cu. ft. (24 kg/cu. m), thermal resistivity of 6.2 deg F x h x sq. ft./Btu x in. at 75 deg F (43 K x m/W at 24 deg C).

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and applications indicated.

- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed to ice, rain, or snow at any time.
- C. Extend insulation to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness indicated unless multiple layers are otherwise shown or required to make up total thickness.

### 3.2 INSTALLATION OF BELOW-GRADE INSULATION

- A. On vertical surfaces, set insulation units according to manufacturer's written instructions.
- B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

### 3.3 INSTALLATION OF INSULATION FOR FRAMED CONSTRUCTION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Glass-Fiber or Mineral-Wool Blanket Insulation: Install in cavities formed by framing members according to the following requirements:
  - 1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill the cavities, provide lengths that will produce a snug fit between ends.
  - 2. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
  - 3. Maintain 3-inch (76-mm) clearance of insulation around recessed lighting fixtures not rated for or protected from contact with insulation.
  - 4. For wood-framed construction, install blankets according to ASTM C 1320 and as follows:
    - a. With faced blankets having stapling flanges, secure insulation by inset, stapling flanges to sides of framing members.
    - b. With faced blankets having stapling flanges, lap blanket flange over flange of adjacent blanket to maintain continuity of vapor retarder once finish material is installed over it.
- C. Loose-Fill Insulation: Apply according to ASTM C 1015 and manufacturer's written instructions. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.
  - 1. For cellulosic-fiber loose-fill insulation, comply with CIMA's Bulletin #2, "Standard Practice for Installing Cellulose Insulation."

- D. Spray-Applied Insulation: Apply spray-applied insulation according to manufacturer's written instructions. Do not apply insulation until installation of pipes, ducts, conduits, wiring, and electrical outlets in walls is completed and windows, electrical boxes, and other items not indicated to receive insulation are masked. After insulation is applied, make flush with face of studs by using method recommended by insulation manufacturer.
- E. Miscellaneous Voids: Install insulation in miscellaneous voids and cavity spaces where required to prevent gaps in insulation using the following materials:
  - 1. Loose-Fill Insulation: Compact to approximately 40 percent of normal maximum volume equaling a density of approximately 2.5 lb/cu. ft. (40 kg/cu. m).
  - 2. Spray Polyurethane Insulation: Apply according to manufacturer's written instructions.

END OF SECTION 072100



## SECTION 072500 - WEATHER BARRIERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Building wrap, Weather Resistive Barrier (WRB).
  - 2. Flexible flashing.
  - 3. Woven Rainscreen

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Evaluation Reports: For water-resistive barrier and flexible flashing, from ICC-ES.

### PART 2 - PRODUCTS

#### 2.1 WATER-RESISTIVE BARRIER

- A. Building Wrap: ASTM E 1677, Type I air barrier; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. DuPont (E. I. du Pont de Nemours and Company); Tyvek **Commercial Wrap**
    - b. Reemay, Inc.; Typar HouseWrap.
  - 2. Water-Vapor Permeance: Not less than **50** g through 1 sq. m of surface in 24 hours per ASTM E 96/E 96M, Desiccant Method (Procedure A).
- B. Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

#### 2.2 MISCELLANEOUS MATERIALS

- A. Flexible Flashing: Self-adhesive **rubberized-asphalt** compound, bonded to a high-density polyethylene film, aluminum foil, or spunbonded polyolefin to produce an overall thickness of not less than 0.025 inch (0.6 mm).

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. Grace Construction Products, a unit of W. R. Grace & Co. - Conn.; Vycor Plus Self-Adhered Flashing

## 2.3 Woven Rainscreen

- A. Rainscreen: provide woven 1/4" thick 3 dimensional woven mesh rainscreen material for use behind siding and trim on new sheathing with integral air barrier.
  1. Products: Subject to compliance with requirements, **provide the following**:
    - a. Benjamin Obdyke ; **Homeslicker Rainscreen 6mm**

## PART 3 - EXECUTION

### 3.1 WATER-RESISTIVE BARRIER INSTALLATION

- A. Cover sheathing with water-resistive barrier as follows:
  1. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.
  2. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap unless otherwise indicated.
- B. Building Wrap: Comply with manufacturer's written instructions.
  1. Seal seams, edges, fasteners, and penetrations with tape.
  2. Extend into jambs of openings and seal corners with tape.

### 3.2 FLEXIBLE FLASHING INSTALLATION

- A. Apply flexible flashing where indicated to comply with manufacturer's written instructions.
  1. Lap seams and junctures with other materials at least 4 inches (100 mm) except that at flashing flanges of other construction, laps need not exceed flange width.
  2. Lap flashing over water-resistive barrier at bottom and sides of openings.
  3. Lap water-resistive barrier over flashing at heads of openings.

END OF SECTION 072500

## SECTION 073113 - ASPHALT SHINGLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Asphalt shingles.
  - 2. Underlayment.
  - 3. Metal flashing and trim.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Evaluation reports.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: An authorized representative who is trained and approved by manufacturer.

#### 1.5 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace asphalt shingles that fail within specified warranty period.
  - 1. Material Warranty Period: **50** years from date of Substantial Completion, prorated, with first **five** years nonprorated.
  - 2. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds of up to **110 mph (49 m/s)** **five** years from date of Substantial Completion.
  - 3. Workmanship Warranty Period: **Two** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Exterior Fire-Test Exposure: Provide asphalt shingles and related roofing materials identical to those of assemblies tested for Class A fire resistance according to ASTM E 108 or UL 790 by Underwriters Laboratories, Inc. or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

### 2.2 GLASS-FIBER-REINFORCED ASPHALT SHINGLES

- A. Laminated-Strip Asphalt Shingles: ASTM D 3462/D 3462M, laminated, multi-ply overlay construction, glass-fiber reinforced, mineral-granule surfaced, and self-sealing.
  - 1. Manufacturers: Subject to compliance with requirements, **provide products by the following:**
    - a. GAF. Timberline
  - 2. Butt Edge: **Notched** cut.
  - 3. Strip Size: **Manufacturer's standard**
  - 4. Algae Resistance: Granules resist algae discoloration.
  - 5. Impact Resistance: UL 2218, Class 4.
  - 6. Color and Blends: as selected from manufacturers full range

### 2.3 UNDERLAYMENT MATERIALS

- A. Felt: asphalt-saturated organic felts, nonperforated.
  - 1. Type: **Type II**, (30 LB)
- B. Synthetic Underlayment: UV-resistant polypropylene, polyolefin, or polyethylene polymer fabric with surface coatings or treatments to improve traction underfoot and abrasion resistance; evaluated and documented to be suitable for use as a roof underlayment under applicable codes by a testing and inspecting agency acceptable to authorities having jurisdiction.
  - 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. GAF Materials Corporation.
    - b. Grace, W. R. & Co. - Conn.
    - c. Owens Corning.
- C. Self-Adhering Sheet Underlayment, Polyethylene Faced: ASTM D 1970/D 1970M, minimum of 40-mil (1.0-mm) thick, slip-resisting, polyethylene-film-reinforced top surface laminated to SBS-modified asphalt adhesive, with release backing; cold applied.

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. Atlas Roofing Corporation.
  - b. Carlisle Residential; a division of Carlisle Construction Products.
  - c. CertainTeed Corporation.
  - d. GAF Materials Corporation.
  - e. Grace, W. R. & Co. - Conn.
  - f. Protecto Wrap Company.

## 2.4 ACCESSORIES

- A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.
- B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch (3-mm) diameter, sharp-pointed, with a minimum 3/8-inch (9.5-mm) diameter flat head and of sufficient length to penetrate 3/4 inch (19 mm) into solid wood decking or extend at least 1/8 inch (3 mm) through OSB or plywood sheathing.
  1. Shank: **Barbed.**
  2. Where nails are in contact with metal flashing, use nails made from same metal as flashing.
- C. Felt-Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch (25-mm) minimum diameter.
- D. Synthetic-Underlayment Fasteners: As recommended in writing by synthetic-underlayment manufacturer for application indicated.
- E. Soffit Vent: "The Edge" vent as provided by Air Vent inc.
- F. Ridge Vent: Cobra Rigid vent 3 by GAF
- G. Hip Vent: Cobra Hip Vent by GAF

## 2.5 METAL FLASHING AND TRIM

- A. General: Comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
  1. Sheet Metal: **Aluminum, Kynar painted finish.**
- B. Fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of the item.
  1. Fabricate with hemmed edges at all exposed locations.

## PART 3 - EXECUTION

### 3.1 UNDERLAYMENT INSTALLATION

- A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
- B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches (50 mm) over underlying course. Lap ends a minimum of 4 inches (100 mm). Stagger end laps between succeeding courses at least 72 inches (1830 mm). Fasten with **felt-underlayment** nails.
  - 1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches (75 mm) in direction that sheds water. Lap ends of felt not less than 6 inches (150 mm) over self-adhering sheet underlayment.
  - 2. Install fasteners at no more than 36 inches (914 mm) o.c.
- C. Synthetic Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides and ends and treat laps as recommended in writing by manufacturer. Stagger end laps between succeeding courses at interval recommended in writing by manufacturer. Fasten according to manufacturer's written instructions. Cover underlayment within period recommended in writing by manufacturer.
  - 1. Install in single layer on roofs sloped at 4:12 and greater.
  - 2. Install in double layer on roofs sloped at less than 4:12.
- D. Self-Adhering Sheet Underlayment: Install, wrinkle free, on roof deck. Comply with low-temperature installation restrictions of underlayment manufacturer if applicable. Install lapped in direction that sheds water. Lap sides not less than 3-1/2 inches (89 mm). Lap ends not less than 6 inches (150 mm) staggered 24 inches (600 mm) between courses. Roll laps with roller. Cover underlayment within seven days.
  - 1. Prime concrete and masonry surfaces to receive self-adhering sheet underlayment.

### 3.2 METAL FLASHING INSTALLATION

- A. General: Install metal flashings and other sheet metal to comply with requirements in Section 076200 "Sheet Metal Flashing and Trim."
  - 1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."

### 3.3 ASPHALT-SHINGLE INSTALLATION

- A. General: Install asphalt shingles according to manufacturer's written instructions, recommendations in ARMA's "Residential Asphalt Roofing Manual," and recommendations in NRCA's "NRCA Guidelines for Asphalt Shingle Roof Systems."



- B. Install starter strip along lowest roof edge, consisting of an asphalt-shingle strip **with tabs removed** with self-sealing strip face up at roof edge.
  - 1. Extend asphalt shingles **3/4 inch** over fasciae at eaves and rakes.
  - 2. Install starter strip along rake edge.
- C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.
- D. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with **manufacturer's recommended** offset pattern at succeeding courses, maintaining uniform exposure.
- E. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.
- F. Fasten asphalt-shingle strips with a minimum of **four** roofing nails located according to manufacturer's written instructions.
  - 1. When ambient temperature during installation is below **50 deg F (10 deg C)** seal asphalt shingles with asphalt roofing cement spots.
- G. Hip and Ridge Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.
  - 1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

END OF SECTION 073113

## SECTION 074113.16 - STANDING-SEAM METAL ROOF PANELS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes standing-seam metal roof panels.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include fabrication and installation layouts of metal panels; details of edge conditions, joints, panel profiles, corners, anchorages, attachment system, trim, flashings, closures, and accessories; and special details.
- C. Samples: For each type of metal panel indicated.

#### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.
- B. UL-Certified, Portable Roll-Forming Equipment: UL-certified, portable roll-forming equipment capable of producing metal panels warranted by manufacturer to be the same as factory-formed products. Maintain UL certification of portable roll-forming equipment for duration of work.

#### 1.4 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of metal panel systems that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **Two** years from date of Substantial Completion.
- B. Special Warranty on Panel Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace metal panels that show evidence of deterioration of factory-applied finishes within specified warranty period.
  - 1. Finish Warranty Period: **20** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. Air Infiltration: Air leakage of not more than 0.06 cfm/sq. ft. (0.3 L/s per sq. m) when tested according to ASTM E 1680 at the following test-pressure difference:
  - 1. Test-Pressure Difference: **1.57 lbf/sq. ft. (75 Pa)**
- B. Water Penetration under Static Pressure: No water penetration when tested according to ASTM E 1646 at the following test-pressure difference:
  - 1. Test-Pressure Difference: **2.86 lbf/sq. ft. (137 Pa)**
- C. Hydrostatic-Head Resistance: No water penetration when tested according to ASTM E 2140.
- D. Wind-Uplift Resistance: Provide metal roof panel assemblies that comply with UL 580 for wind-uplift-resistance class indicated.
  - 1. Uplift Rating: **UL 90.**
- E. FM Global Listing: Provide metal roof panels and component materials that comply with requirements in FM Global 4471 as part of a panel roofing system and that are listed in FM Global's "Approval Guide" for Class 1 or noncombustible construction, as applicable. Identify materials with FM Global markings.
  - 1. Fire/Windstorm Classification: Class 1A-**120**

### 2.2 STANDING-SEAM METAL ROOF PANELS

- A. General: Provide factory-formed metal roof panels designed to be installed by lapping and interconnecting raised side edges of adjacent panels with joint type indicated and mechanically attaching panels to supports using concealed clips in side laps. Include clips, cleats, pressure plates, and accessories required for weathertight installation.
  - 1. Steel Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1514.
  - 2. Aluminum Panel Systems: Unless more stringent requirements are indicated, comply with ASTM E 1637.
- B. Vertical-Rib, Seamed-Joint, Standing-Seam Metal Roof Panels: Formed with vertical ribs at panel edges and **a flat pan** between ribs; designed for sequential installation by mechanically attaching panels to supports using concealed clips located under one side of panels, engaging opposite edge of adjacent panels, and mechanically seaming panels together.
  - 1. Metallic-Coated Steel Sheet: Zinc-coated (galvanized) steel sheet complying with ASTM A 653/A 653M, G90 (Z275) coating designation, or aluminum-zinc alloy-coated steel sheet complying with ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation; structural quality. Prepainted by the coil-coating process to comply with ASTM A 755/A 755M.

- a. Nominal Thickness: **0.028 inch (0.71 mm)**
  - b. Exterior Finish: **Two-coat fluoropolymer**
  - c. Color: **As selected by Architect from manufacturer's full range**
- 2. Clips: **One-piece fixed** to accommodate thermal movement.
  - a. Material: **0.064-inch- (1.63-mm-)** nominal thickness, zinc-coated (galvanized) or aluminum-zinc alloy-coated steel sheet.
- 3. Joint Type: **Single folded**
- 4. Panel Coverage: **12 inches (305 mm)**
- 5. Seam Height: **1.5 inches (38 mm)**

## 2.3 UNDERLAYMENT MATERIALS

- A. Self-Adhering, High-Temperature Underlayment: Provide self-adhering, cold-applied, sheet underlayment, a minimum of 30 mils (0.76 mm) thick, consisting of slip-resistant, polyethylene-film top surface laminated to a layer of butyl or SBS-modified asphalt adhesive, with release-paper backing. Provide primer when recommended by underlayment manufacturer.
  - 1. Thermal Stability: Stable after testing at 240 deg F (116 deg C); ASTM D 1970.
  - 2. Low-Temperature Flexibility: Passes after testing at minus 20 deg F (29 deg C); ASTM D 1970.
- B. Felt Underlayment: ASTM D 226/D 22M, Type II (No. 30), asphalt-saturated organic felts.
- C. Slip Sheet: Manufacturer's recommended slip sheet, of type required for application.

## 2.4 MISCELLANEOUS MATERIALS

- A. Miscellaneous Metal Subframing and Furring: ASTM C 645; cold-formed, metallic-coated steel sheet, ASTM A 653/A 653M, G90 (Z275 hot-dip galvanized) coating designation or ASTM A 792/A 792M, Class AZ50 (Class AZM150) coating designation unless otherwise indicated. Provide manufacturer's standard sections as required for support and alignment of metal panel system.
- B. Panel Accessories: Provide components required for a complete, weathertight panel system including trim, copings, fasciae, mullions, sills, corner units, clips, flashings, sealants, gaskets, fillers, closure strips, and similar items. Match material and finish of metal panels unless otherwise indicated.
  - 1. Closures: Provide closures at eaves and ridges, fabricated of same metal as metal panels.
  - 2. Backing Plates: Provide metal backing plates at panel end splices, fabricated from material recommended by manufacturer.
  - 3. Closure Strips: Closed-cell, expanded, cellular, rubber or crosslinked, polyolefin-foam or closed-cell laminated polyethylene; minimum 1-inch (25-mm) thick, flexible closure strips; cut or premolded to match metal panel profile. Provide closure strips where indicated or necessary to ensure weathertight construction.

- C. Flashing and Trim: Provide flashing and trim formed from same material as metal panels as required to seal against weather and to provide finished appearance. Locations include, but are not limited to, eaves, rakes, corners, bases, framed openings, ridges, fasciae, and fillers. Finish flashing and trim with same finish system as adjacent metal panels.
- D. Panel Fasteners: Self-tapping screws designed to withstand design loads.
- E. Panel Sealants: Provide sealant type recommended by manufacturer that are compatible with panel materials, are nonstaining, and do not damage panel finish.
  - 1. Sealant Tape: Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing; 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
  - 2. Joint Sealant: ASTM C 920; as recommended in writing by metal panel manufacturer.
  - 3. Butyl-Rubber-Based, Solvent-Release Sealant: ASTM C 1311.

## 2.5 FABRICATION

- A. General: Fabricate and finish metal panels and accessories at the factory, by manufacturer's standard procedures and processes, as necessary to fulfill indicated performance requirements demonstrated by laboratory testing. Comply with indicated profiles and with dimensional and structural requirements.
- B. On-Site Fabrication: Subject to compliance with requirements of this Section, metal panels may be fabricated on-site using UL-certified, portable roll-forming equipment if panels are of same profile and warranted by manufacturer to be equal to factory-formed panels. Fabricate according to equipment manufacturer's written instructions and to comply with details shown.
- C. Provide panel profile, including major ribs and intermediate stiffening ribs, if any, for full length of panel.
- D. Fabricate metal panel joints with factory-installed captive gaskets or separator strips that provide a weathertight seal and prevent metal-to-metal contact, and that minimize noise from movements.
- E. Sheet Metal Flashing and Trim: Fabricate flashing and trim to comply with manufacturer's recommendations and recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, metal, and other characteristics of item indicated.

## 2.6 FINISHES

- A. Panels and Accessories:
  - 1. Two-Coat Fluoropolymer: **AAMA 621**. Fluoropolymer finish containing not less than 70 percent PVDF resin by weight in color coat.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Miscellaneous Supports: Install subframing, furring, and other miscellaneous panel support members and anchorages according to ASTM C 754 and metal panel manufacturer's written recommendations.

### 3.2 UNDERLAYMENT INSTALLATION

- A. Self-Adhering Sheet Underlayment: Apply primer if required by manufacturer. Comply with temperature restrictions of underlayment manufacturer for installation. Apply at locations indicated **on Drawings**, wrinkle free, in shingle fashion to shed water, and with end laps of not less than 6 inches (152 mm) staggered 24 inches (610 mm) between courses. Overlap side edges not less than 3-1/2 inches (90 mm). Roll laps with roller. Cover underlayment within 14 days.
  - 1. Apply over the roof area indicated on the drawings:
- B. Felt Underlayment: Apply at locations indicated **on Drawings**, in shingle fashion to shed water, and with lapped joints of not less than 2 inches (50 mm).
  - 1. Apply on roof not covered by self-adhering sheet underlayment. Lap over edges of self-adhering sheet underlayment not less than 3 inches (75 mm), in shingle fashion to shed water.
- C. Slip Sheet: Apply slip sheet over underlayment before installing metal roof panels.
- D. Flashings: Install flashings to cover underlayment to comply with requirements specified in Section 076200 "Sheet Metal Flashing and Trim."

### 3.3 METAL PANEL INSTALLATION

- A. Standing-Seam Metal Roof Panel Installation: Fasten metal roof panels to supports with concealed clips at each standing-seam joint at location, spacing, and with fasteners recommended in writing by manufacturer.
  - 1. Install clips to supports with self-tapping fasteners.
  - 2. Install pressure plates at locations indicated in manufacturer's written installation instructions.
  - 3. Snap Joint: Nest standing seams and fasten together by interlocking and completely engaging factory-applied sealant.
  - 4. Seamed Joint: Crimp standing seams with manufacturer-approved, motorized seamer tool so clip, metal roof panel, and factory-applied sealant are completely engaged.
  - 5. Watertight Installation:
    - a. Apply a continuous ribbon of sealant or tape to seal joints of metal panels, using sealant or tape as recommend in writing by manufacturer as needed to make panels watertight.
    - b. Provide sealant or tape between panels and protruding equipment, vents, and accessories.



- c. At panel splices, nest panels with minimum 6-inch (152-mm) end lap, sealed with sealant and fastened together by interlocking clamping plates.
- B. Accessory Installation: Install accessories with positive anchorage to building and weathertight mounting, and provide for thermal expansion. Coordinate installation with flashings and other components.
- C. Flashing and Trim: Comply with performance requirements, manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, and set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

#### 3.4 CLEANING AND PROTECTION

- A. Remove temporary protective coverings and strippable films, if any, as metal panels are installed, unless otherwise indicated in manufacturer's written installation instructions. On completion of metal panel installation, clean finished surfaces as recommended by metal panel manufacturer. Maintain in a clean condition during construction.

END OF SECTION 074113.16

## SECTION 074616 – METAL PANEL SIDING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes architectural metal siding

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Submit detailed layout drawings showing panel layout, installation procedures and trim profiles.
- C. Samples: For siding including related accessories and trim profiles.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.4 QUALITY ASSURANCE

- A. Mockups: Build mockups to verify selections made under Sample submittals and to demonstrate aesthetic effects and to set quality standards for fabrication and installation.
  - 1. Build mockup of typical wall area as shown on Drawings.
  - 2. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

#### 1.5 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **25** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 METAL SIDING

- A. Architectural Metal Siding: Formed Aluminum-Zinc alloy coated steel sheet: ASTM A792/A792M, structural quality, Grade 50, Coating Class AZ50 (Grade 340, Coating Class AZM150), prepainted by the coil-coating process per ASTM A755/A755M.
  - 1. MBCI Metal Roof and Wall systems: Designer Series 12.0 Flat Panel
- B. Horizontal Pattern: 12-inch (254-mm) exposure.
- C. Texture: **Smooth**
- D. Nominal Thickness: 22 GA
- E. Finish: Manufacturer's Fluoropolymer Two coat System – Signature 300
  - 1. Colors: **As selected by Architect from manufacturer's full range of colors.**
  - 2. Warranty – 40 Years from date of substantial completion.

### 2.2 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
  - 1. Provide accessories **made from same material as** siding unless otherwise indicated.
- B. Fasteners: Self-tapping screws and other acceptable fasteners recommended by metal panel manufacturer. Where exposed fasteners cannot be avoided, supply corrosion-resistant fasteners with heads matching color of metal panels by means of factory-applied coating, with weathertight resilient washers.
  - 1. For fastening to wood, use **ribbed bugle-head screws** of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
  - 2. For fastening to metal, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1/4 inch (6 mm), or three screw-threads, into substrate.
  - 3. For fastening aluminum, use aluminum fasteners. Where fasteners are exposed to view, use prefinished aluminum fasteners in color to match item being fastened.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine metal panel system substrate with Installer present. Inspect for erection tolerances and other conditions that would adversely affect installation of metal panels.

1. Inspect framing that will support insulated metal panels to determine if support components are installed as indicated on approved shop drawings and are within tolerances acceptable to metal panel manufacturer and installer. Confirm presence of acceptable framing members at recommended spacing to match installation requirements of metal panels.
- B. Correct out-of-tolerance work and other deficient conditions prior to proceeding with insulated metal panel installation.

### 3.2 METAL PANEL INSTALLATION

- A. Concealed-Fastener Formed Metal Panels: Install metal panel system in accordance with manufacturer's written instructions, approved shop drawings, project drawings, and referenced publications. Install metal panels in orientation, sizes, and locations indicated. Anchor panels and other components securely in place. Provide for thermal and structural movement.
- B. Fasten metal panels to supports with fasteners at each location indicated on approved shop drawings, at spacing and with fasteners recommended by manufacturer. Fasten panel to support structure through leading panel flange. Snap-fit back flange of subsequent panel into secured flange of previous panel. Where indicated, fasten panels together through flush-fitted panel sides.
  1. Cut panels in field where required using manufacturer's recommended methods.
  2. Dissimilar Materials: Where elements of metal panel system will come into contact with dissimilar materials, treat faces and edges in contact with dissimilar materials as recommended by metal panel manufacturer.
- C. Attach panel flashing trim pieces to supports using recommended fasteners.

### 3.3 ACCESSORY INSTALLATION

- A. General: Install metal panel accessories with positive anchorage to building and weather tight mounting; provide for thermal expansion. Coordinate installation with flashings and other components.
  1. Install components required for a complete metal panel assembly, including trim, copings, flashings, sealants, closure strips, and similar items.
  2. Comply with details of assemblies utilized to establish compliance with performance requirements and manufacturer's written installation instructions.
  3. Set units true to line and level as indicated. Install work with laps, joints, and seams that will be permanently weather resistant.

### 3.4 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074616

## SECTION 074646 - FIBER-CEMENT SIDING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes fiber-cement **siding**.
- B. **Section subject to project alternates, see also section 004323.**

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For fiber-cement **siding** including related accessories.

#### 1.3 WARRANTY

- A. Special Warranty: Manufacturer agrees to repair or replace products that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **10** years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 FIBER-CEMENT SIDING

- A. General: ASTM C 1186, Type A, Grade II, fiber-cement board, noncombustible when tested according to ASTM E 136; with a flame-spread index of 25 or less when tested according to ASTM E 84.
- B. Provide Products available from one of the following manufacturers:
  - 1. James Hardie Building Products
  - 2. CertainTeed Corporation
  - 3. GAF
- C. Labeling: Provide fiber-cement siding that is tested and labeled according to ASTM C 1186 by a qualified testing agency acceptable to authorities having jurisdiction.
- D. Nominal Thickness: Not less than 5/16 inch (8 mm).
- E. Horizontal Pattern: Boards **8 inches (184 to 190 mm)** wide in **plain** style.
  - 1. Texture: **Smooth**

- F. Factory Priming: Manufacturer's standard acrylic primer.

## 2.2 ACCESSORIES

- A. Siding Accessories, General: Provide starter strips, edge trim, outside and inside corner caps, and other items as recommended by siding manufacturer for building configuration.
- B. Flashing: Provide **aluminum** flashing complying with Section 076200 "Sheet Metal Flashing and Trim" at window and door heads and where indicated.
- C. Fasteners:
  - 1. For fastening to wood, use **siding nails** of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
  - 2. For fastening fiber cement, use **hot-dip galvanized** fasteners.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Comply with manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.
  - 1. Install fasteners no more than **24 inches (600 mm)** o.c.
- B. Install joint sealants as specified in Section 079200 "Joint Sealants" and to produce a weathertight installation.

### 3.2 ADJUSTING AND CLEANING

- A. Remove damaged, improperly installed, or otherwise defective materials and replace with new materials complying with specified requirements.
- B. Clean finished surfaces according to manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074646



## SECTION 076200 - SHEET METAL FLASHING AND TRIM

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Formed steep-slope roof sheet metal fabrications.
2. Formed wall sheet metal fabrications.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of product.

B. Shop Drawings: For sheet metal flashing and trim.

1. Include plans, elevations, sections, and attachment details.
2. Distinguish between shop- and field-assembled work.
3. Include identification of finish for each item.
4. Include pattern of seams and details of termination points, expansion joints and expansion-joint covers, direction of expansion, roof-penetration flashing, and connections to adjoining work.

C. Samples: For each exposed product and for each color and texture specified.

#### 1.3 INFORMATIONAL SUBMITTALS

A. Product certificates.

B. Product test reports.

C. Sample warranty.

#### 1.4 CLOSEOUT SUBMITTALS

A. Maintenance data.

#### 1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

1. For copings and roof edge flashings that are SPRI ES-1 tested, shop shall be listed as able to fabricate required details as tested and approved.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General: Sheet metal flashing and trim assemblies shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.
- B. Sheet Metal Standard for Flashing and Trim: Comply with SMACNA's "**Architectural Sheet Metal Manual**" requirements for dimensions and profiles shown unless more stringent requirements are indicated.
- C. SPRI Wind Design Standard: Manufacture and install **roof edge flashings** tested according to SPRI ES-1 and capable of resisting the following design pressure:
  1. Design Pressure: 32 PSF Horizontal, (outward pressure), 52 PSF Vertical, (upward pressure)
- D. Thermal Movements: Allow for thermal movements from ambient and surface temperature changes.

### 2.2 SHEET METALS

- A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying strippable, temporary protective film before shipping.
- B. Copper Sheet: ASTM B 370, cold-rolled copper sheet, H00 or H01 temper.
  1. Exposed Finish: lead or zinc coated copper
  2. Prepatinated Copper-Sheet Finish: dull silver finish
- C. Slip Sheet: Rosin-sized building paper, 3 lb/100 sq. ft. (0.16 kg/sq. m) minimum.

### 2.3 MISCELLANEOUS MATERIALS

- A. General: Provide materials and types of fasteners, solder, protective coatings, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and as recommended by manufacturer of primary sheet metal **or manufactured item** unless otherwise indicated.
- B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal.

1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.
    - a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating. Provide metal-backed EPDM or PVC sealing washers under heads of exposed fasteners bearing on weather side of metal.
    - b. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.
  2. Fasteners: hard copper nails or screws
- C. Sealant Tape: Pressure-sensitive, 100 percent solids, polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch (13 mm) wide and 1/8 inch (3 mm) thick.
- D. Elastomeric Sealant: ASTM C 920, elastomeric polymer sealant; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.
- E. Butyl Sealant: ASTM C 1311, single-component, solvent-release butyl rubber sealant; polyisobutylene plasticized; heavy bodied for hooked-type expansion joints with limited movement.
- F. Epoxy Seam Sealer: Two-part, noncorrosive, seam-cementing compound, recommended by manufacturer for exterior nonmoving joints, including riveted joints.

## 2.4 FABRICATION, GENERAL

- A. General: Custom fabricate sheet metal flashing and trim to comply with details shown and recommendations in cited sheet metal standard that apply to design, dimensions, geometry, metal thickness, and other characteristics of item required. Fabricate sheet metal flashing and trim in shop to greatest extent possible.
1. Obtain field measurements for accurate fit before shop fabrication.
  2. Form sheet metal flashing and trim to fit substrates without excessive oil canning, buckling, and tool marks; true to line, levels, and slopes; and with exposed edges folded back to form hems.
  3. Conceal fasteners and expansion provisions where possible. Do not use exposed fasteners on faces exposed to view.
- B. Expansion Provisions: Form metal for thermal expansion of exposed flashing and trim.
1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with butyl sealant concealed within joints.
  2. Use lapped expansion joints only where indicated on Drawings.
- C. Sealant Joints: Where movable, nonexpansion-type joints are required, form metal to provide for proper installation of elastomeric sealant according to cited sheet metal standard.
- D. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

- E. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer.

## 2.5 ROOF-DRAINAGE SHEET METAL FABRICATIONS

- A. Hanging Gutters: Fabricate to cross section required, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch (2400-mm) long sections. Furnish flat-stock gutter brackets and gutter spacers and straps fabricated from same metal as gutters, of size recommended by cited sheet metal standard but with thickness not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, and gutter accessories from same metal as gutters.
  - 1. Fabricated from lead or zinc coated copper.
  - 2. Accessories: **Continuous, removable leaf screen with sheet metal frame and hardware cloth screen**
- B. Downspouts: Fabricate **rectangular** downspouts to dimensions indicated, complete with mitered elbows. Furnish with metal hangers from
  - 1. Fabricate from lead or zinc coated copper:

## 2.6 STEEP-SLOPE ROOF SHEET METAL FABRICATIONS

- A. Apron, Step, Cricket, and Backer Flashing: Fabricate from the following materials:
  - 1. 16 oz copper, with lead or zinc coating.
- B. Drip Edges: Fabricate from the following materials:
  - 1. 16 oz copper, with lead or zinc coating.
- C. Eave, Rake Flashing: Fabricate from the following materials:
  - 1. 16 oz copper, with lead or zinc coating.

## 2.7 WALL SHEET METAL FABRICATIONS

- A. Opening Flashings in Frame Construction: Fabricate head, sill, **jamb**, and similar flashings to extend 4 inches (100 mm) beyond wall openings. Form head and sill flashing with 2-inch (50-mm) high, end dams. Fabricate from the following materials:
  - 1. 16 oz copper, with lead or zinc coating.

## PART 3 - EXECUTION

### 3.1 INSTALLATION, GENERAL

- A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.
  - 1. Install sheet metal flashing and trim true to line, levels, and slopes. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
  - 2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
  - 3. Space cleats not more than 12 inches (300 mm) apart. Attach each cleat with at least two fasteners. Bend tabs over fasteners.
  - 4. Install exposed sheet metal flashing and trim with limited oil canning, and free of buckling and tool marks.
  - 5. Torch cutting of sheet metal flashing and trim is not permitted.
- B. Metal Protection: Where dissimilar metals contact each other, or where metal contacts pressure-treated wood or other corrosive substrates, protect against galvanic action or corrosion by painting contact surfaces with bituminous coating or by other permanent separation as recommended by sheet metal manufacturer or cited sheet metal standard.
  - 1. Coat concealed side of sheet metal flashing and trim with bituminous coating where flashing and trim contact wood, ferrous metal, or cementitious construction.
  - 2. Underlayment: Where installing sheet metal flashing and trim directly on cementitious or wood substrates, install underlayment and cover with slip sheet.
- C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at maximum of **10 feet (3 m)** with no joints within 24 inches (600 mm) of corner or intersection.
  - 1. Form expansion joints of intermeshing hooked flanges, not less than 1 inch (25 mm) deep, filled with sealant concealed within joints.
  - 2. Use lapped expansion joints only where indicated on Drawings.
- D. Fasteners: Use fastener sizes that penetrate **substrate not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.**
- E. Conceal fasteners and expansion provisions where possible in exposed work and locate to minimize possibility of leakage. Cover and seal fasteners and anchors as required for a tight installation.
- F. Seal joints as required for watertight construction. Prepare joints and apply sealants to comply with requirements in Section 079200 "Joint Sealants."
- G. Rivets: Rivet joints in uncoated aluminum where necessary for strength.

### 3.2 ROOF-DRAINAGE SYSTEM INSTALLATION

- A. General: Install sheet metal roof-drainage items to produce complete roof-drainage system according to cited sheet metal standard unless otherwise indicated. Coordinate installation of roof perimeter flashing with installation of roof-drainage system.
- B. Hanging Gutters: Fabricate gutter in continuous run. Attach gutters at eave or fascia to firmly anchor them in position. Provide end closures and seal watertight with sealant. Slope to downspouts.
  - 1. Install continuous gutter screens on gutters with noncorrosive fasteners, **removable** for cleaning gutters.
- C. Downspouts: Join sections with 1-1/2-inch (38-mm) telescoping joints. Provide hangers with fasteners designed to hold downspouts securely to walls. Locate hangers at top and bottom and at approximately 60 inches (1500 mm) o.c.

### 3.3 ROOF FLASHING INSTALLATION

- A. General: Install sheet metal flashing and trim to comply with performance requirements and cited sheet metal standard. Provide concealed fasteners where possible, and set units true to line, levels, and slopes. Install work with laps, joints, and seams that are permanently watertight and weather resistant.
- B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in cited sheet metal standard unless otherwise indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate.
- C. Roof-Penetration Flashing: Coordinate installation of roof-penetration flashing with installation of roofing and other items penetrating roof. Seal with sealant and clamp flashing to pipes that penetrate roof.

### 3.4 WALL FLASHING INSTALLATION

- A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to cited sheet metal standard unless otherwise indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.
- B. Opening Flashings in Frame Construction: Install continuous head, sill, **jamb**, and similar flashings to extend 4 inches (100 mm) beyond wall openings.

### 3.5 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.
- B. Clean and neutralize flux materials. Clean off excess solder.
- C. Clean off excess sealants.

- D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions.

END OF SECTION 076200



## SECTION 078100 - APPLIED FIREPROOFING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes sprayed fire-resistive materials.

#### 1.2 DEFINITIONS

- A. SFRM: Sprayed fire-resistive materials.

#### 1.3 PREINSTALLATION MEETINGS

- A. Preinstallation Conference: Conduct conference at **Project site**.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.5 INFORMATIONAL SUBMITTALS

- A. Product certificates.
- B. Evaluation reports.
- C. Field quality-control reports.

#### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: A firm or individual certified, licensed, or otherwise qualified by fireproofing manufacturer as experienced and with sufficient trained staff to install manufacturer's products according to specified requirements.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Assemblies: Provide fireproofing, including auxiliary materials, according to requirements of each fire-resistance design and manufacturer's written instructions.

- B. Fire-Resistance Design: Indicated on Drawings, tested according to **ASTM E 119 or UL 263**; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Steel members are to be considered unrestrained unless specifically noted otherwise.
- C. Asbestos: Provide products containing no detectable asbestos.

## 2.2 SPRAYED FIRE-RESISTIVE MATERIALS

- A. Sprayed Fire-Resistive Material: Manufacturer's standard, factory-mixed, lightweight, dry formulation, complying with indicated fire-resistance design.
  - 1. CAFCO Fendolite M-II by Isolotek
  - 2. Application: Designated for exterior use by a qualified testing agency acceptable to authorities having jurisdiction.
  - 3. Bond Strength: Minimum **1000-lbf/sq. ft. (47.88-kPa)** cohesive and adhesive strength based on field testing according to ASTM E 736.
  - 4. Thickness: As required for fire-resistance design indicated, measured according to requirements of fire-resistance design or ASTM E 605, whichever is thicker, but not less than 0.375 inch (9 mm).
  - 5. Combustion Characteristics: ASTM E 136.
  - 6. Surface-Burning Characteristics: Comply with ASTM E 84.
    - a. Flame-Spread Index: 0
    - b. Smoke-Developed Index: 0
  - 7. Compressive Strength: Minimum **300 lbf/sq. in. (2068 kPa)** according to ASTM E 761.
  - 8. Corrosion Resistance: No evidence of corrosion according to ASTM E 937.
  - 9. Deflection: No cracking, spalling, or delamination according to ASTM E 759.
  - 10. Effect of Impact on Bonding: No cracking, spalling, or delamination according to ASTM E 760.
  - 11. Air Erosion: Maximum weight loss of **0.025 g/sq. ft. (0.270 g/sq. m)** in 24 hours according to ASTM E 859.
  - 12. Fungal Resistance: Treat products with manufacturer's standard antimicrobial formulation to result in **no growth on specimens per ASTM G 21**

## 2.3 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that are compatible with fireproofing and substrates and are approved by UL or another testing and inspecting agency acceptable to authorities having jurisdiction for use in fire-resistance designs indicated.
- B. Substrate Primers: Primers approved by fireproofing manufacturer for the required fire-resistance design.
- C. Bonding Agent: Product approved by fireproofing manufacturer.

- D. Topcoat: Suitable for application over applied fireproofing; of type recommended in writing by fireproofing manufacturer for each fire-resistance design.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for substrates and other conditions affecting performance of the Work and according to each fire-resistance design.

### 3.2 PREPARATION

- A. Cover other work subject to damage from fallout or overspray of fireproofing materials during application.
- B. Prime substrates where included in fire-resistance design and where recommended in writing by fireproofing manufacturer unless compatible shop primer has been applied and is in satisfactory condition to receive fireproofing.

### 3.3 APPLICATION

- A. Construct fireproofing assemblies that are identical to fire-resistance design indicated and products as specified, tested, and substantiated by test reports; for thickness, primers, sealers, topcoats, finishing, and other materials and procedures affecting fireproofing work.
- B. Comply with fireproofing manufacturer's written instructions for mixing materials, application procedures, and types of equipment used to mix, convey, and apply fireproofing; as applicable to particular conditions of installation and as required to achieve fire-resistance ratings indicated.
- C. Spray apply fireproofing to maximum extent possible. After the spraying operation in each area, complete the coverage by trowel application or other placement method recommended in writing by fireproofing manufacturer.
- D. Do not install enclosing or concealing construction until after fireproofing has been applied, inspected, and tested and corrections have been made to deficient applications.

### 3.4 FIELD QUALITY CONTROL

- A. Special Inspections: **Owner will engage** a qualified special inspector to perform the following special inspections:
  - 1. Test and inspect as required by the IBC, **Subsection 1705.13, "Sprayed Fire-Resistant Materials."**
- B. Fireproofing will be considered defective if it does not pass tests and inspections.

1. Remove and replace fireproofing that does not pass tests and inspections, and retest.
  2. Apply additional fireproofing, per manufacturer's written instructions, where test results indicate insufficient thickness, and retest.
- C. Prepare test and inspection reports.

### 3.5 CLEANING, PROTECTING, AND REPAIRING

- A. Cleaning: Immediately after completing spraying operations in each containable area of Project, remove material overspray and fallout from surfaces of other construction and clean exposed surfaces to remove evidence of soiling.
- B. Repair fireproofing damaged by other work before concealing it with other construction.
- C. Repair fireproofing by reapplying it using same method as original installation or using manufacturer's recommended trowel-applied product.

END OF SECTION 078100

## SECTION 079200 - JOINT SEALANTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Silicone joint sealants.
2. Nonstaining silicone joint sealants.
3. Urethane joint sealants.
4. Latex joint sealants.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each joint-sealant product.
- B. Samples: For each kind and color of joint sealant required.
- C. Joint-Sealant Schedule: Include the following information:
1. Joint-sealant application, joint location, and designation.
  2. Joint-sealant manufacturer and product name.
  3. Joint-sealant formulation.
  4. Joint-sealant color.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Field-adhesion-test reports.

#### 1.4 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1021 to conduct the testing indicated.

#### 1.5 PRECONSTRUCTION TESTING

- A. Preconstruction Laboratory Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
1. Adhesion Testing: Use ASTM C 794 to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.
  2. Compatibility Testing: Use ASTM C 1087 to determine sealant compatibility when in contact with glazing and gasket materials.

3. Stain Testing: Use ASTM C 1248 to determine stain potential of sealant when in contact with substrates.
- B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates. Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1.1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.

## 1.6 WARRANTY

- A. Special Installer's Warranty: Installer agrees to repair or replace joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. Warranty Period: **Two** years from date of Substantial Completion.
- B. Special Manufacturer's Warranty: Manufacturer agrees to furnish joint sealants to repair or replace those joint sealants that do not comply with performance and other requirements specified in this Section within specified warranty period.
  1. Warranty Period: **Five** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 JOINT SEALANTS, GENERAL

- A. VOC Content of Interior Sealants: Sealants and sealant primers used inside the weatherproofing system 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 substrates shall have a VOC content of **250** g/L or less.
- B. Low-Emitting Interior Sealants: Sealants and sealant primers shall comply with the testing and product requirements of the California Department of Health's (formerly, the California Department of Health Services') "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Colors of Exposed Joint Sealants: **As selected by Architect from manufacturer's full range.**

### 2.2 SILICONE JOINT SEALANTS

- A. Silicone, S, NS, 50, NT: Single-component, nonsag, plus 50 percent and minus 50 percent movement capability, nontraffic-use, neutral-curing silicone joint sealant; ASTM C 920, Type S, Grade NS, Class 50, Use NT.
  1. Products: Subject to compliance with requirements, **provide one of the following**

- a. Dow Corning Corporation; 791.
- b. GE Construction Sealants; SCS2000 SilPruf.
- c. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex Sil 265 LTS.
- d. Pecora Corporation; PCS.
- e. Sika Corporation U.S.; Sikasil WS-295

## 2.3 LATEX JOINT SEALANTS

A. Acrylic Latex: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, **provide one of the following**

- a. BASF Construction Chemicals, LLC, Building Systems; Sonolac.
- b. May National Associates, Inc., a subsidiary of Sika Corporation U.S.; Bondaflex 600
- c. Pecora Corporation; AC-20.
- d. Sherwin-Williams Company (The); 850A
- e. Tremco Incorporated; Tremflex 834.

## 2.4 JOINT-SEALANT BACKING

A. Cylindrical Sealant Backings: ASTM C 1330, **Type B (bicellular material with a surface skin)** and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

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. BASF Construction Chemicals, LLC, Building Systems.
- b. Construction Foam Products, a division of Nomaco, Inc.

B. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer.

## 2.5 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.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.



## PART 3 - EXECUTION

### 3.1 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 laitance and form-release agents from concrete.
  - 2. 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.
- B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces.

### 3.2 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with ASTM C 1193 and joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.
- B. 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.
- C. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.
- 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 to form smooth, uniform beads of configuration indicated. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
  - 1. Provide concave joint profile per Figure 8A in ASTM C 1193 unless otherwise indicated.

### 3.3 FIELD QUALITY CONTROL

- A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:
  - 1. Extent of Testing: Test completed and cured sealant joints as follows:

- a. Perform one test for each joint type.
2. Test Method: Test joint sealants according to Method A, Field-Applied Sealant Joint Hand Pull Tab, in Appendix X1 in ASTM C 1193 or Method A, Tail Procedure, in ASTM C 1521.
- B. Evaluation of Field-Adhesion-Test Results: Sealants not evidencing adhesive failure from testing or noncompliance with other indicated requirements will be considered satisfactory. Remove sealants that fail to adhere to joint substrates during testing or to comply with other requirements. Retest failed applications until test results prove sealants comply with indicated requirements.

### 3.4 JOINT-SEALANT SCHEDULE

- A. Joint-Sealant Application: Interior joints in vertical surfaces and horizontal nontraffic surfaces not subject to significant movement
  1. Joint Locations:
    - a. Control joints on exposed interior surfaces of exterior walls.
    - b. Perimeter joints between interior wall surfaces and frames
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: **Acrylic latex**
  3. Joint-Sealant Color: **As selected by Architect from manufacturer's full range of colors.**
- B. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces.
  1. Joint Locations:
    - a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
    - b. Tile control and expansion joints where indicated.
  2. Joint Sealant: **Silicone, mildew resistant, acid curing, S, NS, 25, NT**
  3. Joint-Sealant Color: **As selected by Architect from manufacturer's full range of colors.**
- C. Joint-Sealant Application: Concealed mastics
  1. Joint Locations:
    - a. Aluminum thresholds.
    - b. Sill plates.
    - c. Other joints as indicated on Drawings.
  2. Joint Sealant: **Butyl-rubber based**
  3. Joint-Sealant Color: **As selected by Architect from manufacturer's full range of colors.**

END OF SECTION 079200

## SECTION 081213 - HOLLOW METAL FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes hollow-metal frames.
- B. Related Requirements:
  - 1. Section 081416 "Flush Wood Doors" for wood doors installed in hollow-metal frames.

#### 1.2 DEFINITIONS

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

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include elevations, frame profiles, metal thicknesses, preparations for hardware, and other details.
- C. Schedule: Prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Product test reports.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Amweld International, LLC.
  - 2. Apex Industries, Inc.
  - 3. Ceco Door Products; an Assa Abloy Group company.
  - 4. Steelcraft; an Ingersoll-Rand company.

## 2.2 REGULATORY REQUIREMENTS

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

## 2.3 INTERIOR FRAMES

- A. Heavy-Duty Frames: SDI A250.8, Level 2.
  - 1. Physical Performance: Level C according to SDI A250.4.
  - 2. Materials: cold-rolled steel sheet, minimum thickness of 0.042 inch (1.0 mm).
  - 3. Construction: **Full profile welded.**
  - 4. Exposed Finish: **Prime**

## 2.4 EXTERIOR HOLLOW-METAL FRAMES

- A. Heavy-Duty Frames: SDI A250.8, Level 2. **At locations indicated in the Door and Frame Schedule.**
  - 1. Physical Performance: Level B according to SDI A250.4.
  - 2. Materials: Metallic-coated steel sheet, minimum thickness of 0.053 inch (1.3 mm), with minimum A40 (ZF120) coating.
  - 3. Construction: **Full profile welded.**
  - 4. Thermal resistance: Provide thermally broken frames
  - 5. Exposed Finish: **Prime.**

## 2.5 FRAME ANCHORS

- A. Jamb Anchors:
  - 1. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch (1.0 mm) thick.
  - 2. Postinstalled Expansion Type for In-Place Concrete or Masonry: Minimum 3/8-inch (9.5-mm) diameter bolts with expansion shields or inserts. Provide pipe spacer from frame to wall, with throat reinforcement plate, welded to frame at each anchor location.
- B. Floor Anchors: Formed from same material as frames, minimum thickness of 0.042 inch (1.0 mm), and as follows:

## 2.6 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than **25** percent.
- B. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B.
- C. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B.
- D. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B.
- E. Frame Anchors: ASTM A 879/A 879M, Commercial Steel (CS), 04Z (12G) coating designation; mill phosphatized.
- F. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.
- G. Power-Actuated Fasteners in Concrete: From corrosion-resistant materials.
- H. Mineral-Fiber Insulation: ASTM C 665, Type I (blankets without membrane facing).
- I. Glazing: Comply with requirements in Section 088000 "Glazing."

## 2.7 FABRICATION

- A. Fabricate hollow-metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for metal thickness. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.
- B. Hollow-Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.
  - 1. **Sidelight** Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
  - 2. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated.
  - 3. Grout Guards: Weld guards to frame at back of hardware mortises in frames to be grouted.
  - 4. Floor Anchors: Weld anchors to bottoms of jambs with at least four spot welds per anchor; however, for slip-on drywall frames, provide anchor clips or countersunk holes at bottoms of jambs.
  - 5. Jamb Anchors: Provide number and spacing of anchors as follows:
    - a. Stud-Wall Type: Locate anchors not more than 18 inches (457 mm) from top and bottom of frame. Space anchors not more than 32 inches (813 mm) o.c.
  - 6. Door Silencers: Except on weather-stripped frames, drill stops to receive door silencers.

- C. Hardware Preparation: Factory prepare hollow-metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to SDI A250.6, the Door Hardware Schedule, and templates.
1. Reinforce frames to receive nontemplated, mortised, and surface-mounted hardware.
  2. Comply with applicable requirements in SDI A250.6 and BHMA A156.115 for preparation of hollow-metal work for hardware.
  3. coordinate frame preparation for hardware supplied and installed by owners vendor
- D. Stops and Moldings: Provide stops and moldings around glazed lites and louvers where indicated. Form corners of stops and moldings with **mitered** hairline joints.
1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow-metal work.
  2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lite is capable of being removed independently.
  3. Provide fixed frame moldings on outside of exterior and on secure side of interior frames.
  4. Provide loose stops and moldings on inside of hollow-metal work.
  5. Coordinate rabbet width between fixed and removable stops with glazing and installation types indicated.

## 2.8 STEEL FINISHES

- A. Prime Finish: Clean, pretreat, and apply manufacturer's standard primer.
1. Shop Primer: SDI A250.10.

## 2.9 ACCESSORIES

- A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

# PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Hollow-Metal Frames: Install hollow-metal frames of size and profile indicated. Comply with SDI A250.11 or NAAMM-HMMA 840 as required by standards specified.
1. Set frames accurately in position; plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.
    - a. At fire-rated openings, install frames according to NFPA 80.
    - b. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make splice smooth, flush, and invisible on exposed faces.
    - c. Install frames with removable stops located on secure side of opening.
    - d. Install door silencers in frames before grouting.

- e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
  - f. Check plumb, square, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
  - g. Field apply bituminous coating to backs of frames that will be filled with grout containing antifreezing agents.
- 2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
  - a. Floor anchors may be set with power-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.
- 3. Installation Tolerances: Adjust hollow-metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
  - a. Squareness: Plus or minus 1/16 inch (1.6 mm), measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
  - b. Alignment: Plus or minus 1/16 inch (1.6 mm), measured at jambs on a horizontal line parallel to plane of wall.
  - c. Twist: Plus or minus 1/16 inch (1.6 mm), measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
  - d. Plumbness: Plus or minus 1/16 inch (1.6 mm), measured at jambs at floor.
- B. Insulating: Install low expanding foam insulation inside frame cavity at exterior openings.
- C. Glazing: Comply with installation requirements in Section 088000 "Glazing" and with hollow-metal manufacturer's written instructions.
  - 1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches (230 mm) o.c. and not more than 2 inches (51 mm) o.c. from each corner.

### 3.2 ADJUSTING AND CLEANING

- A. Final Adjustments: Remove and replace defective work, including hollow-metal work that is warped, bowed, or otherwise unacceptable.
- B. Remove grout and other bonding material from hollow-metal work immediately after installation.
- C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.
- D. Touchup Painting: Cleaning and touchup painting of abraded areas of paint are specified in painting Sections.

END OF SECTION 081213



## SECTION 081416 - FLUSH WOOD DOORS

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section Includes:

1. Solid-core doors with **wood-veneer** faces.
2. **Factory finishing** flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Requirements:

1. Section 081213 "Hollow Metal Frames"
2. Section 088000 "Glazing" for glass view panels in flush wood doors.

#### 1.2 ACTION SUBMITTALS

A. Product Data: For each type of door. **Include factory-finishing specifications.**

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; and the following:

1. Dimensions and locations of blocking.
2. Dimensions and locations of mortises and holes for hardware.
3. Dimensions and locations of cutouts.
4. Undercuts.
5. Requirements for veneer matching.
6. Doors to be factory finished and finish requirements.
7. Fire-protection ratings for fire-rated doors.

C. Samples: For **factory-finished doors**.

#### 1.3 INFORMATIONAL SUBMITTALS

A. Quality Standard Compliance Certificates: **AWI Quality Certification** Program certificates.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Algoma Hardwoods, Inc.
2. Lambton Doors.
3. Mohawk Doors; a Masonite company.

## 2.2 FLUSH WOOD DOORS, GENERAL

- A. Quality Standard: In addition to requirements specified, comply with **AWI's, AWMAC's, and WI's "Architectural Woodwork Standards"**
  1. Provide **AWI Quality Certification** Labels indicating that doors comply with requirements of grades specified.
- B. Low-Emitting Materials: Fabricate doors with adhesives and composite wood products that do not contain urea formaldehyde.
- C. Low-Emitting Materials: Fabricate doors with **adhesives and composite wood products** that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. WDMA I.S.1-A Performance Grade:
  1. Heavy Duty unless otherwise indicated.
- E. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure.
  1. Cores: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
  2. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
  3. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
- F. Smoke- and Draft-Control Door Assemblies: Listed and labeled for smoke and draft control, based on testing according to UL 1784.
- G. Structural-Composite-Lumber-Core Doors:
  1. Structural Composite Lumber: WDMA I.S.10.
    - a. Screw Withdrawal, Face: 700 lbf (3100 N).
    - b. Screw Withdrawal, Edge: 400 lbf (1780 N).
- H. Mineral-Core Doors:
  1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.

2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

## 2.3 VENEER-FACED DOORS FOR TRANSPARENT FINISH

### A. Interior Solid-Core Doors:

1. Grade: **Premium, with Grade AA faces.**
2. Species: **White oak**
3. Cut: **Quarter sliced**
4. Match between Veneer Leaves: **Book** match.
5. Assembly of Veneer Leaves on Door Faces: **Center-balance** match.
6. Pair and Set Match: Provide for doors hung in same opening **or separated only by mullions.**
7. Core: **Either glued wood stave or structural composite lumber**
8. Construction: **Five or seven** plies. Stiles and rails are bonded to core, then entire unit is abrasive planed before veneering.

## 2.4 LIGHT FRAMES AND PANELS

- ### A. Metal Frames for Glazed Openings: extruded aluminum frames with square edges, clear anodized finish.

## 2.5 FABRICATION

- ### A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.
1. Comply with NFPA 80 requirements for fire-rated doors.
- ### B. Factory machine doors for hardware that is not surface applied.
- ### C. Openings: Factory cut and trim openings through doors.
1. Light Openings: Trim openings with moldings of material and profile indicated.
  2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Section 088000 "Glazing."

## 2.6 FACTORY FINISHING

- ### A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on **top and** bottom edges, edges of cutouts, and mortises.
- B. Factory finish doors that are indicated to receive transparent finish.
- C. Use only paints and coatings that comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- D. Transparent Finish:
  1. Grade: **Premium**
  2. Staining: Clear finish as selected from manufacturers finish chart.
  3. Effect: **Open-grain finish**
  4. Sheen: **Satin**

### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Hardware: For installation, see **Section 087100 "Door Hardware."**
- B. Installation Instructions: Install doors to comply with manufacturer's written instructions and referenced quality standard, and as indicated.
  1. Install fire-rated doors according to NFPA 80.
  2. Install smoke- and draft-control doors according to NFPA 105.
- C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.
- D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

END OF SECTION 081416

## SECTION 083313 - COILING COUNTER DOORS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Fire-rated counter doors.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type and size of coiling counter door and accessory.
- B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data.
  - 1. Include points of attachment and their corresponding static and dynamic loads imposed on structure.
  - 2. Show locations of controls, locking devices, detectors or replaceable fusible links, and other accessories.
  - 3. Include diagrams for power, signal, and control wiring.
- C. Samples: For each exposed product and for each color and texture specified.

#### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer for both installation and maintenance of units required for this Project.
- B. Fire-Rated Door Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to **NFPA 252**.

### PART 2 - PRODUCTS

#### 2.1 COUNTER DOOR ASSEMBLY

- A. Counter Door: Coiling counter door formed with curtain of interlocking metal slats.
  - 1. Cornell Iron Works; Fire Rated Counter shutter, model ERC 10
    - a. Provide M100 fireguard control system interconnected with fire alarm system to automatically close shutter upon activation of the fire alarm.
    - b. Provide battery back-up to prevent shutter from closing during brief power outages.

- c. Provide shutter with NFPA compliant closing delay feature and safety edge to prevent injury during closing.
- B. Fire Rating: **1 hour with smoke control.**
- C. Door Curtain Material: **Galvanized steel**
- D. Door Curtain Slats: **Curved** profile slats of **1-1/4-inch (32-mm)** center-to-center height.
- E. Bottom Bar: Manufacturer's standard continuous channel or tubular shape, fabricated **hot-dip galvanized steel** and finished **to match door.**
- F. Curtain Jamb Guides: **Galvanized steel** with exposed finish matching curtain slats.
- G. Hood: **Match curtain material and finish**
  - 1. Mounting: **Face of wall**
- H. Integral Frame, Hood, and Fascia: **Galvanized steel.**
  - 1. Mounting: **Face of wall**
- I. Sill Configuration: **No sill**
- J. Manual Door Operator: **Chain-hoist operator**
- K. Door Finish:
  - 1. Baked-Enamel or Powder-Coated Finish: **Color as selected by Architect from manufacturer's full range.**

## 2.2 MATERIALS, GENERAL

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

## 2.3 DOOR CURTAIN MATERIALS AND CONSTRUCTION

- A. Door Curtains: Fabricate coiling counter-door curtain of interlocking metal slats in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:
  - 1. Indicate on Drawings which side of door is exterior face if it is not obvious.
  - 2. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
- B. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

## 2.4 HOODS

- A. General: Form sheet metal hood to entirely enclose coiled curtain and operating mechanism at opening head. Contour to fit end brackets to which hood is attached. Roll and reinforce top and bottom edges for stiffness. Form closed ends for surface-mounted hoods and fascia for any portion of between-jamb mounting that projects beyond wall face. Equip hood with intermediate support brackets as required to prevent sagging.
  - 1. Include automatic drop baffle on fire-rated doors to guard against passage of smoke or flame.

## 2.5 CURTAIN ACCESSORIES

- A. Smoke Seals: Equip each fire-rated door with replaceable smoke-seal perimeter gaskets or brushes for smoke and draft control as required for door listing and labeling by a qualified testing agency.
- B. Automatic-Closing Device: Equip each fire-rated door with an automatic-closing device or holder-release mechanism and governor unit complying with NFPA 80 and an easily tested and reset release mechanism. Automatic-closing device shall be designed for activation by the following:
  - 1. Replaceable fusible links with temperature rise and melting point of **165 deg F (74 deg C)** interconnected and mounted on both sides of door opening.
  - 2. Manufacturer's standard UL-labeled smoke detector and door-holder-release devices.
  - 3. Manufacturer's standard UL-labeled heat detector and door-holder-release devices.
  - 4. Building fire-detection, smoke-detection, and -alarm systems.

## 2.6 COUNTERBALANCING MECHANISM

- A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

## 2.7 MANUAL DOOR OPERATORS

- A. General: Equip door with manual door operator by door manufacturer.
- B. Chain-Hoist Operator: Consisting of endless steel hand chain, chain-pocket wheel and guard, and gear-reduction unit with a maximum **25-lbf (111-N)** force for door operation. Provide alloy-steel hand chain with chain holder secured to operator guide.



## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install coiling counter doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.
- B. Fire-Rated Doors: Install according to NFPA 80.
- C. Smoke-Control Doors: Install according to NFPA 80 and NFPA 105.
- D. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion. Lubricate bearings and sliding parts as recommended by manufacturer.

END OF SECTION 083313

## SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. **Exterior and interior** manual-swing entrance doors **and door-frame units**.

#### 1.2 ACTION SUBMITTALS

##### A. Product Data: For each type of product.

##### B. Shop Drawings: Include plans, elevations, sections, full-size details, and attachments to other work.

1. Show connection to and continuity with adjacent thermal, weather, air, and vapor barriers.

##### C. Samples: For each exposed finish required.

##### D. Entrance Door Hardware Schedule: Prepared by or under supervision of supplier, detailing fabrication and assembly of entrance door hardware, as well as procedures and diagrams.

#### 1.3 INFORMATIONAL SUBMITTALS

##### A. Energy Performance Certificates: NFRC-certified energy performance values from manufacturer.

#### 1.4 CLOSEOUT SUBMITTALS

##### A. Maintenance data.

#### 1.5 QUALITY ASSURANCE

##### A. Installer Qualifications: An entity that employs installers and supervisors who are trained and approved by manufacturer.

##### B. Testing Agency Qualifications: Qualified according to ASTM E 699 for testing indicated.

##### C. Product Options: Information on Drawings and in Specifications establishes requirements for aesthetic effects and performance characteristics of assemblies. Aesthetic effects are indicated by dimensions, arrangements, alignment, and profiles of components and assemblies as they relate to sightlines, to one another, and to adjoining construction.

1. Do not change intended aesthetic effects, as judged solely by Architect, except with Architect's approval. If changes are proposed, submit comprehensive explanatory data to Architect for review.

## 1.6 WARRANTY

- A. Special Warranty: **Installer** agrees to repair or replace components of aluminum-framed entrances and storefronts that do not comply with requirements or that fail in materials or workmanship within specified warranty period.
  1. Warranty Period: **Two** years from date of Substantial Completion.
- B. Special Finish Warranty: Standard form in which manufacturer agrees to repair finishes or replace aluminum that shows evidence of deterioration of factory-applied finishes within specified warranty period.
  1. Warranty Period: **20** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. General Performance: Comply with performance requirements specified, as determined by testing of aluminum-framed entrances and storefronts representing those indicated for this Project without failure due to defective manufacture, fabrication, installation, or other defects in construction.
  1. Aluminum-framed entrances and storefronts shall withstand movements of supporting structure including, but not limited to, story drift, twist, column shortening, long-term creep, and deflection from uniformly distributed and concentrated live loads.
  2. Failure also includes the following:
    - a. Thermal stresses transferring to building structure.
    - b. Glass breakage.
    - c. Noise or vibration created by wind and thermal and structural movements.
    - d. Loosening or weakening of fasteners, attachments, and other components.
    - e. Failure of operating units.
- B. Structural: Test according to ASTM E 330 as follows:
  1. When tested at positive and negative wind-load design pressures, assemblies do not evidence deflection exceeding specified limits.
  2. When tested at **150** percent of positive and negative wind-load design pressures, assemblies, including anchorage, do not evidence material failures, structural distress, or permanent deformation of main framing members exceeding **0.2** percent of span.
  3. Test Durations: As required by design wind velocity, but not less than **10** seconds.
- C. Air Infiltration: Test according to ASTM E 283 for infiltration as follows:

1. Fixed Framing and Glass Area:
    - a. Maximum air leakage of **0.06 cfm/sq. ft. (0.30 L/s per sq. m)** at a static-air-pressure differential of **1.57 lbf/sq. ft. (75 Pa)**
  2. Entrance Doors:
    - a. Pair of Doors: Maximum air leakage of **1.0 cfm/sq. ft. (5.08 L/s per sq. m)** at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
    - b. Single Doors: Maximum air leakage of **0.5 cfm/sq. ft. (2.54 L/s per sq. m)** at a static-air-pressure differential of 1.57 lbf/sq. ft. (75 Pa).
- D. Water Penetration under Static Pressure: Test according to ASTM E 331 as follows:
1. No evidence of water penetration through fixed glazing and framing areas when tested according to a minimum static-air-pressure differential of 20 percent of positive wind-load design pressure, but not less than **6.24 lbf/sq. ft. (300 Pa)**
- E. Energy Performance: Certify and label energy performance according to NFRC as follows:
1. Thermal Transmittance (U-factor): Fixed glazing and framing areas shall have U-factor of not more than **0.45 Btu/sq. ft. x h x deg F (2.55 W/sq. m x K)** as determined according to NFRC 100.
  2. Solar Heat Gain Coefficient: Fixed glazing and framing areas shall have a solar heat gain coefficient of no greater than **0.40** as determined according to NFRC 200.
- F. Thermal Movements: Allow for thermal movements resulting from ambient and surface temperature changes:
1. Temperature Change: 120 deg F (67 deg C), ambient; 180 deg F (100 deg C), material surfaces.

## 2.2 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. EFCO Corporation – Xtherm system; 403X
  2. Kawneer North America.

## 2.3 FRAMING

- A. Framing Members: Manufacturer's extruded- or formed-aluminum framing members of thickness required and reinforced as required to support imposed loads.
1. Construction: **Dual Thermally broken**
  2. Glazing System: Retained mechanically with gaskets on four sides.
  3. Glazing Plane: Center
  4. Finish: **Clear anodized**
  5. Fabrication Method: Field-fabricated stick system.

- B. Backer Plates: Manufacturer's standard, continuous backer plates for framing members, if not integral, where framing abuts adjacent construction.
- C. Brackets and Reinforcements: Manufacturer's standard high-strength aluminum with nonstaining, nonferrous shims for aligning system components.
- D. Materials:
  - 1. Aluminum: Alloy and temper recommended by manufacturer for type of use and finish indicated.
    - a. Sheet and Plate: ASTM B 209 (ASTM B 209M).
    - b. Extruded Bars, Rods, Profiles, and Tubes: ASTM B 221 (ASTM B 221M).
    - c. Extruded Structural Pipe and Tubes: ASTM B 429/B 429M.
    - d. Structural Profiles: ASTM B 308/B 308M.
  - 2. Steel Reinforcement: Manufacturer's standard zinc-rich, corrosion-resistant primer complying with SSPC-PS Guide No. 12.00; applied immediately after surface preparation and pretreatment. Select surface preparation methods according to recommendations in SSPC-SP COM, and prepare surfaces according to applicable SSPC standard.
    - a. Structural Shapes, Plates, and Bars: ASTM A 36/A 36M.
    - b. Cold-Rolled Sheet and Strip: ASTM A 1008/A 1008M.
    - c. Hot-Rolled Sheet and Strip: ASTM A 1011/A 1011M.

## 2.4 ENTRANCE DOOR SYSTEMS

- A. Entrance Doors: Manufacturer's standard glazed entrance doors for manual-swing operation.
  - 1. Door Construction: **1-3/4-inch (44.5-mm) overall thickness, with minimum 0.125-inch- (3.2-mm-) thick**, extruded-aluminum tubular rail and stile members. Mechanically fasten corners with reinforcing brackets that are deeply penetrated and fillet welded or that incorporate concealed tie rods.
    - a. Thermal Construction: **High-performance plastic connectors separate aluminum members exposed to the exterior from members exposed to the interior**
  - 2. Door Design: **As indicated**
  - 3. Glazing Stops and Gaskets: **Square**, snap-on, extruded-aluminum stops and preformed gaskets.
    - a. Provide nonremovable glazing stops on outside of door.

## 2.5 ENTRANCE DOOR HARDWARE

- A. Entrance Door Hardware: Hardware not specified in this Section is specified in **Section 087100 "Door Hardware."**

- B. General: Provide entrance door hardware **and entrance door hardware sets indicated in door and frame schedule** for each entrance door to comply with requirements in this Section.
1. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.
  2. Opening-Force Requirements:
    - a. Egress Doors: Not more than 15 lbf (67 N) to release the latch and not more than 30 lbf (133 N) to set the door in motion
    - b. Accessible Interior Doors: Not more than 5 lbf (22.2 N) to fully open door.
- C. Butt Hinges: BHMA A156.1, Grade 1, radius corner.
1. Nonremovable Pins: Provide set screw in hinge barrel that, when tightened into a groove in hinge pin, prevents removal of pin while entrance door is closed.
  2. Exterior Hinges: **Stainless steel, with stainless-steel pin**
  3. Quantities:
    - a. For doors up to **87 inches (2210 mm)** high, provide three hinges per leaf.
    - b. For doors more than **87 and up to 120 inches (2210 and up to 3048 mm)** high, provide four hinges per leaf.
- D. Panic Exit Devices: BHMA A156.3, Grade 1, listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305.
- E. Cylinders: **As specified in Section 087100 "Door Hardware."**
- F. Strikes: Provide strike with black-plastic dust box for each latch or lock bolt; fabricated for aluminum framing.
- G. Operating Trim: BHMA A156.6.
- H. Removable Mullions: BHMA A156.3, extruded aluminum.
1. When used with panic exit devices, provide removable mullions listed and labeled by a testing and inspecting agency acceptable to authorities having jurisdiction, for panic protection, based on testing according to UL 305. Use only mullions that have been tested with exit devices to be used.
- I. Closers: BHMA A156.4, Grade 1, with accessories required for a complete installation, sized as required by door size, exposure to weather, and anticipated frequency of use; adjustable to comply with field conditions and requirements for opening force.
- J. Concealed Overhead Holders: BHMA A156.8, Grade 1.
- K. Surface-Mounted Holders: BHMA A156.16, Grade 1.
- L. Door Stops: BHMA A156.16, Grade 1, floor or wall mounted, as appropriate for door location indicated, with integral rubber bumper.
- M. Weather Stripping: Manufacturer's standard replaceable components.

- N. Weather Sweeps: Manufacturer's standard exterior-door bottom sweep with concealed fasteners on mounting strip.
- O. Silencers: BHMA A156.16, Grade 1.
- P. Thresholds: BHMA A156.21, raised thresholds beveled with a slope of not more than 1:2, with maximum height of 1/2 inch (12.7 mm).
- Q. Finger Guards: Manufacturer's standard collapsible neoprene or PVC gasket anchored to frame hinge-jamb at center-pivoted doors.

## 2.6 GLAZING

- A. Glazing: Comply with Section 088000 "Glazing."
- B. Glazing Gaskets: Manufacturer's standard sealed-corner pressure-glazing system of black, resilient elastomeric glazing gaskets, setting blocks, and shims or spacers.
- C. Glazing Sealants: As recommended by manufacturer.
- D. Sealants used inside the weatherproofing system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

## 2.7 FABRICATION

- A. Form or extrude aluminum shapes before finishing.
- B. Fabricate components that, when assembled, have the following characteristics:
  - 1. Profiles that are sharp, straight, and free of defects or deformations.
  - 2. Accurately fitted joints with ends coped or mitered.
  - 3. Physical and thermal isolation of glazing from framing members.
  - 4. Accommodations for thermal and mechanical movements of glazing and framing to maintain required glazing edge clearances.
  - 5. Provisions for field replacement of glazing.
  - 6. Fasteners, anchors, and connection devices that are concealed from view to greatest extent possible.
- C. Mechanically Glazed Framing Members: Fabricate for flush glazing without projecting stops.
- D. Entrance Door Frames: Reinforce as required to support loads imposed by door operation and for installing entrance door hardware.
- E. Entrance Doors: Reinforce doors as required for installing entrance door hardware.
- F. Entrance Door Hardware Installation: Factory install entrance door hardware to the greatest extent possible. Cut, drill, and tap for factory-installed entrance door hardware before applying finishes.



- G. After fabrication, clearly mark components to identify their locations in Project according to Shop Drawings.

## 2.8 ALUMINUM FINISHES

- A. Clear Anodic Finish: AAMA 611, **AA-M12C22A41, Class I, 0.018 mm** or thicker.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General:

1. Comply with manufacturer's written instructions.
2. Do not install damaged components.
3. Fit joints to produce hairline joints free of burrs and distortion.
4. Rigidly secure nonmovement joints.
5. Install anchors with separators and isolators to prevent metal corrosion and electrolytic deterioration and to prevent impeding movement of moving joints.
6. Seal perimeter and other joints watertight unless otherwise indicated.

- B. Metal Protection:

1. Where aluminum is in contact with dissimilar metals, protect against galvanic action by painting contact surfaces with materials recommended by manufacturer for this purpose or by installing nonconductive spacers.
2. Where aluminum is in contact with concrete or masonry, protect against corrosion by painting contact surfaces with bituminous paint.

- C. Set continuous sill members and flashing in full sealant bed as specified in Section 079200 "Joint Sealants" to produce weathertight installation.

- D. Install components plumb and true in alignment with established lines and grades.

- E. Install operable units level and plumb, securely anchored, and without distortion. Adjust weather-stripping contact and hardware movement to produce proper operation.

- F. Install glazing as specified in Section 088000 "Glazing."

- G. Entrance Doors: Install doors to produce smooth operation and tight fit at contact points.

1. Exterior Doors: Install to produce weathertight enclosure and tight fit at weather stripping.
2. Field-Installed Entrance Door Hardware: Install surface-mounted entrance door hardware according to entrance door hardware manufacturers' written instructions using concealed fasteners to greatest extent possible.

END OF SECTION 084113

## SECTION 085413 - FIBERGLASS WINDOWS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes fiberglass-framed windows.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
- C. Samples: For each exposed product and for each color specified.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.
- B. Sample warranties.

#### 1.4 WARRANTY

- A. Manufacturer's Warranty: Manufacturer agrees to repair or replace fiberglass windows that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period:
    - a. Window: **10** years from date of Substantial Completion.
    - b. Glazing Units: **20** years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 WINDOW PERFORMANCE REQUIREMENTS

- A. Product Standard: Comply with AAMA/WDMA/CSA 101/IS.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.
  - 1. Window Certification: WDMA certified with label attached to each window.

- B. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of **0.29 Btu/sq. ft. x h x deg F**
- C. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of **0.40**.

## 2.2 FIBERGLASS WINDOWS

- A. Operating Types: Fixed Units
- B. Frames and Sashes: Pultruded fiberglass complying with AAMA/WDMA/CSA 101/I.S.2/A440 and with exposed exterior fiberglass surfaces finished with manufacturer's standard enamel coating complying with **AAMA 624-10**.
  - 1. Exterior Color: **As selected by Architect from manufacturer's full range.**
  - 2. Interior Finish: white
- C. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.
  - 1. Kind: Fully tempered [**where indicated on Drawings**] **<Insert requirements>**.
- D. Insulating-Glass Units: ASTM E 2190.
  - 1. Glass: ASTM C 1036, Type 1, Class 1, q3.
    - a. Tint: **Clear**
    - b. Kind: Fully tempered where required by code.
  - 2. Lites: **Two**
  - 3. Filling: Fill space between glass lites with **argon**.
  - 4. Low-E Coating: Manufacturers standard Low-E Coating
- E. Glazing System: **Manufacturer's standard factory-glazing system that produces weathertight seal**
- F. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.
- G. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.
  - 1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

## 2.3 ACCESSORIES

- A. Jamb Extensions: none, provide standard 2" frame profile.
- B. Sill pan: Provide pre-formed sill pan and back dam by manufacturer.

## 2.4 FABRICATION

- A. Fabricate fiberglass windows in sizes indicated. Include a complete system for installing and anchoring windows.
- B. Glaze fiberglass windows in the factory.
- C. Weather strip each operable sash to provide weathertight installation.
- D. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.
- B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.
- C. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.
- D. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.
- E. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

END OF SECTION 085413

## SECTION 087100 - DOOR HARDWARE

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes:
  - 1. Mechanical door hardware for the following:
    - a. Swinging doors.
  - 2. Cylinders for door hardware specified in other Sections.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Other Action Submittals:
  - 1. Door Hardware Schedule: Prepared by or under the supervision of Installer, detailing fabrication and assembly of door hardware, as well as installation procedures and diagrams. Coordinate final door hardware schedule with doors, frames, and related work to ensure proper size, thickness, hand, function, and finish of door hardware.
    - a. Format: Use same scheduling sequence and format **and use same door numbers** as in the Contract Documents.
    - b. Content: Include the following information:
      - 1) Identification number, location, hand, fire rating, size, and material of each door and frame.
      - 2) Locations of each door hardware set, cross-referenced to Drawings on floor plans and to door and frame schedule.
      - 3) Complete designations, including name and manufacturer, type, style, function, size, quantity, function, and finish of each door hardware product.
      - 4) Description of electrified door hardware sequences of operation and interfaces with other building control systems.
  - 2. Keying Schedule: Prepared by or under the supervision of Installer, detailing Owner's final keying instructions for locks.

#### 1.3 QUALITY ASSURANCE

- A. Installer Qualifications: Supplier of products and an employer of workers trained and approved by product manufacturers and an Architectural Hardware Consultant who is available during the

course of the Work to consult with Contractor, Architect, and Owner about door hardware and keying.

- B. Architectural Hardware Consultant Qualifications: A person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and who is currently certified by DHI.
- C. Source Limitations: Provide electrified door hardware from same manufacturer as mechanical door hardware, unless otherwise indicated. Manufacturers that perform electrical modifications and that are listed by a testing and inspecting agency acceptable to authorities having jurisdiction are acceptable.
- D. Fire-Rated Door Assemblies: Where fire-rated door assemblies are indicated, provide door hardware rated for use in assemblies complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at positive pressure according to NFPA 252 or UL 10C, unless otherwise indicated.
- E. Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meet requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
  - 1. Air Leakage Rate: Maximum air leakage of 0.3 cfm/sq. ft. (3 cu. m per minute/sq. m) at the tested pressure differential of 0.3-inch wg (75 Pa) of water.
- F. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction.
- G. Means of Egress Doors: Latches do not require more than 15 lbf (67 N) to release the latch. Locks do not require use of a key, tool, or special knowledge for operation.
- H. Accessibility Requirements: For door hardware on doors in an accessible route, comply with **ICC/ANSI A117.1**.
  - 1. Provide operating devices that do not require tight grasping, pinching, or twisting of the wrist and that operate with a force of not more than 5 lbf (22.2 N).
  - 2. Comply with the following maximum opening-force requirements:
    - a. Interior, Non-Fire-Rated Hinged Doors: 5 lbf (22.2 N) applied perpendicular to door.
    - b. Sliding or Folding Doors: 5 lbf (22.2 N) applied parallel to door at latch.
    - c. Fire Doors: Minimum opening force allowable by authorities having jurisdiction.
  - 3. Bevel raised thresholds with a slope of not more than 1:2. Provide thresholds not more than **1/2 inch (13 mm) high**.
  - 4. Adjust door closer sweep periods so that, from an open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches (75 mm) from the latch, measured to the leading edge of the door.
- I. Keying Conference: Conduct conference at Project site to comply with requirements in Section 013100 "Project Management and Coordination."

#### 1.4 DELIVERY, STORAGE, AND HANDLING

- A. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

#### 1.5 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **Three** years from date of Substantial Completion, unless otherwise indicated.
    - a. Locks: **Five** years from date of Substantial Completion.
    - b. Manual Closers: **10** years from date of Substantial Completion.

### PART 2 - PRODUCTS

#### 2.1 SCHEDULED DOOR HARDWARE

- A. Provide door hardware for each door as scheduled **on Drawings** to comply with requirements in this Section.
  - 1. Door Hardware Sets: Provide quantity, item, size, finish or color indicated, and **products complying with BHMA designations referenced.**
  - 2. Sequence of Operation: Provide electrified door hardware function, sequence of operation, and interface with other building control systems indicated.

#### 2.2 HINGES

- A. Hinges: BHMA A156.1. **Provide template-produced hinges for hinges installed on hollow-metal doors and hollow-metal frames.**
  - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Hager Companies.
    - b. IVES Hardware; an Ingersoll-Rand company.
    - c. McKinney Products Company; an ASSA ABLOY Group company.
    - d. Stanley Commercial Hardware; Div. of The Stanley Works.

#### 2.3 MECHANICAL LOCKS AND LATCHES

- A. Strikes: Provide manufacturer's standard strike for each lock bolt or latchbolt complying with requirements indicated for applicable lock or latch and with strike box and curved lip extended to protect frame; finished to match lock or latch.



1. Flat-Lip Strikes: For locks with three-piece antifriction latchbolts, as recommended by manufacturer.
2. Extra-Long-Lip Strikes: For locks used on frames with applied wood casing trim.
3. Aluminum-Frame Strike Box: Manufacturer's special strike box fabricated for aluminum framing.
4. Rabbet Front and Strike: Provide on locksets for rabbeted meeting stiles.

B. Bored Locks: BHMA A156.2; Grade **1**; Series 4000.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. PDQ Manufacturing. XGT series, Miami Lever
  - b. SARGENT Manufacturing Company; an ASSA ABLOY Group company. – 10 line bored lock, B-lever, G-rose
2. Cycle test: Exceed 5 times A156.2 grade 1 requirements
3. Finish: US26D

## 2.4 ELECTROMECHANICAL LOCKS

A. Electromechanical Locks: BHMA A156.25; Grade **1**; motor or solenoid driven; **bored**; with strike that suits frame.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Best Access Systems; Div. of Stanley Security Solutions, Inc.
  - b. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
  - c. Schlage Commercial Lock Division; an Ingersoll-Rand company.
2. Provide at pairs of doors with integrated card access or key FOB system provided by owner's vendor.
3. Fail secure operation
4. Coordinate access control with power operated doors

## 2.5 AUXILIARY ELECTRIFIED DOOR HARDWARE

A. Basis-of-Design Product: Subject to compliance with requirements, provide HES model 5200 Electric Strike where indicated on drawings.

1. BMHA grade 1 classification
2. 24 Volt unit
3. Fail secure operation; allow for field selectable operation of each device.
4. Coordinate access control with power operated doors

## 2.6 MANUAL FLUSH BOLTS

A. Manual Flush Bolts: BHMA A156.16; minimum 3/4-inch (19-mm) throw; designed for mortising into door edge.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - a. Adams Rite Manufacturing Co.; an ASSA ABLOY Group company.
  - b. Burns Manufacturing Incorporated.
  - c. Don-Jo Mfg., Inc.
  - d. Hiawatha, Inc.
  - e. IVES Hardware; an Ingersoll-Rand company.

## 2.7 EXIT DEVICES AND AUXILIARY ITEMS

- A. Exit Devices and Auxiliary Items: BHMA A156.3.
- B. Basis-of-Design Product: Subject to compliance with requirements, provide Sargent manufacturing 80 series exit devices where indicated on drawings.
  1. 8500 Narrow design rim exit device on single doors, interior or exterior
  2. Concealed vertical rod exit device at Aluminum storefront pairs of doors
  3. Surface mounted vertical rod exit device at solid core pairs of doors
  4. Provide electric lock at pairs of doors for owners electrified access control system.
  5. Lever handle to match bored locks.

## 2.8 LOCK CYLINDERS

- A. Lock Cylinders: Tumbler type, constructed from brass or bronze, stainless steel, or nickel silver.
  1. Manufacturer: Same manufacturer as for locking devices.
  2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated or comparable product by one of the following:
    - a. Best Access Systems; Div. of Stanley Security Solutions, Inc.
- B. Construction Cores: Provide construction cores that are replaceable by permanent cores. Provide 10 construction master keys.

## 2.9 KEYING

- A. Keying System: Factory registered, complying with guidelines in BHMA A156.28, Appendix A. Incorporate decisions made in keying conference.
  1. Great-Grand Master Key System: Change keys, a master key, a grand master key, and a great-grand master key operate cylinders.
  2. Reviewing keying system and schedule with owner.
- B. Keys: **Brass**.
  1. Stamping: Permanently inscribe each key with a visual key control number and include the following notation:
    - a. Notation: **"DO NOT DUPLICATE."**

2. Quantity: In addition to one extra key blank for each lock, provide the following:
  - a. Cylinder Change Keys: Three.
  - b. Master Keys: Five.
  - c. Grand Master Keys: Five.
  - d. Great-Grand Master Keys: Five.

## 2.10 KEY CONTROL SYSTEM

- A. Key Control Cabinet: BHMA A156.5; metal cabinet with baked-enamel finish; containing key-holding hooks, labels, 2 sets of key tags with self-locking key holders, key-gathering envelopes, and temporary and permanent markers; with key capacity of **150** percent of the number of locks.
  1. 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. American Key Boxes and Cabinets.
    - b. GE Security, Inc.
    - c. HPC, Inc.
    - d. Lund Equipment Co., Inc.
    - e. MMF Industries.
    - f. Tri Palm International.
  2. Wall-Mounted Cabinet: Cabinet with hinged-panel door equipped with key-holding panels and pin-tumbler cylinder door lock.

## 2.11 SURFACE CLOSERS

- A. Surface Closers: BHMA A156.4; rack-and-pinion hydraulic type with adjustable sweep and latch speeds controlled by key-operated valves and forged-steel main arm. Comply with manufacturer's written recommendations for size of door closers depending on size of door, exposure to weather, and anticipated frequency of use. Provide factory-sized closers, adjustable to meet field conditions and requirements for opening force.
  1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. Arrow USA; an ASSA ABLOY Group company.
    - b. Corbin Russwin Architectural Hardware; an ASSA ABLOY Group company.
    - c. DORMA Architectural Hardware; Member of The DORMA Group North America.
    - d. Dor-O-Matic; an Ingersoll-Rand company.
    - e. K2 Commercial Hardware; a Black & Decker Corp. company.
    - f. LCN Closers; an Ingersoll-Rand company.
    - g. Norton Door Controls; an ASSA ABLOY Group company.
    - h. Rixson Specialty Door Controls; an ASSA ABLOY Group company.
    - i. SARGENT Manufacturing Company; an ASSA ABLOY Group company.
    - j. Yale Security Inc.; an ASSA ABLOY Group company.

## 2.12 MECHANICAL STOPS AND HOLDERS

A. Wall- and Floor-Mounted Stops: BHMA A156.16; **aluminum** base metal.

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. Architectural Builders Hardware Mfg., Inc.
  - b. Baldwin Hardware Corporation.
  - c. Burns Manufacturing Incorporated.
  - d. Cal-Royal Products, Inc.
  - e. Don-Jo Mfg., Inc.
  - f. Door Controls International, Inc .
  - g. Hager Companies.
  - h. Hiawatha, Inc.
  - i. IVES Hardware; an Ingersoll-Rand company.
  - j. Rockwood Manufacturing Company.
  - k. Stanley Commercial Hardware; Div. of The Stanley Works.

## 2.13 DOOR GASKETING

A. Door Gasketing: BHMA A156.22; air leakage not to exceed 0.50 cfm per foot (0.000774 cu. m/s per m) of crack length for gasketing other than for smoke control, as tested according to ASTM E 283; with resilient or flexible seal strips that are easily replaceable and readily available from stocks maintained by manufacturer.

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. Hager Companies.
  - b. National Guard Products.
  - c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
  - d. Zero International.

## 2.14 THRESHOLDS

A. Thresholds: BHMA A156.21; fabricated to full width of opening indicated.

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. Hager Companies.
  - b. National Guard Products.
  - c. Pemko Manufacturing Co.; an ASSA ABLOY Group company.
  - d. Reese Enterprises, Inc.
  - e. Rixson Specialty Door Controls; an ASSA ABLOY Group company.

- f. Zero International.

## 2.15 METAL PROTECTIVE TRIM UNITS

- A. Metal Protective Trim Units: BHMA A156.6; fabricated from 0.050-inch (1.3-mm) thick **aluminum** or **stainless steel**; with manufacturer's standard machine or self-tapping screw fasteners.
  - 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. Baldwin Hardware Corporation.
    - b. Burns Manufacturing Incorporated.
    - c. Don-Jo Mfg., Inc.
    - d. Hiawatha, Inc.
    - e. IVES Hardware; an Ingersoll-Rand company.
    - f. Rockwood Manufacturing Company.

## 2.16 FABRICATION

- A. Fasteners: Provide door hardware manufactured to comply with published templates prepared for machine, wood, and sheet metal screws. Provide screws that comply with commercially recognized industry standards for application intended, except aluminum fasteners are not permitted. Provide Phillips flat-head screws with finished heads to match surface of door hardware, unless otherwise indicated.
  - 1. Concealed Fasteners: For door hardware units that are exposed when door is closed, except for units already specified with concealed fasteners. Do not use through bolts for installation where bolt head or nut on opposite face is exposed unless it is the only means of securely attaching the door hardware. Where through bolts are used on hollow door and frame construction, provide sleeves for each through bolt.
  - 2. Fire-Rated Applications:
    - a. Wood or Machine Screws: For the following:
      - 1) Hinges mortised to doors or frames
      - 2) Strike plates to frames.
      - 3) Closers to doors and frames.
    - b. Steel Through Bolts: For the following unless door blocking is provided:
      - 1) Surface hinges to doors.
      - 2) Closers to doors and frames.
      - 3) Surface-mounted exit devices.
  - 3. Spacers or Sex Bolts: For through bolting of hollow-metal doors.
  - 4. Fasteners for Wood Doors: Comply with requirements in DHI WDHS.2, "Recommended Fasteners for Wood Doors."

5. Gasketing Fasteners: Provide noncorrosive fasteners for exterior applications and elsewhere as indicated.

## 2.17 FINISHES

- A. Provide finishes complying with BHMA A156.18; US26D.
- B. Protect mechanical finishes on exposed surfaces from damage by applying a strippable, temporary protective covering before shipping.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
- B. Wood Doors: Comply with DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
- C. Mounting Heights: Mount door hardware units at heights **to comply with the following** unless otherwise indicated or required to comply with governing regulations.
  1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  2. Custom Steel Doors and Frames: HMMA 831.
  3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- D. Install each door hardware item to comply with manufacturer's written instructions. Where cutting and fitting are required to install door hardware onto or into surfaces that are later to be painted or finished in another way, coordinate removal, storage, and reinstallation of surface protective trim units with finishing work. Do not install surface-mounted items until finishes have been completed on substrates involved.
  1. Set units level, plumb, and true to line and location. Adjust and reinforce attachment substrates as necessary for proper installation and operation.
  2. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- E. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than the number recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- F. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  1. Replace construction cores with permanent cores

- G. Key Control System: Tag keys and place them on markers and hooks in key control system cabinet, as determined by final keying schedule.
- H. Boxed Power Supplies: Locate power supplies as indicated or, if not indicated, **above accessible ceilings**. Verify location with Architect.
  - 1. Configuration: Provide **least number of power supplies required to adequately serve doors** with electrified door hardware.
- I. Thresholds: Set thresholds for exterior doors and other doors indicated in full bed of sealant complying with requirements specified in Section 079200 "Joint Sealants."
- J. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they will impede traffic.
- K. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- L. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- M. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.
- N. Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.

END OF SECTION 087100



## SECTION 088000 - GLAZING

### PART 1 - GENERAL

#### 1.1 SUMMARY

A. Section includes:

1. Glass for **doors, interior borrowed lites**, interior service windows
2. Glazing sealants and accessories.

#### 1.2 COORDINATION

- A. Coordinate glazing channel dimensions to provide necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Glazing Schedule: List glass types and thicknesses for each size opening and location. Use same designations indicated on Drawings.

#### 1.4 INFORMATIONAL SUBMITTALS

- A. Preconstruction adhesion and compatibility test report.

#### 1.5 QUALITY ASSURANCE

- A. Sealant Testing Agency Qualifications: An independent testing agency qualified according to ASTM C 1021 to conduct the testing indicated.

#### 1.6 WARRANTY

- A. Manufacturer's Special Warranty for Coated-Glass Products: Manufacturer agrees to replace coated-glass units that deteriorate within specified warranty period. Deterioration of coated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning coated glass contrary to manufacturer's written instructions. Defects include peeling, cracking, and other indications of deterioration in coating.

1. Warranty Period: **10** years from date of Substantial Completion.

- B. Manufacturer's Special Warranty for Laminated Glass: Manufacturer agrees to replace laminated-glass units that deteriorate within specified warranty period. Deterioration of

laminated glass is defined as defects developed from normal use that are not attributed to glass breakage or to maintaining and cleaning laminated glass contrary to manufacturer's written instructions. Defects include edge separation, delamination materially obstructing vision through glass, and blemishes exceeding those allowed by referenced laminated-glass standard.

1. Warranty Period: **10** years from date of Substantial Completion.

- C. Manufacturer's Special Warranty for Insulating Glass: Manufacturer agrees to replace insulating-glass units that deteriorate within specified warranty period. Deterioration of insulating glass is defined as failure of hermetic seal under normal use that is not attributed to glass breakage or to maintaining and cleaning insulating glass contrary to manufacturer's written instructions. Evidence of failure is the obstruction of vision by dust, moisture, or film on interior surfaces of glass.

1. Warranty Period: **10** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 GLAZING PRODUCTS

- A. Fully Tempered Float Glass: ASTM C 1048, Kind FT (fully tempered), Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- B. Heat-Strengthened Float Glass: ASTM C 1048, Kind HS (heat strengthened), Type I, Condition A (uncoated) unless otherwise indicated, Type I, Class 1 (clear) or Class 2 (tinted) as indicated, Quality-Q3.
- C. Pyrolytic-Coated, Low-Maintenance Glass: Clear float glass with a coating on first surface having both photocatalytic and hydrophilic properties that act to loosen dirt and to cause water to sheet evenly over the glass instead of beading.

### 2.2 FIRE-PROTECTION-RATED GLAZING

- A. Fire-Protection-Rated Glazing: Listed and labeled by a testing agency acceptable to authorities having jurisdiction, for fire-protection ratings indicated, based on positive-pressure testing according to NFPA 257 or UL 9, including the hose-stream test, and shall comply with NFPA 80.
1. Fire-protection-rated glazing required to have a fire-protection rating of 20 minutes shall be exempt from the hose-stream test.
- B. Fire-Protection-Rated Glazing Labeling: Permanently mark fire-protection-rated glazing with certification label of a testing agency acceptable to authorities having jurisdiction. Label shall indicate manufacturer's name; test standard; whether glazing is permitted to be used in doors or openings; if permitted in openings, whether or not glazing has passed the hose-stream test; whether or not glazing meets 450 deg F (250 deg C) temperature-rise limitation; and the fire-resistance rating in minutes.

- C. Fire-Protection-Rated Tempered Glass: **8-mm** thickness, fire-protection-rated tempered glass; and complying with 16 CFR 1201, Category II.
  - 1. Technical Glass Products, Fire-Lite Plus
    - a. Fire resistance rating as indicated on the drawings
    - b. Premium Grade Finish

## 2.3 LAMINATED GLASS

- A. Laminated Glass: ASTM C 1172. Use materials that have a proven record of no tendency to bubble, discolor, or lose physical and mechanical properties after fabrication and installation.
  - 1. Construction: Laminate glass with **polyvinyl butyl interlayer** to comply with interlayer manufacturer's written instructions.
  - 2. Interlayer Thickness: Provide thickness not less than that indicated and as needed to comply with requirements.
  - 3. Interlayer Color: Clear unless otherwise indicated.

## 2.4 GLAZING SEALANTS

- A. General:
  - 1. Compatibility: Compatible with one another and with other materials they contact, including glass products, seals of insulating-glass units, and glazing channel substrates, under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
  - 2. Suitability: Comply with sealant and glass manufacturers' written instructions for selecting glazing sealants suitable for applications indicated and for conditions existing at time of installation.
- B. Glazing Sealant: Neutral-curing silicone glazing sealant complying with ASTM C 920, Type S, Grade NS, Class 100/50, Use NT.

## 2.5 GLAZING TAPES

- A. Expanded Cellular Glazing Tapes: Closed-cell, PVC foam tapes; factory coated with adhesive on both surfaces; and complying with AAMA 800 for the following types:
  - 1. AAMA 810.1, Type 1, for glazing applications in which tape acts as the primary sealant.
  - 2. AAMA 810.1, Type 2, for glazing applications in which tape is used in combination with a full bead of liquid sealant.

## 2.6 MISCELLANEOUS GLAZING MATERIALS

- A. Cleaners, Primers, and Sealers: Types recommended by sealant or gasket manufacturer.
- B. Setting Blocks: Elastomeric material with a Shore, Type A durometer hardness of 85, plus or minus 5.

- C. Spacers: Elastomeric blocks or continuous extrusions of hardness required by glass manufacturer to maintain glass lites in place for installation indicated.
- D. Edge Blocks: Elastomeric material of hardness needed to limit glass lateral movement (side walking).
- E. Cylindrical Glazing Sealant Backing: ASTM C 1330, Type O (open-cell material), of size and density to control glazing sealant depth and otherwise produce optimum glazing sealant performance.

## PART 3 - EXECUTION

### 3.1 GLAZING, GENERAL

- A. Comply with combined written instructions of manufacturers of glass, sealants, gaskets, and other glazing materials, unless more stringent requirements are indicated, including those in referenced glazing publications.
- B. Protect glass edges from damage during handling and installation. Remove damaged glass from Project site and legally dispose of off Project site. Damaged glass includes glass with edge damage or other imperfections that, when installed, could weaken glass, impair performance, or impair appearance.
- C. Apply primers to joint surfaces where required for adhesion of sealants, as determined by preconstruction testing.
- D. Install setting blocks in sill rabbets, sized and located to comply with referenced glazing publications, unless otherwise required by glass manufacturer. Set blocks in thin course of compatible sealant suitable for heel bead.
- E. Do not exceed edge pressures stipulated by glass manufacturers for installing glass lites.
- F. Provide spacers for glass lites where length plus width is larger than 50 inches (1270 mm).
- G. Provide edge blocking where indicated or needed to prevent glass lites from moving sideways in glazing channel, as recommended in writing by glass manufacturer and according to requirements in referenced glazing publications.

### 3.2 TAPE GLAZING

- A. Position tapes on fixed stops so that, when compressed by glass, their exposed edges are flush with or protrude slightly above sightline of stops.
- B. Install tapes continuously, but not necessarily in one continuous length. Do not stretch tapes to make them fit opening.
- C. Cover vertical framing joints by applying tapes to heads and sills first, then to jambs. Cover horizontal framing joints by applying tapes to jambs, then to heads and sills.

- D. Place joints in tapes at corners of opening with adjoining lengths butted together, not lapped. Seal joints in tapes with compatible sealant approved by tape manufacturer.
- E. Apply heel bead of elastomeric sealant.
- F. Center glass lites in openings on setting blocks, and press firmly against tape by inserting dense compression gaskets formed and installed to lock in place against faces of removable stops. Start gasket applications at corners and work toward centers of openings.
- G. Apply cap bead of elastomeric sealant over exposed edge of tape.

### 3.3 GASKET GLAZING (DRY)

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

### 3.4 CLEANING AND PROTECTION

- A. Immediately after installation remove nonpermanent labels and clean surfaces.
- B. Protect glass from contact with contaminating substances resulting from construction operations. Examine glass surfaces adjacent to or below exterior concrete and other masonry surfaces at frequent intervals during construction, but not less than once a month, for buildup of dirt, scum, alkaline deposits, or stains.
  - 1. If, despite such protection, contaminating substances do come into contact with glass, remove substances immediately as recommended in writing by glass manufacturer. Remove and replace glass that cannot be cleaned without damage to coatings.
- C. Remove and replace glass that is damaged during construction period.

### 3.5 MONOLITHIC GLASS SCHEDULE

- A. Glass Type: Clear **fully tempered** float glass.
  - 1. Minimum Thickness: **6 mm**
  - 2. Safety glazing required.

### 3.6 FIRE-PROTECTION-RATED GLAZING SCHEDULE

- A. Glass Type: 20-minute fire-protection-rated glazing with hose-stream test

### 3.7 LAMINATED GLASS SCHEDULE

- A. Glass Type: Clear laminated glass with two plies of **fully tempered** float glass.
  - 1. Minimum Thickness of Each Glass Ply: **6 mm**
  - 2. Interlayer Thickness: **0.030 inch (0.76 mm)**
  - 3. Safety glazing required.

### 3.8 INSULATING GLASS SCHEDULE

- A. Glass Type: Pyrolytic-coated, self-cleaning, low-maintenance, low-E coated, clear insulating glass.
  - 1. Basis-of-Design Product: **Cardinal Glass Industries; Neat LoE**
  - 2. Overall Unit Thickness: **1 inch (25 mm)**
  - 3. Minimum Thickness of Each Glass Lite: **4 mm**
  - 4. Outdoor Lite: Pyrolytic-coated, self-cleaning, low-maintenance, clear **fully tempered** float glass.
  - 5. Interspace Content: **Argon.**
  - 6. Indoor Lite: **Fully tempered** float glass.
  - 7. Low-E Coating: **Pyrolytic on third** surface.
  - 8. Visible Light Transmittance: 66 percent minimum.
  - 9. Solar Heat Gain Coefficient: 0.40 maximum.
  - 10. Safety glazing required.

END OF SECTION 088000

## SECTION 089119 - FIXED LOUVERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes fixed, **extruded-aluminum** louvers.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For louvers and accessories. Include plans, elevations, sections, details, and attachments to other work. Show frame profiles and blade profiles, angles, and spacing.
- C. Samples: For each type of metal finish required.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product Test Reports: Based on tests performed according to AMCA 500-L.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Louver Performance Ratings: Provide louvers complying with requirements specified, as demonstrated by testing manufacturer's stock units identical to those provided, except for length and width according to AMCA 500-L.

#### 2.2 FIXED, EXTRUDED-ALUMINUM LOUVERS

- A. Horizontal, Drainable-Blade Louver

1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**
  - a. Airolite Company, LLC (The).
  - b. Greenheck Fan Corporation.
  - c. Nystrom, Inc.
  - d. Ruskin Company; Tomkins PLC.
2. Louver Depth: **4 inches (100 mm)**
3. Frame and Blade Nominal Thickness: Not less than **0.080 inch (2.03 mm) for blades and frames.**



4. Mullion Type: Exposed.
5. Louver Performance Ratings:
  - a. Free Area: Not less than **8.0 sq. ft. (0.74 sq. m)** for 48-inch (1220-mm) wide by 48-inch (1220-mm) high louver.
  - b. Point of Beginning Water Penetration: Not less than **1100 fpm (5.6 m/s)**
  - c. Air Performance: Not more than **0.10-inch wg (25-Pa)** static pressure drop at **700-fpm (3.6-m/s)** free-area exhaust and intake velocity.
6. AMCA Seal: Mark units with AMCA Certified Ratings Seal.

## 2.3 LOUVER SCREENS

- A. General: Provide screen at **each exterior louver**.
  1. Screen Location for Fixed Louvers: Interior face.
  2. Screening Type: Bird screening.
- B. Louver Screen Frames: Same type and form of metal as indicated for louver to which screens are attached.
- C. Louver Screening for Aluminum Louvers:
  1. Bird Screening: Aluminum, 1/2-inch (13-mm) square mesh, 0.063-inch (1.60-mm) wire.

## 2.4 MATERIALS

- A. Aluminum Extrusions: ASTM B 221 (ASTM B 221M), Alloy 6063-T5, T-52, or T6.
- B. Aluminum Sheet: ASTM B 209 (ASTM B 209M), Alloy 3003 or 5005 with temper as required for forming, or as otherwise recommended by metal producer for required finish.
- C. Fasteners: Use types and sizes to suit unit installation conditions.
  1. Use **hex-head or Phillips pan-head** screws for exposed fasteners unless otherwise indicated.
  2. For fastening aluminum, use aluminum or 300 series stainless-steel fasteners.
  3. For fastening galvanized steel, use hot-dip-galvanized steel or 300 series stainless-steel fasteners.
  4. For fastening stainless steel, use 300 series stainless-steel fasteners.
  5. For color-finished louvers, use fasteners with heads that match color of louvers.

## 2.5 FABRICATION

- A. Fabricate frames, including integral sills, to fit in openings of sizes indicated, with allowances made for fabrication and installation tolerances, adjoining material tolerances, and perimeter sealant joints.

- B. Join frame members to each other and to fixed louver blades with fillet welds **concealed from view** unless otherwise indicated or size of louver assembly makes bolted connections between frame members necessary.

## 2.6 ALUMINUM FINISHES

- A. High-Performance Organic Finish: Two-coat fluoropolymer finish complying with **AAMA 2605** and containing not less than **70** percent PVDF resin by weight in color coat. Prepare, pretreat, and apply coating to exposed metal surfaces to comply with coating and resin manufacturers' written instructions.

1. Color and Gloss: **As selected by Architect from manufacturer's full range.**

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Locate and place louvers level, plumb, and at indicated alignment with adjacent work.
- B. Use concealed anchorages where possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.
- C. Provide perimeter reveals and openings of uniform width for sealants and joint fillers, as indicated.
- D. Protect unpainted galvanized and nonferrous-metal surfaces that are in contact with concrete, masonry, or dissimilar metals from corrosion and galvanic action by applying a heavy coating of bituminous paint or by separating surfaces with waterproof gaskets or nonmetallic flashing.

### 3.2 ADJUSTING

- A. Restore louvers damaged during installation and construction so no evidence remains of corrective work. If results of restoration are unsuccessful, as determined by Architect, remove damaged units and replace with new units.

END OF SECTION 089119

## SECTION 092900 - GYPSUM BOARD

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Interior gypsum board.
  - 2. Exterior gypsum board

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.
- B. STC-Rated Assemblies: For STC-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 90 and classified according to ASTM E 413 by an independent testing agency.
- C. Low Emitting Materials: For ceiling and wall assemblies, provide materials and construction identical to those tested in assembly and complying with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

#### 2.2 GYPSUM BOARD, GENERAL

- A. Recycled Content of Gypsum Panel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site from materials that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles (800 km) of Project site.
- C. Regional Materials: Gypsum panel products shall be manufactured within 500 miles (800 km) of Project site.

## 2.3 INTERIOR GYPSUM BOARD

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. CertainTeed Corp.
  2. Georgia-Pacific Gypsum LLC.
  3. Lafarge North America Inc.
  4. National Gypsum Company.
  5. USG Corporation.
- B. Gypsum Wallboard: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch (15.9 mm).
  2. Long Edges: **Tapered**
- C. Gypsum Board, Type X: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch (15.9 mm).
  2. Long Edges: **Tapered**
- D. Gypsum Ceiling Board: ASTM C 1396/C 1396M.
1. Thickness: 5/8 inch (15.9 mm).
  2. Long Edges: Tapered.
- E. Moisture- and Mold-Resistant Gypsum Board: ASTM C 1396/C 1396M. With moisture- and mold-resistant core and paper surfaces.
1. Core: **5/8 inch (15.9 mm)**
  2. Long Edges: Tapered.
  3. Mold Resistance: ASTM D 3273, score of 10 as rated according to ASTM D 3274.

## 2.4 EXTERIOR GYPSUM BOARD FOR CEILINGS AND SOFFITS

- A. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
1. Core: **5/8 inch (15.9 mm), Type X.**

## 2.5 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047
1. Material: **aluminum-coated steel sheet.**
- B. Standard Trim: ASTM C 1047, provided or approved by manufacturer for use in gypsum veneer plaster applications indicated.
1. Material: **aluminum-coated steel sheet.**

- C. Aluminum Trim: ASTM B 221 (ASTM B 221M), Alloy 6063-T5.

## 2.6 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
  - 1. Interior Gypsum Board: Paper.
  - 2. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Board: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

## 2.7 AUXILIARY MATERIALS

- A. Laminating Adhesive: Adhesive or joint compound recommended for directly adhering gypsum panels to continuous substrate.
  - 1. Laminating adhesive shall have a VOC content of **50** g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Laminating adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
- C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing).
- D. Acoustical Joint Sealant: ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings as demonstrated by testing according to ASTM E 90.
  - 1. Products: Subject to compliance with requirements, **available products that may be incorporated into the Work include, but are not limited to, the following**:
    - a. Pecora Corporation; [AC-20 FTR] [AIS-919].
    - b. USG Corporation; SHEETROCK Acoustical Sealant.
  - 2. Acoustical joint sealant shall have a VOC content of **250** g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 3. Acoustical joint sealant 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. Thermal Insulation: As specified in Section 072100 "Thermal Insulation."

## PART 3 - EXECUTION

### 3.1 APPLYING AND FINISHING PANELS

- A. Comply with ASTM C 840.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4 to 1/2-inch (6.4 to 12.7-mm) wide spaces at these locations and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.
- D. Install trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
  - 1. Control Joints: Install control joints **according to ASTM C 840 and in specific locations approved by Architect for visual effect.**
- E. Prefill open joints and damaged surface areas.
- F. Apply joint tape over gypsum board joints, except for trim products specifically indicated as not intended to receive tape.
- G. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  - 1. Level 1: Draftstopping panels in attic area
  - 2. Level 2: Ceiling plenum and concealed areas, and where indicated.
  - 3. Level 5: Where exposed and scheduled for finishing
    - a. Primer and its application to surfaces are specified in Section 099123 "Interior Painting."
- H. Glass-Mat Gypsum Sheathing Board: Skim coat finish according to manufacturer's written instructions for use as exposed soffit board.
- I. Protect adjacent surfaces from drywall compound and texture finishes and promptly remove from floors and other non-drywall surfaces. Repair surfaces stained, marred, or otherwise damaged during drywall application.
- J. Remove and replace panels that are wet, moisture damaged, and mold damaged.

END OF SECTION 092900

## SECTION 095113 - ACOUSTICAL PANEL CEILINGS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes acoustical panels and exposed suspension systems for ceilings.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified.
- C. Shop drawings: layout drawings of ceiling systems.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Seismic Performance: Acoustical ceiling shall withstand the effects of earthquake motions determined according to **ASCE/SEI 7**.
- B. Surface-Burning Characteristics: Comply with ASTM E 84; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: Comply with ASTM E 1264 for **Class A** materials.
  - 2. Smoke-Developed Index: **50** or less.

#### 2.2 ACOUSTICAL PANEL CEILINGS, GENERAL

- A. Low-Emitting Materials: Acoustical panel ceilings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- B. Recycled Content: total recycled content greater than 50%.
- C. Glass-Fiber-Based Panels: Made with binder containing no urea formaldehyde.



- D. Acoustical Panel Standard: Comply with ASTM E 1264.
- E. Metal Suspension System Standard: Comply with ASTM C 635.
- F. Attachment Devices: Size for five times the design load indicated in ASTM C 635, Table 1, "Direct Hung," unless otherwise indicated. Comply with seismic design requirements.

## 2.3 ACOUSTICAL PANELS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** and as follows:
  - 1. Armstrong World Industries, Inc.
- B. Classification: Dune
- C. Color: **White**
- D. LR: 0.83
- E. NRC: 0.50, Type E-400 mounting according to ASTM E 795.
- F. CAC: 35
- G. Edge/Joint Detail: beveled tegular edge
- H. Thickness: **5/8 inch (15 mm)**
- I. Modular Size: **24 by 24 inches (610 by 610 mm)**
  - 1. Provide matching panels 24 by 48 inches at mechanical units as shown on the drawings.

## 2.4 METAL SUSPENSION SYSTEMS

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **product indicated on Drawings** and as follows:
  - 1. Armstrong World Industries, Inc.
- B. Narrow-Face, Capped, Double-Web, Steel Suspension System: Main and cross runners roll formed from cold-rolled steel sheet; prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, not less than G30 (Z90) coating designation; with prefinished 9/16-inch (15-mm) wide metal caps on flanges.
- C. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension-system runners.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Install acoustical panel ceilings to comply with ASTM C 636/C 636M and seismic design requirements indicated, according to manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."
- B. Measure each ceiling area and establish layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and comply with layout shown on reflected ceiling plans.
  - 1. Arrange directionally patterned acoustical panels as indicated on reflected ceiling plans.

END OF SECTION 095113

## SECTION 096513 - RESILIENT BASE AND ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Resilient base.
  - 2. Resilient molding accessories.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Samples: For each exposed product and for each color and texture specified, not less than 12 inches (300 mm) long.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. FloorScore Compliance: Resilient **base** shall comply with requirements of FloorScore certification.
- B. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

#### 2.2 VINYL BASE

- 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. Armstrong World Industries, Inc.
  - 2. Burke Mercer Flooring Products, Division of Burke Industries Inc.
  - 3. Johnsonite; A Tarkett Company.
  - 4. Roppe Corporation, USA.
- B. Product Standard: ASTM F 1861, Type TV (vinyl, thermoplastic).
  - 1. Group: **I (solid, homogeneous)**
  - 2. Style and Location:

- a. Style A, Straight: **Provide in areas with carpet and in areas with resilient flooring**
- C. Minimum Thickness: **0.125 inch (3.2 mm)**
- D. Height: **As indicated on Drawings.**
- E. Lengths: **Coils in manufacturer's standard length**
- F. Outside Corners: **Job formed**
- G. Inside Corners: **Job formed**
- H. Colors and Patterns: **As selected by Architect from full range of industry colors**

## 2.3 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient-product manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by resilient-product manufacturer for resilient products and substrate conditions indicated.
  - 1. Adhesives shall have a VOC content of 50 g/L or less
  - 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Floor Polish: Provide protective, liquid floor-polish products recommended by resilient stair-tread manufacturer.

## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.
- B. Concrete Substrates for Resilient Stair Accessories: Prepare horizontal surfaces according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.

3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing.
  4. Moisture Testing: Proceed with installation only after substrates pass testing according to manufacturer's written recommendations, but not less stringent than the following:
    - a. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have maximum **75** percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient products until they are the same temperature as the space where they are to be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient products.

### 3.2 RESILIENT BASE INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient base.
- B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.
- C. Install resilient base in lengths as long as practical without gaps at seams and with tops of adjacent pieces aligned.
- D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
- E. Do not stretch resilient base during installation.
- F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.
- G. Preformed Corners: Install preformed corners before installing straight pieces.
- H. Job-Formed Corners:
1. Outside Corners: Use straight pieces of maximum lengths possible and form with returns not less than **3 inches (76 mm)** in length.
    - a. Form without producing discoloration (whitening) at bends.
  2. Inside Corners: Use straight pieces of maximum lengths possible and form with returns not less than **3 inches (76 mm)** in length.
    - a. **Miter or cope** corners to minimize open joints.

### 3.3 RESILIENT ACCESSORY INSTALLATION

- A. Comply with manufacturer's written instructions for installing resilient accessories.
- B. Resilient Stair Accessories:
  - 1. Use stair-tread-nose filler to fill nosing substrates that do not conform to tread contours.
  - 2. Tightly adhere to substrates throughout length of each piece.
  - 3. For treads installed as separate, equal-length units, install to produce a flush joint between units.
- C. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of floor covering that would otherwise be exposed.

### 3.4 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient products.
- B. Cover resilient products subject to wear and foot traffic until Substantial Completion.

END OF SECTION 096513

## SECTION 096516 - RESILIENT FLOORING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes **vinyl** flooring in sheet and tile form.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For each type of flooring. Include flooring layouts, locations of seams, edges, columns, doorways, enclosing partitions, built-in furniture, cabinets, and cutouts.
  - 1. Show details of special patterns.
- C. Samples: For each exposed product and for each color and texture specified in manufacturer's standard size, but not less than **6-by-9-inch (150-by-230-mm)** sections.
  - 1. For heat-welding bead, manufacturer's standard-size Samples, but not less than **9 inches (230 mm)** long, of each color required.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Maintenance data.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Test-Response Characteristics: For resilient sheet flooring, as determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
  - 1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.
- B. FloorScore Compliance: Resilient sheet flooring shall comply with requirements of FloorScore certification.
- C. Low-Emitting Materials: Flooring system shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."

## 2.2 VINYL TILE FLOORING

- A. Basis-of-Design Product: Subject to compliance with requirements, **provide Mannington Commercial LVT, Natures Path collection or comparable product.**
- B. Product Standard: ASTM F 1913.
- C. Thickness: **0.100 inch (2.5 mm)**
- D. Size: 18 inches by 18 inches
- E. Colors and Patterns: **See A901- As selected by Architect from full range.**

## 2.3 VINYL SHEET FLOORING

- A. Basis-of-Design Product: Subject to compliance with requirements, **provide Mannington Commercial Heterogeneous Sheet Flooring, Vivendi, Woven, Parchment**
- B. Product Standard: ASTM F 1913.
- C. Thickness: **0.080 inch (2.03 mm)**
- D. Size: 9' x 30yd2
- E. Colors and Patterns: **See A901- As selected by Architect from full range.**

## 2.4 INSTALLATION MATERIALS

- A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by resilient sheet flooring manufacturer for applications indicated.
- B. Adhesives: Water-resistant type recommended by flooring and adhesive manufacturers to suit resilient sheet flooring and substrate conditions indicated.
  - 1. Adhesives shall have a VOC content of **50 g/L** or less.
  - 2. Adhesives shall comply with the testing and product requirements of the California Department of Public Health's "Standard Method for the Testing and Evaluation of Volatile Organic Chemical Emissions from Indoor Sources Using Environmental Chambers."
- C. Seamless-Installation Accessories for sheet flooring:
  - 1. Heat-Welding Bead: Manufacturer's solid-strand product for heat welding seams.
    - a. Color: **Match flooring**
  - 2. Chemical-Bonding Compound: Manufacturer's product for chemically bonding seams.



## PART 3 - EXECUTION

### 3.1 PREPARATION

- A. Prepare substrates according to resilient sheet flooring manufacturer's written instructions to ensure adhesion of resilient sheet flooring.
- B. Concrete Substrates: Prepare according to ASTM F 710.
  - 1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
  - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by resilient sheet flooring manufacturer. Do not use solvents.
  - 3. Alkalinity and Adhesion Testing: Perform tests recommended by resilient sheet flooring manufacturer. Proceed with installation only after substrate alkalinity falls within range on pH scale recommended by manufacturer in writing, but not less than 5 or more than **10 pH**.
  - 4. Moisture Testing: Proceed with installation only after substrates pass testing according to resilient sheet flooring manufacturer's written recommendations, but not less stringent than the following:
    - a. Perform relative humidity test using in situ probes according to ASTM F 2170. Proceed with installation only after substrates have a maximum **75** percent relative humidity level.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound; remove bumps and ridges to produce a uniform and smooth substrate.
- D. Do not install resilient flooring until it is the same temperature as the space where it is to be installed.
- E. Immediately before installation, sweep and vacuum clean substrates to be covered by resilient sheet flooring.

### 3.2 RESILIENT TILE FLOORING INSTALLATION

- A. Comply with manufacturer's written instructions for installing floor tile.
- B. Lay out floor tiles from center marks established with principal walls, discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths that equal less than one-half tile at perimeter.
  - 1. Lay tiles **square with room axis**
- C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
  - 1. Lay tiles **with grain running as indicated on the drawings**.

- D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.
- E. Extend flooring into toe spaces, door reveals, closets, and similar openings.
  - 1. Extend to center of door openings when transitioning to different floor finish material.
- F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent marking device.
- G. Install floor tiles on covers for telephone and electrical ducts, building expansion-joint covers, and similar items in finished floor areas. Maintain overall continuity of color and pattern between pieces of tile installed on covers and adjoining tiles. Tightly adhere tile edges to substrates that abut covers and to cover perimeters.
- H. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.
- I. Roll flooring with roller per manufacturer instructions, but roller weight shall not be less than 100lb.
- J. Seamless Installation:
  - 1. Heat-Welded Seams: Comply with ASTM F 1516. Rout joints and heat weld with welding bead to permanently fuse sections into a seamless flooring. Prepare, weld, and finish seams to produce surfaces flush with adjoining flooring surfaces.
  - 2. Chemically Bonded Seams: Bond seams with chemical-bonding compound to permanently fuse sections into a seamless flooring. Prepare seams and apply compound to produce tightly fitted seams without gaps, overlays, or excess bonding compound on flooring surfaces.

### 3.3 CLEANING AND PROTECTION

- A. Comply with manufacturer's written instructions for cleaning and protecting resilient sheet flooring.
- B. Cover resilient sheet flooring until Substantial Completion.

END OF SECTION 096516

## SECTION 096813 - CARPETING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes carpet and carpet tile.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Submittals:
  - 1. Product Data:
    - a. For carpet tile, documentation indicating compliance with testing and product requirements of CRI's "Green Label Plus" program.
    - b. For installation adhesive, documentation including printed statement of VOC content.
  - 2. Laboratory Test Reports: For carpet **and installation adhesives**, 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. Shop Drawings: Show the following:
  - 1. Columns, doorways, enclosing walls or partitions, built-in cabinets, and locations where cutouts are required in carpet tiles.
  - 2. Type of subfloor.
  - 3. Type of installation.
  - 4. Pattern of installation.
  - 5. Pattern type, location, and direction.
  - 6. Pile direction.
- D. Samples: For each exposed product and for each color and texture specified.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Product test reports.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

## 1.5 QUALITY ASSURANCE

- A. Fire-Test-Response Ratings: Where indicated, provide carpet tile identical to those of assemblies tested for fire response according to NFPA 253 by a qualified testing agency.

## 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Comply with CRI 104.

## 1.7 FIELD CONDITIONS

- A. Comply with CRI 104 for temperature, humidity, and ventilation limitations.

## 1.8 WARRANTY

- A. Special Warranty for Carpet Tiles: Manufacturer agrees to repair or replace components of carpet tile installation that fail in materials or workmanship within specified warranty period.
  - 1. Warranty does not include deterioration or failure of carpet tile due to unusual traffic, failure of substrate, vandalism, or abuse.
  - 2. Failures include, but are not limited to, more than 10 percent edge raveling, snags, runs, **dimensional stability, loss of tuft bind strength**, loss of face fiber, and delamination.
  - 3. Warranty Period: **10** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 CARPET – C1

- A. Product: Subject to compliance with requirements, provide Bigelow, Mohawk Group Commercial, Venturesome QS Tile
- B. Color: **As selected by Architect from manufacturer's full range**
- C. Fiber Type: Colorstrand SD Nylon
- D. Stitches: **10.6 inch (mm)**.
- E. Face Weight: **15.0 oz./sq. yd.** for finished carpet tile.
- F. Backing System: EcoFlex ICT
- G. Size: **24 by 24 inches (610 by 610 mm)**
- H. Applied Soil-Resistance Treatment: Dura Tech
  - 1. Passes GSA Stain release rating
- I. Performance Characteristics: As follows:

1. Appearance Retention Rating: **Severe traffic, 3.5** minimum according to ASTM D 7330.
2. Critical Radiant Flux Classification: Not less than **0.22 W/sq. cm.**
3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
4. Tuft Bind: Not less than **8 lbf (36 N)** according to ASTM D 1335.
5. Delamination: Not less than **4 lbf/in. (18 N/mm)** according to ASTM D 3936.
6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
8. Resistance to Insects: Comply with AATCC 24.
9. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
10. Colorfastness to Light: Not less than 4 after **60** AFU (AATCC fading units) according to AATCC 16, Option E.
11. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
12. Electrostatic Propensity: Less than **3.5** kV according to AATCC 134.
13. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.

## 2.2 CARPET – C2

- A. Product: Subject to compliance with requirements, provide Bigelow, Mohawk Group Commercial, Reckless QS Tile
- B. Color: **As selected by Architect from manufacturer's full range**
- C. Fiber Type: Colorstrand SD Nylon
- D. Stitches: **10.6 inch (mm).**
- E. Face Weight: **15.0 oz./sq. yd.** for finished carpet tile.
- F. Backing System: EcoFlex ICT
- G. Size: **24 by 24 inches (610 by 610 mm)**
- H. Applied Soil-Resistance Treatment: Dura Tech
  1. Passes GSA Stain release rating
- I. Performance Characteristics: As follows:
  1. Appearance Retention Rating: **Severe traffic, 3.5** minimum according to ASTM D 7330.
  2. Critical Radiant Flux Classification: Not less than **0.22 W/sq. cm.**
  3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
  4. Tuft Bind: Not less than **8 lbf (36 N)** according to ASTM D 1335.
  5. Delamination: Not less than **4 lbf/in. (18 N/mm)** according to ASTM D 3936.
  6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
  7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
  8. Resistance to Insects: Comply with AATCC 24.

9. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
10. Colorfastness to Light: Not less than 4 after **60** AFU (AATCC fading units) according to AATCC 16, Option E.
11. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
12. Electrostatic Propensity: Less than **3.5** kV according to AATCC 134.
13. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.

### 2.3 CARPET TILE – C3 (Walk-off)

- A. Basis-of-Design Product: Subject to compliance with requirements, provide **Mannington Commercial Entryway Systems walk-off carpet tile, Recoarse ii** or comparable product.
- B. Color: **As selected by Architect from manufacturer's full range**
- C. Fiber Type: Type 6,6 Nylon
- D. Face Weight: **38.0 oz./sq. yd. (g/sq. m)** for finished carpet tile.
- E. Backing System: 100% Synthetic
- F. Size: **24 by 24 inches (610 by 610 mm)**
- G. Applied Soil-Resistance Treatment: Sentry Soil Protection
- H. Performance Characteristics: As follows:
  1. Appearance Retention Rating: **Severe traffic, 3.5** minimum according to ASTM D 7330.
  2. Critical Radiant Flux Classification: Not less than **0.22 W/sq. cm.**
  3. Dry Breaking Strength: Not less than 100 lbf (445 N) according to ASTM D 2646.
  4. Tuft Bind: Not less than **8 lbf (36 N)** according to ASTM D 1335.
  5. Delamination: Not less than **4 lbf/in. (18 N/mm)** according to ASTM D 3936.
  6. Dimensional Tolerance: Within 1/32 inch (0.8 mm) of specified size dimensions, as determined by physical measurement.
  7. Dimensional Stability: 0.2 percent or less according to ISO 2551 (Aachen Test).
  8. Resistance to Insects: Comply with AATCC 24.
  9. Colorfastness to Crocking: Not less than 4, wet and dry, according to AATCC 165.
  10. Colorfastness to Light: Not less than 4 after **60** AFU (AATCC fading units) according to AATCC 16, Option E.
  11. Antimicrobial Activity: Not less than 2-mm halo of inhibition for gram-positive bacteria, not less than 1-mm halo of inhibition for gram-negative bacteria, and no fungal growth, according to AATCC 174.
  12. Electrostatic Propensity: Less than **3.5** kV according to AATCC 134.
  13. Emissions: Provide carpet tile that complies with testing and product requirements of CRI's "Green Label Plus" program.

## 2.4 INSTALLATION ACCESSORIES

- A. Trowelable Leveling and Patching Compounds: Latex-modified, hydraulic-cement-based formulation provided or recommended by carpet tile manufacturer.
- B. Adhesives: Water-resistant, mildew-resistant, nonstaining, pressure-sensitive type to suit products and subfloor conditions indicated, that complies with flammability requirements for installed carpet tile and is recommended by carpet tile manufacturer for releasable installation.
  - 1. Adhesives shall have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
  - 2. Adhesives 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."

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for maximum moisture content, alkalinity range, installation tolerances, and other conditions affecting carpet tile performance. Examine carpet tile for type, color, pattern, and potential defects.
- B. Wood Subfloors: Verify that underlayment surface is free of irregularities and substances that may interfere with adhesive bond or show through surface.
- C. Concrete Subfloors: Verify that concrete slabs comply with ASTM F 710.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.
- E. Preparation: Comply with CRI 104, Section 6.2, "Site Conditions; Floor Preparation," and with carpet tile manufacturer's written installation instructions for preparing substrates indicated to receive carpet tile installation.
- F. Installation: Comply with CRI 104, Section 14, "Carpet Modules," and with carpet tile manufacturer's written installation instructions.
- G. Installation Method: **As recommended in writing by manufacturer.**
- H. Maintain dye lot integrity. Do not mix dye lots in same area.
- I. Cut and fit carpet tile to butt tightly to vertical surfaces, permanent fixtures, and built-in furniture including cabinets, pipes, outlets, edgings, thresholds, and nosings. Bind or seal cut edges as recommended by carpet tile manufacturer.
- J. Extend carpet tile into toe spaces, door reveals, closets, open-bottomed obstructions, removable flanges, alcoves, and similar openings.

- K. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on finish flooring as marked on subfloor. Use nonpermanent, nonstaining marking device.
- L. Install pattern parallel to walls and borders.
  - 1. Install carpet tile in quarter turn layout.
- M. Perform the following operations immediately after installing carpet tile:
  - 1. Remove excess adhesive, seam sealer, and other surface blemishes using cleaner recommended by carpet tile manufacturer.
  - 2. Remove yarns that protrude from carpet tile surface.
  - 3. Vacuum carpet tile using commercial machine with face-beater element.
- N. Protect installed carpet tile to comply with CRI 104, Section 16, "Protecting Indoor Installations."

END OF SECTION 096813



## SECTION 099113 - EXTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on **the following exterior substrates:**
  - 1. Galvanized metal
  - 2. Wood
  - 3. Plastic trim fabrications.

#### 1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- E. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Samples: For each type of paint system and each color and gloss of topcoat.

#### 1.4 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.

- a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
  - b. Other Items: Architect will designate items or areas required.
2. Final approval of color selections will be based on mockups.
  - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, **provide product** listed in other Part 2 articles for the paint category indicated.

### 2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
  1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Provide materials that comply with VOC limits of authorities having jurisdiction.
- D. Colors: **As selected by Architect from manufacturer's full range**
  1. **30** percent of surface area will be painted with deep tones.

### 2.3 PRIMERS/SEALERS

- A. Primer, Bonding, Water Based: **MPI #17 X-Green**
  1. Sherwin Williams Preprite/ Pro Block, Interior Exterior Primer Sealer

### 2.4 METAL PRIMERS

- A. Primer, Alkyd, Anti-Corrosive for Metal: **MPI #79.**
  1. Sherwin Williams: Kem Kromik Universal Primer

## 2.5 WOOD PRIMERS

- A. Primer, Alkyd for Exterior Wood: **MPI #5.**
  - 1. Sherwin Williams Exterior Oil Based Wood primer

## 2.6 WATER-BASED PAINTS

- A. Latex, Exterior Semi-Gloss: **MPI #11.**
  - 1. Sherwin Williams; Emerald Exterior Acrylic Latex, Semi-Gloss

## 2.7 CLEAR OIL SEALER FOR EXTERIOR WOOD

- A. Cabot, Australian Timber Oil, Natural #3400

# 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.
- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
  - 1. Wood: 15 percent.
  - 2. Portland Cement Plaster: 12 percent.
  - 3. Gypsum Board: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
- D. Proceed with coating application only after unsatisfactory conditions have been corrected.
  - 1. Application of coating indicates acceptance of surfaces and conditions.

## 3.2 PREPARATION

- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates and paint systems indicated.
- B. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
  - 1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

### 3.3 APPLICATION

- A. Apply paints according to manufacturer's written instructions and recommendations in "MPI Manual."
- B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

### 3.4 CLEANING AND PROTECTION

- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
- B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.5 EXTERIOR PAINTING SCHEDULE

- A. Galvanized-Metal Substrates:
  - 1. System:
    - a. Prime Coat: Primer, galvanized metal, **as recommended in writing by topcoat manufacturer for exterior use on galvanized-metal substrates with topcoat indicated.**
    - b. Intermediate Coat: Exterior alkyd enamel matching topcoat.
    - c. Topcoat: Latex, Exterior Semi-Gloss: **MPI #11.**
- B. Wood substrates, nontraffic surfaces, including wood trim architectural woodwork, wood siding, wood fences, new and existing material
  - 1. Clear Oil Sealer
    - a. 1 coat on soffits
    - b. 2 coats on shingle siding
- C. Plastic Trim Fabrication Substrates:
  - 1. Latex System:
    - a. Prime Coat: Primer, bonding, water based, **MPI #17.**
    - b. Intermediate Coat: Latex, exterior, matching topcoat.
    - c. Topcoat: Latex, exterior semi-gloss (Gloss Level 5), **MPI #11.**

END OF SECTION 099113

## SECTION 099123 - INTERIOR PAINTING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes surface preparation and the application of paint systems on **interior substrates**.

#### 1.2 DEFINITIONS

- A. Gloss Level 1: Not more than 5 units at 60 degrees and 10 units at 85 degrees, according to ASTM D 523.
- B. Gloss Level 2: Not more than 10 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- C. Gloss Level 3: 10 to 25 units at 60 degrees and 10 to 35 units at 85 degrees, according to ASTM D 523.
- D. Gloss Level 4: 20 to 35 units at 60 degrees and not less than 35 units at 85 degrees, according to ASTM D 523.
- E. Gloss Level 5: 35 to 70 units at 60 degrees, according to ASTM D 523.
- F. Gloss Level 6: 70 to 85 units at 60 degrees, according to ASTM D 523.
- G. Gloss Level 7: More than 85 units at 60 degrees, according to ASTM D 523.

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product. Include preparation requirements and application instructions.
- B. Submittals:
  - 1. Product Data: For paints and coatings, including printed statement of VOC content.
  - 2. Laboratory Test Reports: For paints and coatings, documentation indicating that they meet 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 each type of paint system and in each color and gloss of topcoat.
- D. Product List: For each product indicated. Include printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

#### 1.4 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  - 1. Paint: **5** percent, but not less than **1 gal. (3.8 L)** of each material and color applied.

## 1.5 QUALITY ASSURANCE

- A. Mockups: Apply mockups of each paint system indicated and each color and finish selected to verify preliminary selections made under Sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
  - 1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
    - a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft. (9 sq. m).
    - b. Other Items: Architect will designate items or areas required.
  - 2. Final approval of color selections will be based on mockups.
    - a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, **provide products** listed in other Part 2 articles for the paint category indicated.

### 2.2 PAINT, GENERAL

- A. MPI Standards: Provide products that comply with MPI standards indicated and that are listed in its "MPI Approved Products List."
- B. Material Compatibility:
  - 1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
  - 2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.
- C. VOC Content: Products shall comply with VOC limits of authorities having jurisdiction **and, for interior paints and coatings applied at Project site, the following VOC limits, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24).**
  - 1. Flat Paints and Coatings: 50 g/L.
  - 2. Nonflat Paints and Coatings: 150 g/L.
  - 3. Primers, Sealers, and Undercoaters: 200 g/L.
  - 4. Floor Coatings: 100 g/L.
- D. Low-Emitting Materials: Interior paints and coatings 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.**

- 1. **30** percent of surface area will be painted with deep tones.

## 2.3 PRIMERS/SEALERS

- A. Primer Sealer, Interior, Institutional Low Odor/VOC: **MPI #149.**

- 1. Sherwin Williams, Pro Mar 200 Zero VOC, Interior Latex Primer

- B. Primer, Latex, for Interior Wood: **MPI #39.**

- 1. Sherwin Williams; preprite Problock, Primer Sealer

- C. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

## 2.4 METAL PRIMERS

- A. Primer, Rust-Inhibitive, Water Based: **MPI #107.**

- 1. Sherwin Williams, Pro Industrial Pro-Cryl Universal Primer

## 2.5 WATER-BASED PAINTS

- A. Latex, Interior, Institutional Low Odor/VOC, (Gloss Level 2): **MPI #144.**

- 1. Sherwin Williams, Pro Mar 200 Zero VOC, Interior Latex Low Sheen

- B. Latex, Interior, Institutional Low Odor/VOC, Semi-Gloss (Gloss Level 5): **MPI #147.**

- 1. Sherwin Williams; Emerald, Interior Acrylic Latex Semi-Gloss

- C. Sealer, Water Based, for Concrete Floors: **MPI #99.**

- 1. Sherwin Williams; H+C Wet Look Sealer

- D. Epoxy Paint, - MPI 115 X-Green

- 1. Sherwin Williams; Pro industrial, Water Based Catalyzed Epoxy, Eg Shell

## 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.

- B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:

- 1. Concrete: 12 percent.
  - 2. Masonry (Clay and CMU): 12 percent.

3. Wood: 15 percent.
  4. Gypsum Board: 12 percent.
  5. Plaster: 12 percent.
- C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.
  - D. Proceed with coating application only after unsatisfactory conditions have been corrected.
    1. Application of coating indicates acceptance of surfaces and conditions.
- 3.2 PREPARATION
- A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.
  - B. Remove hardware, covers, plates, and similar items already in place that are removable and are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
    1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
  - C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
    1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.
- 3.3 APPLICATION
- A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
  - B. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.
- 3.4 CLEANING AND PROTECTION
- A. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.
  - B. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.
- 3.5 INTERIOR PAINTING SCHEDULE
- A. Concrete Substrates, Traffic Surfaces:



1. Water-Based Clear Sealer System:
  - a. First Coat: Sealer, water based, for concrete floors, **MPI #99.**
  - b. Topcoat: Sealer, water based, for concrete floors, **MPI #99.**
- B. Steel Substrates:
  1. Institutional Low-Odor/VOC Latex System:
    - a. Prime Coat: Primer, rust-inhibitive, water based **MPI #107.**
    - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), **MPI #147.**
- C. Wood Substrates: Including **wood trim, architectural woodwork, doors, and wood-based panel products**
  1. Institutional Low-Odor/VOC Latex System:
    - a. Prime Coat: Primer, latex, for interior wood, **MPI #39.**
    - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    - c. Topcoat: Latex, interior, institutional low odor/VOC, semi-gloss (Gloss Level 5), **MPI #147.**
- D. **Gypsum Board** Substrates:
  1. Institutional Low-Odor/VOC Latex System:
    - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, **MPI #149.**
    - b. Intermediate Coat: Latex, interior, institutional low odor/VOC, matching topcoat.
    - c. Topcoat: Latex, interior, institutional low odor/VOC, (Gloss Level 2), **MPI #144.**
  2. Institutional epoxy System:
    - a. Prime Coat: Primer sealer, interior, institutional low odor/VOC, **MPI #149.**
    - b. Intermediate Coat: matching topcoat.
    - c. Topcoat: Water based Catalyzed Epoxy, (Gloss Level 2), **MPI #115.**

END OF SECTION 099123

## SECTION 101419 - DIMENSIONAL LETTER SIGNAGE

### 1.1 SUMMARY

#### A. Section Includes:

1. Cast dimensional characters.

### 1.2 ACTION SUBMITTALS

#### A. Product Data: For each type of product.

#### B. Shop Drawings: For dimensional letter signs.

1. Include fabrication and installation details and attachments to other work.
2. Show sign mounting heights, locations of supplementary supports to be provided by others, and accessories.
3. Show message list, typestyles, graphic elements, and layout for each sign at least **half size**.
4. Show locations of electrical service connections.
5. Include diagrams for power, signal, and control wiring.

#### C. Samples: For each exposed product and for each color and texture specified.

#### D. Sign Schedule: Use same designations specified or indicated on Drawings or in a sign schedule.

### 1.3 CLOSEOUT SUBMITTALS

#### A. Maintenance data.

### 1.4 WARRANTY

#### A. Special Warranty: Manufacturer agrees to repair or replace components of signs that fail in materials or workmanship within specified warranty period.

1. Warranty Period: **Five** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 DIMENSIONAL LETTER SIGNS, GENERAL

### 2.2 PERFORMANCE REQUIREMENTS

- A. Delegated Design: Engage a qualified professional engineer, as defined in Section 014000 "Quality Requirements," to design sign structure and anchorage of **dimensional character** Building mounted signage sign type see A 201
- B. Thermal Movements: For exterior allow for thermal movements from ambient and surface temperature changes.
  - 1. Temperature Change: 120 deg F
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

### 2.3 DIMENSIONAL CHARACTERS

- A. Cast Characters **A 201**: Characters with uniform faces, sharp corners, and precisely formed lines and profiles, and as follows:
  - 1. Character Material: Cast **aluminum**.
  - 2. Character Height: **as noted on the drawings**
  - 3. **Font: as selected by Architect From Manufacturers standard**
  - 4. Finishes:
    - a. Integral Aluminum Finish: **as selected by Architect from full range of industry colors and color densities**
  - 5. Mounting: **Concealed studs**.

### 2.4 ACCESSORIES

- A. Fasteners and Anchors: Manufacturer's standard as required for secure anchorage of signage, noncorrosive and compatible with each material joined, and complying with the following:
  - 1. Use concealed fasteners and anchors unless indicated to be exposed.
  - 2. For exterior exposure, furnish **stainless-steel** devices unless otherwise indicated.
  - 3. Exposed Metal-Fastener Components, General:
    - a. Fabricated from same basic metal and finish of fastened metal unless otherwise indicated.
  - 4. Sign Mounting Fasteners:
    - a. Concealed Studs: Concealed (blind), threaded studs welded or brazed to back of sign material, screwed into back of sign assembly, or screwed into tapped lugs cast integrally into back of cast sign material, unless otherwise indicated.

## 2.5 FABRICATION

- A. General: Provide manufacturer's standard sign assemblies according to requirements indicated.
  - 1. Mill joints to a tight, hairline fit. Form assemblies and joints exposed to weather to resist water penetration and retention.
  - 2. Provide welds and brazes behind finished surfaces without distorting or discoloring exposed side. Clean exposed welded and brazed connections of flux, and dress exposed and contact surfaces.
  - 3. Conceal connections if possible; otherwise, locate connections where they are inconspicuous.
  - 4. Internally brace signs for stability and for securing fasteners.
  - 5. Provide rebates, lugs, and brackets necessary to assemble components and to attach to existing work. Drill and tap for required fasteners. Use concealed fasteners where possible; use exposed fasteners that match sign finish.
  - 6. Castings: Fabricate castings free of warp, cracks, blowholes, pits, scale, sand holes, and other defects that impair appearance or strength. Grind, wire brush, sandblast, and buff castings to remove seams, gate marks, casting flash, and other casting marks before finishing.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install signs using mounting methods indicated and according to manufacturer's written instructions.
  - 1. Install signs level, plumb, true to line, and at locations and heights indicated, with sign surfaces free of distortion and other defects in appearance.
  - 2. Before installation, verify that sign surfaces are clean and free of materials or debris that would impair installation.
  - 3. Corrosion Protection: Coat concealed surfaces of exterior aluminum in contact with grout, concrete, masonry, wood, or dissimilar metals, with a heavy coat of bituminous paint.
- B. Mounting Methods:
  - 1. Concealed Studs: Using a template, drill holes in substrate aligning with studs on back of sign. Remove loose debris from hole and substrate surface.
    - a. Thin or Hollow Surfaces: Place sign in position and flush to surface, install washers and nuts on studs projecting through opposite side of surface, and tighten.
- C. Remove temporary protective coverings and strippable films as signs are installed.

END OF SECTION 101419

## SECTION 102239 – FOLDING PANEL PARTITION

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Panel folding partitions.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Include plans, elevations, sections, details, attachments to other work.
- C. Samples: For each exposed product and for each color and texture specified.

#### 1.3 QUALITY ASSURANCE

- A. Surface-Burning Characteristics: As determined by testing identical products according to ASTM E 84 by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
  - 1. Flame-Spread Index: **25** or less.
  - 2. Smoke-Developed Index: **450** or less.

### PART 2 - PRODUCTS

#### 2.1 FOLDING PANEL PARTITION

- A. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**:
  - 1. Modernfold, Inc; a DORMA Group company.
    - a. Paired Panel Partition: Acousti-seal ENCORE
    - b. STC rating 54 (minimum)
- B. General: Top-supported, horizontal-sliding, manually operated folding doors.
- C. Panel Width: 48 inch max; size last panel in run to fill opening.
- D. Outer Covering: Complying with indicated surface-burning characteristics; attached to door support frames in a concealed manner at sufficient intervals to prevent sagging and separation and to permit on-site removal and repair, with vertical seams located in valleys and material hemmed at top and bottom.
- E. Sweep Seals: Manufacturer's standard top and bottom sweep seals on both sides.
- F. Carriers: Four-wheel carriers at lead post and two-wheel carriers at intermediate spacing, as necessary for size and weight of partition, to ensure secure, easy, and quiet operation.

1. Doors 96 Inches (2438 mm) High or Less: Nylon wheels on steel shafts.
  2. Doors More Than 96 Inches (2438 mm) High: Ball-bearing wheels with nylon tread and steel shafts.
- G. Tracks: Manufacturer's standard metal track made of extruded aluminum or formed steel with factory-applied, corrosion-resistant finish. Limit track deflection, independent of structural supporting system, to no more than 80 percent of bottom clearance.
1. Head Trim: Prefinished wood molding for surface-mounted tracks.
  2. Galvanized-steel sheet or aluminum subchannel for forming pocket for recessed suspension track.
  3. Metal ceiling contact guard to protect finished ceiling surface from damage by moving top sweep seals; with finish matching other exposed metal.
- H. Hardware: Manufacturer's standard heavy-duty, manually operated metal pulls and latches as follows:
1. Finish: **Clear-anodized aluminum**
  2. Latch: Operable from **one** side of closed door (larger room side)
- I. Jamb Molding: Manufacturer's standard wood or metal molding at closing jamb as required for light-tight jamb closure.
- J. Stacking: Tiebacks to maintain door in stacked position.
- K. Stacking Configuration: Stack **at one end of opening**
- L. Opening Size: **As indicated on Drawings**

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. General: Install folding doors complying with manufacturer's written installation instructions. Install track in one piece.
- B. Standard Floor Clearances: 1/4 to 3/4 inch (6.4 to 19 mm) maximum (above floor finish).
- C. Adjust units as necessary to ensure smooth, quiet operation without warping or binding. Adjust hardware to function smoothly. Confirm that latches engage accurately and securely without forcing or binding.

END OF SECTION 083513

## SECTION 102800 - TOILET, BATH, AND LAUNDRY ACCESSORIES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Public/Private-use washroom accessories.
  - 2. Custodial accessories.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Product Schedule: Indicating types, quantities, sizes, and installation locations by room of each accessory required.
  - 1. Identify locations using room designations indicated.
  - 2. Identify products using designations indicated.

#### 1.3 INFORMATIONAL SUBMITTALS

- A. Warranty: 1 year for all Bobrick washroom accessories.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.5 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

#### 1.6 WARRANTY

- A. Special Mirror Warranty: Manufacturer's standard form in which manufacturer agrees to replace mirrors that develop visible silver spoilage defects and that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: 15 years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PUBLIC-USE WASHROOM ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Bobrick Washroom Equipment, Inc.

B. Toilet Tissue (Roll) Dispenser:

1. Basis-of-Design Product: Bobrick B-6857.
2. Description: Dual Roll Dispenser.
3. Mounting: Surface mounted.
4. Operation: Noncontrol delivery with standard spindle.
5. Capacity: Designed for 5-1/2 inch (139.7 mm) diameter tissue rolls.
6. Material and Finish: Stainless steel, w/ satin finish.

C. Paper Towel (Folded) Dispenser:

1. Basis-of-Design Product: Bobrick B-262.
2. Mounting: Surface mounted.
3. Minimum Capacity: 400 C-fold or 525 multifold towels.
4. Material and Finish: Stainless steel, w/ satin finish.
5. Lockset: Tumbler type.
6. Refill Indicators: None.

D. Liquid-Soap Dispenser:

1. Basis-of-Design Product: Bobrick B-2112.
2. Description: Designed for dispensing soap in liquid or lotion form.
3. Mounting: Horizontally oriented, surface mounted.
4. Capacity: 40 fl oz. (0.001).
5. Materials: Stainless steel, w/ satin finish. Push valve dispenser, vandal resistant.
6. Lockset: Special key required.
7. Refill Indicator: Window type.

E. Grab Bar:

1. Basis-of-Design Product(s): Bobrick B-5806x18", B-5806x36", B-5806x42".
2. Mounting: Flanges with concealed fasteners.
3. Material: Stainless steel w/ satin finish, 0.047 inch (1.2 mm) thick, type 304.
  - a. Finish: Smooth finish (satin) on ends and slip-resistant texture in grip area.
4. Outside Diameter: 1-1/4 inches (32 mm).
5. Configuration and Length: As indicated on Drawings.

F. Sanitary-Napkin Disposal Unit:

1. Basis-of-Design Product: Bobrick B-254.



2. Mounting: Surface mounted.
3. Door or Cover: Self-closing panel covers disposal opening. Door has tumbler lock.
4. Receptacle: Removable leak-proof 1.2 gal. plastic receptacle.
5. Material and Finish: Stainless steel w/ satin finish.

G. Mirror Unit:

1. Basis-of-Design Product: Bobrick B-290 2442
2. Frame: One-piece, roll-formed ¾ inch x ¾" (19 mm x 19 mm) angle-frame. Type 304 stainless steel angle with satin finish. Corners heliarc welded, ground and polished smooth.
  - a. Corners: Welded and ground smooth.
3. Hangers: Produce rigid, tamper- and theft-resistant installation, using method indicated below.
  - a. Wall bracket of galvanized steel, equipped with concealed locking devices requiring a special tool to remove.
4. Size: 24 inch (609.6 mm) by 36 inch (914.4 mm).

H. Robe Hook:

1. Basis-of-Design Product: Bobrick B-233.
2. Description: Single-prong unit.
3. Material and Finish: 11 Gauge (3.2 mm) type 304 Stainless steel w/ satin finish.

I. Diaper-Changing Station:

1. Basis-of-Design Product: Koala Kare KB108-01.
2. Description: Horizontal unit that opens by folding down from stored position and with child-protection strap.
  - a. Engineered to support a minimum of 200-lb (90.7-kg) static load when opened.
3. Mounting: Surface mounted, with unit projecting not more than 4 inches (100 mm) from wall when closed.
4. Operation: Concealed pneumatic cylinder and hinge structure provides controlled, slow opening and closing of bed.
5. Material and Finish: FDA approved rotationally-molded high-density polyethylene with Microban antimicrobial. Reinforced full-length steel-on-steel hinge mechanism and mounting hardware included. Contoured changing surface area is 307.72 sq. in. (198,529 sq. mm) Includes nylon safety straps and bag hooks.
6. Liner Dispenser: Built in liner dispenser for use with 3-ply chemical free biodegradable sanitary liners.

## 2.2 CUSTODIAL ACCESSORIES

A. Manufacturers: Subject to compliance with requirements, provide products by the following:

1. Bobrick Washroom Equipment, Inc.

B. Mop and Broom Holder:

1. Basis-of-Design Product: Bobrick B-223x24.
2. Description: Mop and broom holder of type-304 stainless steel. Recommended mounting height above floor' 72 inch (1,829 mm).
3. Length: 24 inch (609.6 mm).
4. Hooks: None.
5. Mop/Broom Holders: Three, spring-loaded, rubber cam holders.
6. Material and Finish: Stainless steel, w/ satin finish.

## 2.3 FABRICATION

A. Keys: Provide universal keys for internal access to accessories for servicing and resupplying. Provide keys to Owner's representative.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

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

END OF SECTION 102800

## SECTION 104413 - FIRE PROTECTION CABINETS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes fire-protection cabinets for portable fire extinguishers.

#### 1.2 RELATED SECTIONS

- A. Section 263100 “ Fire Alarm system” for integrated monitoring of extinguishers

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: For fire-protection cabinets.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Maintenance data.

#### 1.5 COORDINATION

- A. Coordinate size of fire-protection cabinets to ensure that type and capacity of fire extinguishers indicated are accommodated.
- B. Coordinate sizes and locations of fire-protection cabinets with wall depths.
- C. Coordination with Fire alarm system and connections

#### 1.6 SEQUENCING

- A. Apply **decals** on field-painted fire-protection cabinets after painting is complete.

### PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Fire-Rated Fire-Protection Cabinets: Listed and labeled to comply with requirements in ASTM E 814 for fire-resistance rating of walls where they are installed.

- B. Provide cabinets with integrated monitoring systems connected to fire alarm system meeting the requirements of NFPA 1, paragraph 13.6.2, among others.

## 2.2 FIRE-PROTECTION CABINET

- A. Cabinet Type: Suitable for fire extinguisher.
  - 1. Basis-of-Design Product: Subject to compliance with requirements, provide:
    - a. JL Industries, Inc.; a division of the Activar Construction Products Group.
- B. Cabinet Construction: **Nonrated or 1-hour fire rated as required for partition type indicated on drawings.**
  - 1. Fire-Rated Cabinets: Construct fire-rated cabinets with double walls fabricated from 0.043-inch (1.09-mm) thick cold-rolled steel sheet lined with minimum 5/8-inch (16-mm) thick fire-barrier material. Provide factory-drilled mounting holes.
- C. Cabinet Material: **Aluminum sheet**
- D. Semirecessed Cabinet: One-piece combination trim and perimeter door frame overlapping surrounding wall surface with exposed trim face and wall return at outer edge (backbend).
  - 1. Rolled-Edge Trim: **2-1/2-inch (64-mm)** backbend depth.
- E. Cabinet Trim Material: **Aluminum sheet**
- F. Door Material: **Aluminum sheet**
- G. Door Style: **Fully glazed panel with frame**
- H. Door Glazing: **Tempered float glass (clear)**
- I. Door Hardware: Manufacturer's standard door-operating hardware of proper type for cabinet type, trim style, and door material and style indicated.
- J. Accessories:
  - 1. Door Lock: **Cam lock that allows door to be opened during emergency by pulling sharply on door handle.**
  - 2. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location.
    - a. Identify fire extinguisher in fire-protection cabinet with the words "**FIRE EXTINGUISHER**"
      - 1) Location: Applied to **cabinet door**
      - 2) Application Process: **Pressure-sensitive vinyl letters.**
      - 3) Lettering Color: **Red.**
      - 4) Orientation: **Vertical**
- K. Materials:

1. Aluminum: ASTM B 221 (ASTM B 221M), with strength and durability characteristics of not less than Alloy 6063-T5 for aluminum sheet. ASTM B 221 (ASTM B 221M) for extruded shapes.
  - a. Finish: **Clear anodic** or **Color anodic**
  - b. Color: **As selected by Architect from full range of industry colors and color densities.**
2. Tempered Float Glass: ASTM C 1048, Kind FT, Condition A, Type I, Quality q3, 3 mm thick, **Class 1 (clear)**

## 2.3 FABRICATION

- A. Fire-Protection Cabinets: Provide manufacturer's standard box (tub) with trim, frame, door, and hardware to suit cabinet type, trim style, and door style indicated.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Prepare recesses for **semirecessed** fire-protection cabinets as required by type and size of cabinet and trim style.
- B. Install fire-protection cabinets in locations and at mounting heights indicated.
- C. Fire-Protection Cabinets: Fasten cabinets to structure, square and plumb.
- D. Connect cabinets to fire alarm monitoring system.
- E. Identification: Apply at locations indicated.
- F. Adjust fire-protection cabinet doors to operate easily without binding. Verify that integral locking devices operate properly.
- G. Test connection to Fire alarm system as part of fire alarm testing with local Authority having Jurisdiction.

END OF SECTION 104413

## SECTION 104416 - FIRE EXTINGUISHERS

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes portable, hand-carried fire extinguishers **and mounting brackets for fire extinguishers.**

#### 1.2 RELATED SECTIONS

- A. Section 104413 "Fire Protection Cabinets"
- B. Section 263100 "Fire Alarm system" for integrated monitoring of extinguishers

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

#### 1.5 COORDINATION

- A. Coordinate type and capacity of fire extinguishers with fire-protection cabinets to ensure fit and function.
- B.
- C. Coordination with Fire alarm system and connections

#### 1.6 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace fire extinguishers that fail in materials or workmanship within specified warranty period.
  - 1. Warranty Period: **Six** years from date of Substantial Completion.

## PART 2 - PRODUCTS

### 2.1 PERFORMANCE REQUIREMENTS

- A. NFPA Compliance: Fabricate and label fire extinguishers to comply with NFPA 10, "Portable Fire Extinguishers."
- B. Provide Extinguishers with integrated monitoring systems connected to fire alarm system meeting the requirements of NFPA 1, paragraph 13.6.2, among others.
- C. Fire Extinguishers: Listed and labeled for type, rating, and classification by an independent testing agency acceptable to authorities having jurisdiction.

### 2.2 PORTABLE, HAND-CARRIED FIRE EXTINGUISHERS

- A. Fire Extinguishers: Type, size, and capacity for each **fire-protection cabinet** indicated.
  - 1. Manufacturers: Subject to compliance with requirements, **provide products by one of the following**
    - a. Amerex Corporation.
    - b. Guardian Fire Equipment, Inc.
  - 2. Instruction Labels: Include pictorial marking system complying with NFPA 10, Appendix B
- B. Multipurpose Dry-Chemical Type ABC: UL-rated 10 lb nominal capacity, with monoammonium phosphate-based dry chemical in manufacturer's standard enameled container.

### 2.3 MOUNTING BRACKETS

- A. Mounting Brackets: Manufacturer's standard steel, designed to secure fire extinguisher to wall or structure, of sizes required for types and capacities of fire extinguishers indicated, with plated baked-enamel finish.
  - 1. Manufacturers: Subject to compliance with requirements, **provide products by the same manufacturer as the extinguisher unit.**
- B. Identification: Lettering complying with authorities having jurisdiction for letter style, size, spacing, and location. Locate as indicated by Architect.
  - 1. Identify bracket-mounted fire extinguishers with the words "FIRE EXTINGUISHER" in red letter decals applied to mounting surface.

## PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Examine fire extinguishers for proper charging and tagging.
- B. Install fire extinguishers **and mounting brackets** in locations indicated and in compliance with requirements of authorities having jurisdiction.
- A. Mounting Brackets: Fasten mounting brackets to surfaces, square and plumb, at locations indicated.
- B. Connect Extinguishers to fire alarm monitoring system.
- C. Test connection to Fire alarm system as part of fire alarm testing with local Authority having Jurisdiction.

END OF SECTION 104416



## SECTION 107516 - GROUND-SET FLAGPOLES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes ground-set flagpoles made from **aluminum**

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
  - 1. Include construction details, material descriptions, dimensions of individual components and profiles, operating characteristics, fittings, accessories, and finishes for flagpoles.
- B. Delegated-Design Submittal: For flagpoles.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For flagpoles to include in operation and maintenance manuals.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain flagpoles as complete units, including fittings, accessories, bases, and anchorage devices, from single source from single manufacturer.

#### 2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Flagpole assemblies, including anchorages and supports, shall withstand design loads indicated within limits and under conditions indicated.
  - 1. Wind Loads: Determine according to NAAMM FP 1001. Basic wind speed for Project location is 120 mph.

#### 2.3 ALUMINUM FLAGPOLES

- A. Product: subject to the following requirements provide the illuminator from Flagpole Warehouse, model ILIH25 with internal Halyard beacon.

- B. Aluminum Flagpoles: **Entasis**-tapered flagpoles fabricated from seamless extruded tubing complying with ASTM B 241/B 241M, Alloy 6063, with a minimum wall thickness of 3/16 inch (4.8 mm).
- C. Exposed Height: **25 feet (7.5 m)**
- D. Metal Foundation Tube: Manufacturer's standard corrugated-steel foundation tube, 0.060-inch (1.52-mm) wall thickness with 3/16-inch (4.8-mm) steel bottom plate and support plate; 3/4-inch (19-mm) diameter, steel ground spike; and steel centering wedges welded together. Galvanize foundation tube after assembly. Furnish loose hardwood wedges at top of foundation tube for plumbing pole.

## 2.4 MISCELLANEOUS MATERIALS

- A. Drainage Material: Crushed stone, or crushed or uncrushed gravel; coarse aggregate.
- B. Sand: ASTM C 33/C 33M, fine aggregate.
- C. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.

## 2.5 ALUMINUM FINISHES

- A. Clear Anodic Finish.

# PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Prepare uncoated metal flagpoles that are set in foundation tubes by painting below-grade portions with a heavy coat of bituminous paint.
- B. Foundation Tube: Place foundation tube, center, and brace to prevent displacement during concreting. Place concrete. Plumb and level foundation tube and allow concrete to cure.
- C. Sleeves: Locate and secure sleeves in forms by bracing to reinforcement and forms.

## 3.2 FLAGPOLE INSTALLATION

- A. General: Install flagpoles where indicated and according to manufacturer's written instructions.
- B. Foundation Tube: Place flagpole in tube, seated on bottom plate between steel centering wedges, and install hardwood wedges to secure flagpole in place. Place and compact sand in foundation tube and remove hardwood wedges. Seal top of foundation tube with a 2-inch (50-mm) layer of elastomeric joint sealant and cover with flashing collar.

END OF SECTION 107516

## SECTION 122413 - ROLLER WINDOW SHADES

### PART 1 - GENERAL

#### 1.1 SUMMARY

##### A. Section Includes:

1. Manually operated black-out roller shades with single rollers.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show fabrication and installation details for roller shades, including shadeband materials, their orientation to rollers, and their seam and batten locations.
- C. Samples: For each exposed product and for each color and texture specified.

#### 1.3 CLOSEOUT SUBMITTALS

- A. Operation and maintenance data.

#### 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Fabricator of products.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Source Limitations: Obtain roller shades from single source from single manufacturer.

#### 2.2 MANUALLY OPERATED SHADES WITH SINGLE ROLLERS

- A. Chain-and-Clutch Operating Mechanisms: With continuous-loop bead chain and clutch that stops shade movement when bead chain is released; permanently adjusted and lubricated.
  1. Chain-Retainer Type: **Chain tensioner, sill mounted**
  2. Spring Lift-Assist Mechanisms: Provide for shadebands that weigh more than **10 lb (4.5 kg)** or for shades as recommended by manufacturer, whichever criterion is more stringent.

- B. Rollers: Corrosion-resistant steel or extruded-aluminum tubes of diameters and wall thicknesses required to accommodate operating mechanisms and weights and widths of shadebands indicated without deflection. Provide with permanently lubricated drive-end assemblies and idle-end assemblies designed to facilitate removal of shadebands for service.
- C. Mounting Hardware: Brackets or endcaps, corrosion resistant and compatible with roller assembly, operating mechanism, installation accessories, and mounting location and conditions indicated.
- D. Roller-Coupling Assemblies: Coordinated with operating mechanism and designed to join up to three inline rollers into a multiband shade that is operated by one roller drive-end assembly.
- E. Shadebands:
  - 1. Shadeband Material: **Light-blocking fabric**
  - 2. Shadeband Bottom (Hem) Bar: Steel or extruded aluminum.
    - a. Type: **Exposed with endcaps and integral light seal at bottom where it meets the sill.**
    - b. Color and Finish: **As selected by Architect from manufacturer's full range**
- F. Installation Accessories:
  - 1. Front Fascia: Aluminum extrusion that conceals front and underside of roller and operating mechanism and attaches to roller endcaps without exposed fasteners.
  - 2. Endcap Covers: To cover exposed endcaps.
  - 3. Closure Panel and Wall Clip: Removable aluminum panel designed for installation at bottom of site-constructed ceiling recess or pocket and for snap-in attachment to wall clip without fasteners.
  - 4. Side Channels: With light seals and designed to eliminate light gaps at sides of shades as shades are drawn down. Provide side channels with shadeband guides or other means of aligning shadebands with channels at tops.
  - 5. Bottom (Sill) Channel or Angle: With light seals and designed to eliminate light gaps at bottoms of shades when shades are closed.
  - 6. Installation Accessories Color and Finish: **As selected from manufacturer's full range**

## 2.3 SHADEBAND MATERIALS

- A. Shadeband Material Flame-Resistance Rating: Comply with **NFPA 701**. Testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.

## PART 3 - EXECUTION

### 3.1 ROLLER SHADE INSTALLATION

- A. Install roller shades level, plumb, and aligned with adjacent units according to manufacturer's written instructions.

1. Opaque Shadebands: Located so shadeband is not closer than **2 inches (51 mm)** to interior face of glass. Allow clearances for window operation hardware.
  2. Install within window opening jambs
- B. Adjust and balance roller shades to operate smoothly, easily, safely, and free from binding or malfunction throughout entire operational range.
- C. Clean roller shade surfaces, after installation, according to manufacturer's written instructions.
- D. Replace damaged roller shades that cannot be repaired, in a manner approved by Architect, before time of Substantial Completion.

END OF SECTION 122413

**BARRINGTON TOWN OFFICES  
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## **SECTION 221001 - SUMMARY OF WORK**

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### **Part 1 - GENERAL REQUIREMENTS**

**Identification:** Refer to the Contract (Owner-Contractor Agreement) for name location, project number and abbreviated identification of the work of the project.

**Contract Documents:** Requirements of the work are contained in the contract documents, and include cross-references herein to published information, which is not necessarily bound therewith.

**Verbal Summary of Work:** Contractor to provide complete in-place mechanical systems, as shown on drawings and/or as needed for a complete and proper installation, tested and in compliance with all Federal, State and local codes for the project.

### **Part 2 - PRODUCTS**

Not used.

### **Part 3 - EXECUTION**

Not used.

**END OF SECTION 221001**

# **SECTIONS 221007 - DEFINITIONS AND STANDARDS**

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## **Part 1 - GENERAL**

### **Definitions**

**General Requirements:** Provisions of Division-1 sections, General Requirements, apply to the entire work of the Contract.

**Indicated:** Shown on drawings or written into other portions of contract documents.

**Approved by Architect/Engineer:** In no case releases Contractor from responsibility to fulfill requirements of contract documents.

**Furnish:** Supply and deliver to project site, ready for unloading, unpacking, assembly, installation, and similar subsequent requirements.

**Install:** Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

**Provide:** Furnish and install, complete and ready for intended use.

**Coordinate:** Work together harmoniously in a common action or effort to accomplish specified work.

**Installer:** Entity (firm or person) engaged to install work, by Contractor, subcontractor or sub-subcontractor. Installers are required to be skilled in work they are engaged to install.

**Specification Text Format:** Imperative language is directed at Contractor, unless otherwise noted.

**Overlapping/Conflicting Requirements:** Most stringent (generally) requirement written directly into contract documents is intended and will be enforced, unless specifically detailed language written into the contract documents clearly indicates that a less stringent requirement is acceptable. Refer uncertainties to Architect/Engineer for decision before proceeding.

**Minimum Requirements:** Indicated requirements are for a specific minimum acceptable level of quality/quantity, as recognized in the industry. Actual work must comply (within specified tolerances), or may exceed minimums within reasonable limits. Refer uncertainties to Architect/Engineer before proceeding.

**Abbreviations, Plural Words:** Abbreviations, where not defined in contract documents, will be interpreted to mean the normal construction industry terminology, determined by recognized grammatical rules, by the Architect/Engineer. Plural words will be interpreted as singular and singular words will be interpreted as plural where applicable for context of contract documents.

**Change Orders:** All change order proposals by Contractor must include a complete breakdown of time, hourly rate, materials cost, and overhead/profit markups.



**Testing Laboratory:** An independent entity engaged for the project to provide inspections, tests, interpretations, reports and similar services.

## **Standards and Regulations**

**Industry Standards:** Applicable standards of construction industry have same force and effect on performance of the work as if copied directly into contract documents or bound and published therewith. Standards referenced in contract documents or in governing regulations have precedence over non-referenced standards, insofar as different standards may contain overlapping or conflicting requirements. Comply with standards in effect as of date of contract documents, unless otherwise indicated.

## **Part 2 - PRODUCTS**

Not used.

## **Part 3 - EXECUTION**

Not used.

**END OF SECTION 221007**

## **SECTION 221010 - BASIC REQUIREMENTS**

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### **Part 1 - GENERAL**

#### **Related Documents**

The general provisions of Contract, including General and Supplemental General Conditions of the Contract and Division 1 Specification Sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly or indirectly.

The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail.

All trade subcontractors are to note that the organization of these Specifications into divisions, sections, and paragraphs, and likewise the arrangement of the Drawings, is set up for the convenience of understanding the scope of the Work only. This structuring shall not control the General Contractor in dividing the Work among trade subcontractors or in establishing the extent of the Work to be performed by any trade.

#### **Commissioning Requirements**

Where there is a third party Commissioning Agent, Contractor shall comply with the commissioning requirements specified in various Divisions, Sections, and Schedules, as provided by the Commissioning Agent. These Sections and Schedules may include, but shall not be limited to, Project Closeout; Operations and Maintenance Data; Testing, Adjusting and Balancing; and Commissioning Requirements. Each of these Sections and Schedules, including those that are part of Division 22, shall include the name of the Commissioning Agent, and Contractor shall direct any questions regarding these requirements to the Commissioning Agent.

Where there is overlap between the Kohler & Lewis requirements and those of the Commissioning Agent, Contractor shall adhere to both sets of requirements. Where there is conflict, the most stringent requirements shall apply.

#### **Reference Symbols**

Symbols shown on the drawings show approximate location of fixtures, ductwork, piping, and other equipment, unless otherwise detailed. The exact location will be governed by structural conditions, appearance and obstructions. This is not to be construed so as to permit redesigning systems.

It is not intended that the drawings show in detail every fitting and appurtenance, etc., but all material necessary to complete the systems in accordance with the practices of the trade and to the complete satisfaction of the Architect will be provided without additional recompense under this Division of the specifications.

No deviations from the layout will be made without written approval of the Architect.

## **Conflicting Requirements**

In case of overlapping or conflicting requirements or indications of any type, in any part or parts of any of the Contract Documents, follow the most expensive/stringent version unless approved otherwise in writing by Engineer.

## **Submittals**

**Shop Drawings and Product Data:** Refer to Division 1 for requirements. The following paragraphs supplement the requirements of Division 1, when not in conflict with them.

Submittal Binder. Submit to Mechanical Engineer one and only one copy of all mechanical shop drawings and product data at one time in a hard-sided three-ring binder, organized to the extent possible by specification sections and tabbed. (If there are a few long lead time products, it is acceptable to submit them early before the rest of the binder is assembled. Also, controls submittals often come later in a separate notebook.) Submit the number of copies to other recipients as required by Division 1. (Copies to other recipients may be paper or electronic as specified by those other recipients.) GC must review submittals prior to receipt of Engineer and submittals must be sent “through channels” unless other arrangements are made with Architect. Submit resubmittals separately. Do not resubmit approved items.

Submittal Binder Contents. For all proposed products, submittal data must include the complete model number and all required options and accessories, such as size, material, and finish. For proposed products that are not an exact match to a specified model number, submittal data must also show in writing all features and required options listed in the Specifications and in the Schedules. For all products, any specified requirements that are not met by the proposed product shall be specifically listed and noted. Provide shop drawings of mechanical room layout if different from the layout shown on the Drawings.

Mechanical Contractor shall ensure that ATC Contractor receives a complete copy of the mechanical and electrical drawings, specifications, addenda, and submittals.

Resubmittals. Resubmittals shall be three-hole punched and organized by specification sections.

See “Part 3 – Execution” for requirements for the submittal process.

**Record Documents:** Refer to Division 1 for requirements. The following paragraphs supplement the requirements of Division 1.

Provide a new, complete clean set of CAD generated mechanical/plumbing drawings to indicate, in a distinctive CAD generated line weight, revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned to column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.

*Provide an additional drawing(s) as required showing equipment schedule summaries in table format of all major installed HVAC equipment. Provide a similar drawing(s) as required for plumbing items ONLY if specifically requested by Owner.*

Bind drawings into a set with a cover sheet indicating the job name and location, and the name and address of the Contractor. Also provide a copy of the as-built drawings on CD.

Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

*Where required by Owner, add schedules to as-built drawings. Schedules shall be Kohler and Lewis schedules, modified to indicate actual installed equipment.*

**Operation and Maintenance Data:** Refer to the Division 1 Section for procedures and requirements for preparation and submittal of maintenance manuals. In addition to the information required by Division 1 for Maintenance Data, include the following information:

Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.

Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

Servicing instructions and lubrication charts and schedules.

A periodic preventative maintenance and inspection schedule for each system and for the components in the system, listing inspection and maintenance operations to be performed daily, weekly, monthly, quarterly and annually as required to provide for long life and faithful performance of the systems. The schedule shall be prepared by the Mechanical Contractor. It shall be presented in a concise 8-1/2x11 chart format to serve as a checklist for maintenance personnel. (Copies of manufacturer's product literature do not satisfy this requirement.)

One copy of the valve charts in clear plastic covers and one copy bound in each operating and maintenance manuals.

One copy of spare parts list bound in each operating and maintenance manuals.

**Warranties:** Compile and assemble the warranties specified in Division 22, into a separated set of three ring binders, tabulated and indexed for easy reference.

Provide complete warranty information for each item of product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

## Quality Assurance

**Permits and Inspections:** Refer to General Conditions and Requirements.

**Codes:** Refer to the General Conditions and Requirements. Comply with the applicable requirements of the applicable editions of the following publications in addition to codes referenced elsewhere in this Division.

International Plumbing Code

International Mechanical Code

NFPA

Life Safety Code

*State Energy Codes as applicable, including Vermont Commercial Building Energy Standards (VT), IECC (NH, MA), and Ashrae 90.1 (MA).*

Applicable State and Local Codes

## Spare Parts

**General:** Provide spare parts in accordance with the Spare Parts Schedule at the end of this section, or as indicated in individual specification sections when a schedule is not included in this section. Provide the quantity indicated on the schedule. Spare filters are filters in addition to the filters that come with the equipment and the new filters to be installed in equipment when it is turned over to the Owner.

The Owners stock of spare parts shall not be used by the Contractor during the Warrantee period.

**Submittal:** Submit a list of spare parts indicating the quantity of each item and include this list in the Owner's Manual.

**Delivery:** Deliver the spare parts to a site designated by the Owner before substantial completion of the Project. Obtain itemized receipt from Owner.

## Delivery, Storage, and Handling

Deliver products to project in the manufacturer's original, unopened packages and containers properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

Coordinate delivery of materials supplied by Contractor to be built into work done by others to avoid delay.

Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

Store equipment and materials at the site, unless off-site storage is authorized in writing. Storage of materials and equipment on-site will be in a clean, well-ventilated area designated by General Contractor. Protect stored equipment and materials from damage.

## **Part 2 - PRODUCTS**

**General Product Requirements:** Provide products as indicated and as required for a complete system. Products must comply with every item of the descriptions in the Specifications and in the Schedules. In case of a discrepancy between the specified make/model and the description, the more expensive/stringent version shall prevail.

**Manufacturers:** Comply with Division One requirements. For products not specified by make and model number, or for those so specified but accompanied by the term “or equal,” Contractor may propose any available products that comply with the Contract Documents.

Many products are specified by make and model number. The designation of a specific manufacturer or manufacturer’s product in the Mechanical Schedules is for the purpose of establishing the minimum requirements for the mechanical equipment specified. Provide either the product designated, or, where more than one manufacturer is listed, the equal product of one of the other listed manufacturers that complies with minimum requirements, warranty coverage, utility connections, capacity, type of construction, available finishes, available colors, operational features, accessories, controls, efficiency, energy consumption, and availability, etc. Note that where an alternate manufacturer is listed without a model number, there may or may not be an “equal” product available. In all cases, all products within a given type must be from a single manufacturer. It shall be the contractor’s responsibility to provide all necessary information for comparison.

**Substitutions:** Where a product is specified by make and model number, products from manufacturers not listed are not allowed except as follows: Contractors wishing to substitute comparable products by manufacturers not listed must submit a written request to the Mechanical Engineer for approval at least ten (10) days prior to the date for receipt of Bids. Each such request shall include catalog data and any other information necessary for a complete evaluation. Any deviations from the product specified must be noted.

The Contractor shall be solely responsible for coordinating the installation of accepted substitutions of comparable products making such changes as may be required for the work to be completed in all respects. Any additional cost, or any loss or damage arising from the substitution of any material or method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner, Architect or Mechanical Engineer, unless such substitution was made at the written request or direction of the Owner, Architect or Mechanical Engineer.

## Part 3 - EXECUTION

### Preparation

**Pre-bid Site Visit:** The Contractor, before submitting a proposal, shall visit the site with plans and specifications in hand to determine the conditions under which work will be performed. No request for extra compensation will be considered for hardships encountered that would have been disclosed or made evident by a reasonable examination of the site.

**Pre-submittal Meeting:** The Engineer is available to meet with the Contractor at the office of the Engineer in Keene, N.H. to review in person the first draft of the submittals (prior to the formal submission of multiple copies), and for assistance as requested in other aspects of the project. The Engineer has found that this meeting significantly expedites the submittal preparation and review process, and results in fewer time-consuming and potentially expensive errors.

**Submittal Process:** Refer to Division 1 for requirements. The following paragraphs supplement the requirements of Division 1, when not in conflict with them.

Prior Contractor Review: Submittal of shop drawings, product data, and samples will be accepted only when stamped or indicated "Approved," "Reviewed," or "No Exception Taken" by the Contractor in accordance with the provisions of "Shop Drawings, Product Data and Samples" Section of AIA Document A201 and Division 1 "SUBMITTALS". Data submitted from subcontractors and material suppliers directly to the Architect/Engineer will not be processed. The Contractor is responsible for: noting any omissions in the submittal; confirming and correlating all quantities, weights and dimensions; selecting fabrication processes and techniques of construction; and coordinating work with that of all other trades. Where an alternate manufacturer is submitted, Contractor shall verify that the alternate product has all the features and required options as specified, and that these features and options are shown on the submittal, and that all dimensions are compatible, and shall make all required adjustments at no extra cost to Owner.

Engineer Review: The Engineer will review submittals to check general conformance with the Contract Documents. This review in no way relieves the Contractor of responsibility to comply with the Contract Documents as described above and elsewhere.

**Coordination:** Coordinate equipment and materials installation with other building components.

Coordinate exact location of exposed ducts, pipes, and equipment with Architect before installation.

Verify all dimensions by field measurements.

Arrange for chases, slots, and openings in other building components to allow for mechanical installations.

Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.

Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.

Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, light fixtures, and other installations.

Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

## **Installation**

**General:** Install products in accordance with manufacturer's written instructions. Comply with manufacturer's recommendations for types of materials, project conditions, and intended use. Coordinate the installation in accordance with final shop drawings, field measurements, manufacturer's data, and as specified herein. Refer to Division-1 Section 01040 "Project Coordination" Paragraph 3.1.

Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.

Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

**Access:** Install equipment and materials to provide required access for servicing and maintenance. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 22 Section 221055 "BASIC MECHANICAL MATERIALS AND METHODS."

Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. Extend all grease fittings to an accessible location.

**Rough-In:** Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Refer to equipment specifications for rough-in requirements.

## **Cutting and Patching**

Do not endanger or damage installed Work through procedures and processes of cutting and patching.

Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations.

No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.

Perform cutting, fitting, and patching of mechanical equipment and materials required to:



Uncover Work to provide for installation of ill-timed Work;

Remove and replace defective Work;

Remove and replace Work not conforming to requirements of the Contract Documents;

Remove samples of installed Work as specified for testing;

Install equipment and materials in existing structures; and

Upon written instructions from the Architect/Mechanical Engineer, uncover and restore Work to provide for Architect/Mechanical Engineer observation of concealed Work.

Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including, but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.

Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

Locate identify, and protect mechanical and electrical services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to changeover.

## **Air Sealing**

Identify and properly seal all penetrations through the building air barrier system as described in the Air Barriers section of the specifications.

## **Protection**

Initiate and maintain protection and other precautions required throughout the construction period to ensure that mechanical systems components will be free of damage or deterioration, and are visibly clean of dirt and debris at the time of Substantial Completion.

## **Correction of Defective Work**

Promptly correct work rejected by Architect or failing to conform to requirements of the Contract Documents. Refer to General Conditions.

## **Work Area Clean-Up**

**During Construction:** Keep premises and surrounding areas free from accumulation of waste materials or rubbish; Each Contractor and Subcontractor shall dispose of his waste materials and rubbish daily off site. Refer to General Conditions and applicable Division-1 Sections.

**Final Clean-up:** Remove waste materials, rubbish, tools, equipment, and surplus materials. Refer to General Conditions and Division-1 Sections.

## **Factory Start-up and Owner's Training**

Provide factory start-up for specified equipment. Factory start-up and training shall be performed by the manufacturer's authorized representative. The Contractor may assist and augment the start-up and training, but in no cases shall this assistance be in lieu of the work required of the authorized factory representative.

Submit copy of "Confirmation of Factory Start-Up" form signed by Owner's representative at completion of Project.

Demonstrate operation and maintenance of plumbing systems to Owner's personnel prior to completion and final payment.

## **Cleaning**

Refer to Division-22 Section 221990 "TESTING, ADJUSTING, AND BALANCING" for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.

## **Touch-up Painting**

Touch-up all marred, scratched, or rusty surfaces on factory painted equipment, with touch-up paint provided by manufacturer.

## **Final Inspection**

**Final Inspection Checklist:** Prior to any request for the Engineer to perform a Final Inspection of the work, or any portion thereof, the Contractor shall complete a Contractor Final Inspection Check List on a form provided by the Engineer.

**END OF SECTION 221010** (revised 12/5/2014)

**CONFIRMATION OF FACTORY START-UP  
AND OWNER'S TRAINING**

**BARRINGTON TOWN OFFICES**

Owner's representative affirms that:

- He/she has read the "Factory Start-up" and "Owner's Training" paragraphs near the end of applicable specifications sections, and that
- All start-up work and training required has been provided, and has been fully satisfactory as far as can be determined at this time.
- Factory Start-up and Owner's Training sessions took place at the following place, dates, and times:

F-2H, F-38H Faucets (adjustments, swing spout): \_\_\_\_\_

Hot Water Heaters: \_\_\_\_\_

Other (list): \_\_\_\_\_

Owner's representative: \_\_\_\_\_

Date \_\_\_\_\_

## CONTRACTOR FINAL INSPECTION LIST - PLUMBING

Project: \_\_\_\_\_ Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

*Instructions:* Place a check mark in the box for each line item that is complete. Use "NA" for items that are Not Applicable. Return the list and we will arrange for a final inspection.

Item	<u>Notes/Location</u>
<b>Record-Keeping Items Have Been Submitted</b>	
<input type="checkbox"/> Balance report on Plumbing Balance Valves. <i>(Required before Final Inspection.)</i> < <b>Note</b>	
<input type="checkbox"/> As-built drawings.	
<input type="checkbox"/> Maintenance manual in binder.	
<input type="checkbox"/> Maintenance and Inspection Chart.	
<input type="checkbox"/> Warranty information in binder.	
<b>Project Close-Out</b>	
<input type="checkbox"/> Seismic Bracing has been inspected by Registered Engineer.	
<input type="checkbox"/> Pipes are labeled.	
<input type="checkbox"/> Pipes are insulated; ends are sealed with vinyl clad sealer.	
<input type="checkbox"/> Valve tag schedule is on the wall.	
<input type="checkbox"/> Rooms and all equipment is clean, with packing labels removed.	
<input type="checkbox"/> All plumbing equipment is painted as per spec; no rusty pipes or equipment.	
<input type="checkbox"/> Thermometers and pressure gages are installed and oriented properly.	
<input type="checkbox"/> Water entrance is complete: meter, strainer, backflow preventer, PRV.	
<input type="checkbox"/> Backflow preventer air gap is piped to floor drain.	
<input type="checkbox"/> Mixing valves are piped and set properly.	
<b>Exterior Walls/Roof/Equipment/Piping</b>	
<input type="checkbox"/> Wall hydrants are sealed. Valve bodies are in heated space.	
<input type="checkbox"/> Roof drain domes are on tight; minimum 8 inch hole cut in membrane.	
<input type="checkbox"/> Condensates from equipment are piped and trapped.	
<input type="checkbox"/> Pipes are insulated; saddles used under pipes.	
<b>Rooms with Plumbing Fixtures</b>	
<input type="checkbox"/> Fixtures are clean, square, tight to walls or floor, with all joints sealed.	
<input type="checkbox"/> Fixture labels and protective coverings are removed.	
<input type="checkbox"/> Faucet handles are set parallel to back wall, opening toward sink/lav.	
<input type="checkbox"/> Faucet aerators are present, correct, and clean.	
<input type="checkbox"/> ADA faucets are provided on ADA sinks and lavs.	
<input type="checkbox"/> Faucets, spouts, and flush valves are tightly mounted.	
<input type="checkbox"/> Mop basin has tight spout, hose, and three mop hangers.	
<input type="checkbox"/> Escutcheons are on all piping, proper sizes, with tight setscrews.	
<input type="checkbox"/> Piping under lavs and sinks has no leaks, and is chrome plated.	
<input type="checkbox"/> Water hammer arrestors are installed with access doors or above ceiling.	
<input type="checkbox"/> Floor drain trap primers are installed.	
<input type="checkbox"/> Floor drains and floor sinks have clean sediment buckets.	
<input type="checkbox"/> Adequate access is provided for all types of tanks and interceptors.	

## **SECTION 221030 - ELECTRICAL REQUIREMENTS**

### **Part 1 - GENERAL**

**Summary:** This section specifies the basic requirements for electrical components for mechanical equipment. These components include, but are not limited to starters, disconnect switches and motors. It includes motors that are factory-installed as part of equipment and appliances as well as field-installed motors.

**Starters, Disconnects and Variable Frequency Drives:** Provide disconnects and starters and variable frequency drives as required for proper installation and operation of equipment. Confirm electrical characteristics of equipment specified with electrical installer before ordering. Coordinate starter and drive characteristics with Control Contractor. See Division 22 Section “Variable Frequency Drives.”

**Motors:** Confirm electrical characteristics of all motors, including factory installed motors provided with pumps, air handling units, energy recovery units, condensing units, and other equipment, with Electrical Contractor before ordering.

**Electrical Characteristics:** Confirm electrical characteristics of all starters, disconnects, variable frequency drives, motors, and other equipment with electrical installer before ordering. This Contractor shall be responsible for all action that may be necessary (by any contractor or subcontractor) to correct any problems due to the failure of Contractor to adhere to this paragraph.

**Codes and Standards:** Comply with National Electrical Code (NFPA 70). Electrical components and materials shall be UL labeled.

### **Part 2 - PRODUCTS**

#### **Starters, Electrical Devices and Wiring**

**Motor Starter Characteristics:** NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations which shall have NEC proper class and division. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition. All motor starters must be compatible with DDC controls.

**Manual Switches Characteristics:** Pilot lights and extra positions for multi-speed motors. Melting alloy type thermal overload relays where motors are not internally overload protected.

**Magnetic Starters Characteristics:** Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated. Trip-free thermal overload relays, each phase. Interlocks, switches and similar devices as required for coordination with control requirements of Division-22 Controls sections. Built-in 120 volts control circuit transformer, fused from line side, where service exceeds 240 volts. Externally operated manual reset. Under-voltage release or protection.

**Motor Connections:** Flexible conduit, except where plug-in electrical cords are specifically indicated.

## **Disconnects**

**Fusible Switches:** Fused, each phase; heavy duty; horsepower rated; non-teasible quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; capacity and characteristics as indicated.

**Non-Fusible Switches:** Horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment larger than 2 horsepower, switches shall be the same as fusible type.

## **Motors**

**General:** Requirements below apply to motors covered by this section except as otherwise indicated.

**Frequency rating:** 60 Hz.

**Voltage rating:** Determined by voltage of circuit to which motor is connected.

**Capacity:** Sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100 percent of rated capacity.

**Temperature Rise:** Based on 40°C ambient except as otherwise indicated.

## **Polyphase motors**

**General:** Squirrel-cage induction-type conforming to the following requirements except as otherwise indicated. NEMA Design Letter Designation: "B".

**Motor Efficiency:** Nominal efficiency equal to or greater than that listed in Minimum Three Phase Motor Efficiency Schedule for that type and rating of motor, unless otherwise stated.

**Internal Thermal Overload Protection for Motors:** For motors so indicated, protection automatically opens control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.

**Bearings:** Double-shielded, prelubricated ball bearings suitable for radial and thrust loading of the application.

**Multi-Speed Motors:** Provide separate winding for each speed

**All Polyphase Motors:** Corona free, inverter-duty rated, energy efficient, squirrel-cage induction, design B units with ratings, characteristics, and features coordinated with and approved by drive manufacturer.

**Rugged Duty Motors:** Totally enclosed with 1.25 minimum service factor. Provide motors with regreasable bearings and equipped with capped relief vents. Insulate windings with nonhygroscopic material external finish shall be chemical resistant paint over corrosion resistant primer. Provide integral condensate drains.

**Motors for Reduced Inrush Starting:** Coordinate with indicated reduced inrush controller type and with characteristics of drive equipment load. Provide required wiring leads in motor terminal box to suit control method.

## **Single Phase Motors**

**General:** Conform to the following requirements except as otherwise indicated.

**Energy Efficient Motors:** One of the following types as selected to suit the starting torque and other requirement of the specific motor application.

Permanent Split Capacitor.

Split-Phase Start, Capacitor-Run.

Capacitor-Start, Capacitor-Run.

**Shaded-Pole Motors:** Use only for motors smaller than 1/20 hp.

**Internal Thermal Overload Protection for Motors:** For motors so indicated, protection automatically opens the power supply circuit to the motor, or a control circuit arranged for external connection. Protection operates when winding temperature exceeds a safe value calibrated to the temperature returns to normal range except as otherwise indicated.

**Bearings:** Belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, prelubricated sleeve bearings may be used for other single phase motors.

## **Part 3 - EXECUTION**

Not used.

**END OF SECTION 221030**

## **SECTION 221055 - BASIC MATERIALS AND METHODS**

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### **Part 1 - GENERAL**

**Submittals:** Submit product data for each specialty and for access doors.

### **Part 2 - PRODUCTS**

**Zinc Content:** Brass alloys of valves and all other hydronic/plumbing products shall contain no more than 15% zinc. Compliance with this requirement shall be shown on all relevant product submittals.

**Mercury:** Products and materials containing mercury are not allowed on this project. Prohibited products include, but are not limited to mercury thermostats (whether wall mounted or unit mounted), mercury float switches, mercury thermometers, mercury boiler pressure or temperature controls, and mercury switches.

**No Antibacterial:** *No part of any product provided under this Division shall be anti-bacterial or anti-microbial using a chemical or physical biocide. Nanoparticle silver is prohibited.*

**Gaskets and Seals:** Provide thickness, material, and type suitable for fluid to be handled, and design temperatures and pressures. Pipe lubricants and sealants such as fluorocarbon resin tape and pipe dopes (Teflon<sup>®</sup>) are not recommended due to evidence that they are subject to leakage when used with propylene glycol solutions. Do not use Viton A, Neoprene, or Nitrite Buna N gaskets or other materials that are not compatible with propylene glycol at elevated temperatures.

**Unions:** Malleable-iron, Class 150 for low pressure service and class 250 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

**Dielectric Unions:** Provide dielectric unions with appropriate end connections for the pipe materials in which installed (screwed, soldered, or flanged), which effectively isolate dissimilar metals, to prevent galvanic action, and stop corrosion.

**Escutcheons:** Chrome-plated, stamped steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter. Outside diameter shall completely cover the opening in floors, walls, or ceilings.

**Sleeves:** Steel Sleeves: Schedule 40 steel pipe, ASTM A120.

**Sleeve Seals:** Modular type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

**Drip Pans:** Provide drip pans fabricated from corrosion-resistant sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.

**Steel Access Doors:** Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.



**Frames:** 16-gauge steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling, or with a perforated flanges with wallboard bead for units installed in gypsum wall board.

**Flush Panel Doors:** 14-gauge sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.

**Wet Areas:** Provide stainless steel access doors and frames if located in toilet rooms or wet areas.

## **Part 3 - EXECUTION**

**Unions:** Install unions at the final connection to each piece of equipment and plumbing fixture having 2" and smaller connections, and elsewhere as indicated.

**Dielectric Unions:** Install dielectric unions to connect piping materials of dissimilar metals.

**Pipe Sleeves:** Install pipe sleeves where piping passes through masonry walls, floors, roofs, and fire-rated assemblies. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves. Sleeves are not required for core drilled holes.

**Acoustic Sealing of Pipes and Duct Penetration:** For all pipe and duct penetrations that are not fire-sealed, pack space around duct or pipe with fiberglass material and caulk with non hardening resilient caulk.

**Escutcheons:** Install escutcheons on pipes exposed to view that pass through walls, floor or ceilings unless Architect waives this requirement and accepts a neat firestopping job as acceptable. Fasten escutcheons securely to pipe and tight to surface. Note that for insulated piping, the insulation should pass through the wall opening and the opening should be firestopped. If the escutcheon/insulation cannot completely cover the opening, then patch the opening to match existing surface.

### **Field Quality Control:**

Follow safety procedures recommended in the Material Safety Data Sheets.

Finish surfaces of firestopping which are to remain exposed in the completed work to a uniform and level condition.

All areas of work must be accessible until inspection by the applicable Code Authorities.

Correct unacceptable firestops and provide additional inspection to verify compliance with this specification.

## **Cleaning:**

Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.

Leave finished work in neat, clean condition with no evidence of spill overs or damage to adjacent surfaces.

**Drip Pans:** Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments; weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.

**Access Doors:** Install access doors for all equipment or devices that require access for servicing, maintenance or replacement. Equipment requiring access doors includes, but is not limited to the following; valves, in-line expansion compensators, water hammer arresters, trap primers, balance valves, air vents.

Coordinate location of access doors with Architect before installing equipment requiring access where access doors may have aesthetic implications.

Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.

Adjust hardware and panels after installation for proper operation.

**Painting - General:** Paint all exposed steel or cast iron or wrought iron piping and fittings that are not insulated, including hydronic piping (Black), oil piping (Black), and gas piping (Yellow). Paint all steel brackets and support structures in the mechanical room that are not galvanized (Black). Paint all expansion tanks, air separators, and other equipment that is not insulated and that does not come with a finish coat of gloss enamel paint (Blue, to match boilers). Remove all packing labels before painting. Touch up any damaged paint on pumps, boilers and other equipment. There should be absolutely no visible rust anywhere in the mechanical room or elsewhere in the building and any mechanical system components.

**Painting - Preparation:** Clean all equipment before painting and remove all shipping labels. Do not remove warning labels of manufacturer name tags. Use high quality oil based industrial enamel paint.

**END OF SECTION 221055** Revised 6/23/2015

## **SECTION 221084 - FIRESTOPPING FOR PLUMBING SYSTEMS**

### **Part 1 - GENERAL**

**Related Documents:** Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

**Definitions:** Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

#### **General Description Of The Work Of This Section**

Only tested firestop systems shall be used in specific locations as follows:

Penetrations for the passage of plumbing piping, through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

Repetitive plumbing penetrations in fire-rated floor assemblies.

**Related Work Of Other Sections:** Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

**Quality Assurance:** A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

Firestop System installation must meet requirements of ASTM E 814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

**Submittals:** Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions.

Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in drawing.

Submit material safety data sheets provided with product delivered to job-site.

**Installer Qualifications:** Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

The work is to be installed by a contractor with at least one of the following qualifications:

- FM 4991 Approved Contractor
- UL Approved Contractor
- Firestop Manufacturer's Accredited Fire Stop Specialty Contractor

**Delivery, Storage, And Handling:**

Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

Do not use damaged or expired materials.

**Project Conditions:** Do not use materials that contain flammable solvents.

**Scheduling:** Schedule installation of cast in place firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

Weather conditions: Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

## Part 2 - PRODUCTS

**Firestopping, General:** Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

Use only firestop products that have been UL 1479 or ASTM E 814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

**Acceptable Manufacturers:** Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

Hilti, Inc.  
3M Electrical Products Div./3M.  
Specified Technologies, Inc.

## PART 3 - EXECUTION

### Preparation

**Verification of Conditions:** Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

Verify penetrations are properly sized and in suitable condition for application of materials.

Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

Do not proceed until unsatisfactory conditions have been corrected.

### **Coordination**

Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete.

Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

### **Installation**

Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

Protect materials from damage on surfaces subjected to traffic.

### **Field Quality Control**

Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

Keep areas of work accessible until inspection by applicable code authorities.

Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.

Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

### **Adjusting And Cleaning**

Remove equipment, materials and debris, leaving area in undamaged, clean condition.

Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

**Identification:** Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Coordinate with Architect before installing if labels will be exposed to view in finished spaces. Include the following information on labels:

The words: “Warning-Through-Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage.”

Contractor’s name, address, and phone number.

Through-penetration firestop system designation of applicable testing and inspecting agency.

Date of installation.

Through-penetration firestop system manufacturer’s name.

Installer’s name.

**END OF SECTION 221084**

# FIRESTOPPING DETAIL SCHEDULE BARRINGTON TOWN OFFICES

**MANUFACTURER: SPECIFIED TECHNOLOGIES, INC.**

CONSTRUCTION TYPE	CONCRETE/MASONRY			FRAME	
ASSEMBLY TYPE	FLOOR	WALL	WALL	FLOOR	WALL
RATING	1 OR 2	1 OR 2	3 HR	1 OR 2	1 OR 2
<i>STEEL (<math>\leq 6"</math>) CAST IRON (<math>\leq 12"</math>) OR COPPER (<math>\leq 4"</math>) PIPE WITH 2" MAX INSULATION</i>	CAJ-5087 LCI Intumescent	CAJ-5087 LCI Intumescent	CAJ-5165 LCI Intumescent	FC-5043 LCI Intumescent	WL-5014 LCI Intumescent
<i>STEEL (<math>\leq 8"</math>) CAST IRON (<math>\leq 12"</math>) OR COPPER (<math>\leq 6"</math>) UNINSULATED</i>	CAJ-1240 LCI Intumescent	CAJ-1240 LCI Intumescent	CAJ-1240 LCI Intumescent	FC-1074 LCI Intumescent	WL-1049 LCI Intumescent
<i>ABS/PVC PIPE <math>\leq 4"</math> WITHOUT INSULATION</i>	CAJ-2574 SSBLU Wrap Strip	CAJ-2574, SSWBLU Wrap Strip	CAJ-2594 SSWBLU Wrap Strip	FC-2034 LCC Collar	WL-2059 LCC Collar

Notes: Refer to architectural plans for all assembly ratings. Submit drawing for each application including applications encountered on job but not indicated above. Submit product information on all fire-stop products. Contractor shall label penetrations in concealed locations with detail if using permanent marker.

"EJ" is a system designed and drafted by specified technologies, inc. If the field application does not meet a UL system.

Specified Technologies, Inc.  
210 Evans Way  
Somerville, NJ 08876  
800.992.1180  
[www.stifiirestop.com](http://www.stifiirestop.com)



## SECTION 221100 - VALVES

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### Part 1 - GENERAL

**Submittals:** Submit product data, for all valves. Include country of origin, body material, valve design, pressure and temperature classifications, end connection details, seating materials, trim material and arrangement, dimensions and required clearances, and installation instructions.

**Pressure and Temperature Ratings:** as required to suit system pressures and temperatures.

**Sizes:** Unless otherwise indicated, provide valves of same size as upstream pipe size.

**End Connections:** as specified in the individual valves specifications.

Threads: Comply with ANSI B2.1. ANSI/ASME B1.20.1.

Solder-Joint: Comply with ANSI B16.18. Do not use solder joints for HVAC applications.

**Country of Origin:** Valves shall be manufactured in the United States, Canada, or Italy.

### Part 2 – PRODUCTS

**Zinc Content:** Brass alloys of valves and all other hydronic/plumbing products shall contain no more than 15% zinc. Compliance with this requirement shall be shown on all relevant product submittals.

**Balance Valves:** 200 psig water working pressure, 250°F maximum operating temperature, bronze body and ball valve. Provide with connections for portable differential pressure meter with integral check valves and seals. Valve shall have identification scale to register degree of valve opening.

**Gate Valves - 2 Inch and Smaller:** MSS SP-80; Class 125, body and bonnet of ASTM V62 cast bronze, threaded or solder ends, solid disc, copper-silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel. Class 150 valve meeting the above shall be used where pressure requires.

**Gate Valves - 2-1/2 Inch and Larger:** MSS SP-70; Class 125 iron body, bronze mounted, with body and bonnet conforming to ASTM A 126 Class B, flanged ends, and "Teflon" impregnated packing and two-piece packing gland assembly.

**Ball Valves –Plumbing:** See “Water Distribution System” section.

**Globe Valves - 2 Inch and Smaller:** MSS SP-80; Class 125, body and screwed bonnet of ASTM B 62 cast bronze, threaded or solder ends, brass or replaceable composition disc, copper silicon alloy stem, brass packing gland, "Teflon" impregnated packing, and malleable iron handwheel. Class 150 valves meeting the above shall be used where pressure requires.

**Butterfly Valves - 2-1/2 Inch and Larger:** MSS SP-67; rated at 200 PSI; cast-iron body conforming to ASTM a 126, Class B. Provide valves with field replaceable EPDM sleeve, aluminum bronze disc, stainless steel stem, and EPDM O-ring stem seals. Provide lever operators with locks for sizes 2 through

6 inches and gear operators with position indicator for sizes 8 through 24 inches. Provide lug or wafer type as indicated. Provide lug valves on dead-end service or requiring additional body strength.

**Relief Valves:** Provide proper size relief valve, in accordance with ASME Boiler and Pressure Vessel Codes, for indicated capacity of the appliance for which installed.

**Swing Check Valves - 2 Inch and Smaller:** MSS SP-80; Class 125, cast bronze body and cap conforming to ASTM B 62, horizontal swing, with a bronze disc, and having threaded or solder ends.

**Temperature & Pressure Relief Valves:** Bronze body, test lever, thermostat, complying with ANSI Z21.22 listing requirements for temperature discharge capacity. Provide temperature relief at 210 °F, and pressure relief at 150 PSI.

**Wafer Check Valves - (Non-Slam):** Class 250, cast iron body, replaceable lapped bronze seat, lapped and balanced twin bronze flappers and stainless steel trim. Valve shall be designed to open and close at approximately one foot differential pressure. Twin flappers shall be loaded with a stainless steel torsion spring to minimize flapper drag and assure even non-slam checking action.

## **Part 3 - EXECUTION**

**General:** Refer to other Division 22 Section and to plans for locations of valves. Install valves and unions for each fixture and item of equipment in a manner to allow equipment removal without system shut-down. Unions are not required on flanged devices. Install 3-valve bypass around each pressure reducing valve using throttling type valves. Install valves where required for proper operation of piping and equipment, including valves in branch lines where necessary to isolate sections of piping.

**Application:** Use gate, ball, and butterfly valves for shut-off duty; globe, ball, and butterfly for throttling duty.

**Application for Vermont State Projects:** Provide ball valves up to 2-1/2" and butterfly 3" and up. Do not use gate valves. Globe valves are not needed except for control valves, which are specified elsewhere.

**Access:** Locate valves for easy access and provide separate support where necessary.

**Stems:** Install valves with stems pointed up, in vertical position where possible, but in no case with stems pointed downward from horizontal plane unless unavoidable. Install valve drains with hose-end adapter with screw cap and chain for each valve that must be installed with stem below horizontal plane. Install extended-stem valves, where insulation is indicated, arranged in proper manner to receive insulation.

**END OF SECTION 221100 (12/11/15)**

## **SECTION 221125 - EXPANSION COMPENSATION**

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### **Part 1 - GENERAL**

**Submittals:** Submit manufacturer's product data for each expansion compensation device.

### **Part 2 - PRODUCTS**

**General:** Provide packless expansion joints where indicated for piping systems, with materials, and pressure/temperature ratings selected by Installer to suit intended service. Select packless expansion joints to provide 200% absorption capacity of piping expansion between anchors.

**Manufacturer:** Keflex or Metraflex

**Expansion Compensators:** Pressure rated for 200 psi, 2-ply stainless steel bellows, brass shrouds and end fittings for copper piping systems, or 2-ply stainless steel bellows, carbon steel shrouds and end fittings for steel piping systems. Provide guides and anchors in accordance with manufacturer's recommendations.

### **Part 3 - EXECUTION**

**Expansion Compensators:** Install expansion joints and compensators where indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Install in accordance with manufacturer's instructions. Provide pipe anchors and pipe alignment guides as required and in accordance with manufacturer's recommendations. Align units properly to avoid end loading and torsional stress.

**Expansion Loops:** Fabricate expansion loops as indicated, in locations indicated, and elsewhere as determined by Installer for adequate expansion of installed piping system. Subject loop to cold spring which will absorb 50% of total expansion between hot and cold conditions. Provide pipe anchors and pipe alignment guides as indicated, and elsewhere as determined by Installer to properly anchor piping in relationship to expansion loops.

**Expansion Compensation for Risers and Terminals:** Install connection between piping mains and risers with at least 5 pipe fittings including tee in main. Install connections between piping risers and terminal units with at least 4 pipe fittings including tee in riser.

**END OF SECTION 221125**

# **SECTION 221135 - METERS AND GAGES**

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## **INDUSTRIAL GLASS AND BIMETAL THERMOMETERS**

### **Part 1 - GENERAL**

**Submittals:** Submit manufacturers' product data for thermometers and pressure gages.

### **Part 2 - PRODUCTS**

**Thermometers:** Industrial Glass Thermometers, nine-inch scale, adjustable angle type, molded ABS or aluminum case, glass window, accuracy one percent of full scale, 3/4 inch NPT connection; 6-inch stem; blue non-mercury fill with no "extremely hazardous substances" as reported on the MSDS. Provide proper size thermowells for all thermometers.

Manufacturer/Model (manufacturer must be 100% mercury-free and provide a written statement to that effect to Engineer): Trerice BX91406-GLW with Blue Spirit Fill, Weiss 9VU6, Weksler AS5L-9, or equal.

*Application: Acceptable for all, except at water heaters in residential units.*

**Remote Thermometers:** *Direct Mount Bimetal Thermometers, three-inch dial, bimetal, angle form (rear connect) for well mounted in the side of the pipe, stainless steel case, glass window, no external calibration screw, accuracy one percent of full scale, one-half inch NPT connection, stainless steel stem, silicone damping, four-inch stem. Provide proper size thermowells for all thermometers.*

*Manufacturer/Model: Trerice (not available), Weiss 3BM4 (angle), Weksler (not available), or equal.*

*Application: Not allowed, except in (1) boiler rooms with only one boiler (new or existing), where all thermometer locations are no more than eight feet above the floor, or (2) at all locations outside boiler rooms (AHUs, ERUs, duct coils, water heaters, etc.).*

**Thermometer Scale:** Fahrenheit. Dual scale including Celsius not acceptable.

Domestic and Hydronic Water: 30 to 240°F or 0 to 250°F, with 2-degree scale divisions.

Chilled Water and Condenser Water: 0 to 120°F or 30 to 130°F, with 1-degree scale divisions.

**Pressure Gages:** Provide pressure gages of general use, 1% accuracy (middle third of range), ANSI B40.1 grade A, phosphor bronze bourdon type, bottom connection, drawn steel, stainless steel/brass/aluminum case, glass window, 4-1/2 inch diameter, with 1/4-inch brass male NPT connector on bottom, range to suit. Pressure range as follows:

Vacuum: 30 inches Hg of vacuum to 15 psig pressure.

Fluids Under Pressure: two times operating pressure.

Manufacturer/Model: Trerice 600CB45, Weiss or Weksler (not available), or equal.

**Pressure Gage Cocks:** Provide pressure gage cocks between pressure gages and gage tees on piping systems. Construct gage cock of brass with 1/4-inch female NPT on each end, and brass "T" handle.

## Part 3 - EXECUTION

**Visibility Requirement:** Install thermometers and pressure gages so as to be easily read, and tilted so as to face directly toward an observer in a normal viewing position, and installed in a upright position with the writing right-side up. Adjust or relocate thermometers and pressure gages as directed by Engineer due to site visits, at no additional cost to Owner.

**Thermometers:** Install each thermometer in brass or stainless steel thermowell, positioned so as to meet the Visibility Requirement, above. Provide stainless steel *or lead free brass* well for domestic water application. Apply a liberal amount of heat transfer paste to the sensing portion of the thermometer before insertion into the thermowell, and ensure that no air gaps remain.

Install in inlet and outlet of the following equipment and elsewhere as indicated: each hydronic boiler and chiller, each hydronic and chilled water coil, including those in air-handling units and energy recovery units, larger than 2000 CFM, each thermal storage tank, and at the outlet of each hydronic or domestic water mixing valve, *and each water heater.*

**Pressure Gages:** Install pressure gages in piping tee with pressure gage cock, located on pipe at most readable position. Install pressure gage cock in piping tee. Install in the following locations and elsewhere as indicated: at suction and discharge of each pump, at discharge of each pressure-reducing valve, at building water service entrance, and at chilled water and condenser water inlets and outlets of chillers.

**Thermometer and Gage Identification:** Install self-adhesive plastic strip identification labels on the glass of all thermometers and gages. Label to match the pipe identification of the fluid, such as CW, HWS, etc. Do not obscure the active portions of the scales.

**END OF SECTION 221135** (Revised October 23, 2014, Printed 12/11/15)

## **SECTION 221140 - SUPPORTS AND ANCHORS**

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### **Part 1 - GENERAL**

**MSS:** Materials, design, manufacture, fabrication, selection, application, and installation shall comply with MSS SP-58, SP-69, and SP-89.

**Submittals:** Submit product data for hangers, clamps, saddles and shields, pipe guides and anchors, threaded rod, and hex nuts.

### **Part 2 - PRODUCTS**

**General:** Except as otherwise indicated, for each piping system provide factory-fabricated piping hangers and supports, selected by Installer to suit piping systems, in accordance with manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping.

**Copper Pipe:** Provide copper-plated hangers and supports for copper-piping systems.

**Manufacturer:** B-Line Systems; Newman Associates (PHD); or Grinnell.

**Adjustable Swivel Rings:** Not allowed. Use clevis hangers or three-bolt clamps.

**Anchor Bolts and Structural Supports:** Provide anchoring and structural supports to meet seismic structural requirements as outlined in the International Building Code or applicable state code. Provide manufacturer's recommended fastening of equipment rigidly mounted to slabs or equipment pads. Provide seismic snubbers on all equipment mounted on vibration isolation springs and devices. Size anchor bolts and snubbers to withstand lateral forces. Refer to Division 22 section "Seismic Restraints."

**Malleable Iron Beam Clamps:** Electro-galvanized malleable iron, center load.

**C-Clamps:** Not allowed. Use malleable iron beam clamps.

**Steel Beam Clamps:** Not allowed. Use malleable iron beam clamps.

**Clevis Hangers:** For non-insulated copper piping, provide standard weight, low carbon steel with copper finish. For all other piping, provide standard weight, electro-galvanized low carbon steel.

**Heavy-Duty Steel Trapezes:** Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.

**Hex Nuts:** Electro-galvanized steel, "heavy."

**Pipe Guides:** Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

**Riser Clamps:** Electro-galvanized steel or copper finish for copper piping.

**Saddles and Shields:** Except as otherwise indicated, provide saddles and shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

**Saddles:** Plain finish steel.

**Shields:** Pre-galvanized steel.

**Threaded Rod:** Electro-galvanized steel.

**Three-Bolt Clamps:** Standard weight, electro-galvanized steel.

**Pipe Supports for Roof Mounted Piping:** Pipe support base shall combine UV protected 33% fiberglass reinforced 6/6 Nylon with an adjustable stainless steel threaded rod and axel assembly and which securely attaches to the base. Base for Pipe Support shall have flat sold lower surface with neoprene roof pad adhered to bottom surface. Pad shall provide for cushion between support and roof surface. Support shall be adjustable up to 10" above roof surface. Assembly shall include a hard cast rubber roller assembly capable of providing impact resistance to prevent damage to roof or support during pipe installation. Supports shall conform to MSS SP-58-2002, MSS SP-69-2002 and where appropriate MSS SP127-2001.

Products shall be: MAPA Products, MS-4 for piping 3" diameter and smaller. (Max load 140 lbs.) Or MAPA Products, MS-5 for piping 5" diameter and smaller (Max. load 165 lbs.) Or equal. New England sales representative: K Ross Co., Kingston, MA, phone 508-747-4493, fax 508-746-6678, email [krosscompany@aol.com](mailto:krosscompany@aol.com). Provide a submittal on this product. (7/1/05)

## **Part 3 - EXECUTION**

**Building Attachments:** Install at required locations within concrete or on structural steel for proper piping support. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts securely to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top of inserts.

**Hangers and Supports, General:** Install hanger and supports in accordance with the following requirements.

Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe.

Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.

Support fire-water piping independently of other piping.

Do not use wire or perforated metal to support piping, and do not support piping from other piping.

**Hanger and Support, Applications:** Install the following hangers and supports:

For horizontal pipes with runs of 20 feet or greater, install with articulated joints at top and bottom of threaded rod, to allow for pipe movement along the length of the piping. For insulated piping, this is normally accomplished using clevis hangers and malleable iron beam clamps.

Support vertical piping with riser clamps at each floor.

**Hanger Spacing:** Comply with the spacing indicated below:

<u>Material</u>	<u>Size (inches)</u>	<u>Maximum Spacing (feet)</u>
Copper	1/2	4
	5/8 to 1-1/4	6
	1-1/2 or greater	10
Steel	1/2	6
	5/8 to 1	8
	1-1/4 or greater	10
Cast Iron	all sizes	8--also install hangers 2 feet from each side of each joint
Sch. 40 PVC	all sizes	5

**Insulated Piping:**

Except as otherwise indicated, provide saddles or shields for all insulated piping. For hot piping, use saddles or shields; for cold piping, use shields only. Size saddles and shields for exact fit to mate with pipe insulation.



**Pipe Clamps:** Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

**Shields:** Where low-compressive-strength insulation such as fiberglass is used, install shields at all hangers.

**Hanger Adjustment:** Adjust hangers so as to distribute loads equally on attachments.

**Support Adjustment:** Provide grout under supports so as to bring piping and equipment to proper level and elevations.

**Anchors:** Install at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

**Housekeeping Pads:** Provide concrete housekeeping bases for floor mounted equipment furnished as part of the work of Division 22. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

**Stands:** Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles or tanks mounted on steel stands.

**Protective Padding:** Provide protective high density foam padding on all hangers and equipment supports that are hung at "head-height" (5' to 7') in occupied spaces or mechanical rooms. Attach foam with adhesive. Do not use duct tape.

**Pipe Supports for Roof Mounted Piping:** Supports should be spaced so that weights are evenly distributed typically 6' to 10' apart unless otherwise stated in this specification. Supports should be positioned so that piping rests evenly on the base without undue strain. Coordinate exact support locations with roofing work. Maintain minimum 6" clearance above roof for all piping. The assemblies shall be leveled using the adjustment feature and the stands spaced so that weights are evenly distributed. Install per manufacturer's recommended installation procedures. (7/1/05)

**END OF SECTION 221140** (revised December 30, 2010)

## **SECTION 221150 - SEISMIC RESTRAINT**

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### **Part 1 - GENERAL**

**Codes and Standards:** This facility shall be provided with seismic restraints in accordance with the applicable edition of the International Building Code, and all applicable codes and standards.

**Mechanical Systems Seismic Restraint Shop Drawings:** Appropriate information for the seismic restraints required shall be submitted to the Structural Engineer.

**Seismic Hazard Level:** For seismic hazard level, see the Basis of Design on Structural Drawing S1 or as otherwise indicated by the Structural Engineer. Unless indicated otherwise by Structural Engineer, Category A and B buildings have no seismic restraint requirements for mechanical systems.

### **Part 2 - PRODUCTS**

**Materials and Equipment:** Manufacturers/Manufacturer's Representatives: Mason Industries, Mechanical Control Systems (978-640-9994); VibraCon (508-393-8221); Novia Associates, Inc. (603-898-8600); B-Line (618-654-2184); or equal.

### **Part 3 - EXECUTION**

**Delegated Design:** Design and detailing of seismic restraints for mechanical equipment and systems is Delegated Design. Mechanical Contractor shall hire a Licensed Professional Structural Engineer to perform this work.

**Inspection:** Following completion of the Seismic Restraint portion of the work, the Mechanical Contractor's Licensed Professional Structural Engineer shall inspect the work and provide a signed letter indicating that the Seismic Restraints comply with the Contract Documents and with all applicable codes and standards. Such letter shall be submitted to the Structural Engineer for review.

**END OF SECTION 221150** (revised September 18, 2012)

## **SECTION 221190 - IDENTIFICATION**

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### **Part 1 - GENERAL**

**Submittals:** Submit product data for pipe markers and valve tags.

**ANSI Compliance:** Comply with ANSI A13.1 for lettering size, length of color field, colors, and installed viewing angles of identification devices.

**Schedules:** Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags," in margin of schedule.

### **Part 2 - PRODUCTS**

**Manufacturers:** Allen Systems; W.H. Brady; Brimar; Industrial Safety Supply; or Seton Name Plate.

**Plastic Pipe Markers; Snap-On Type:** Provide manufacturer's standard pre-printed, semi-rigid, snap-on, color-coded, pipe markers, complying with ANSI A13.1.

**Plastic Pipe Markers; Pressure-Sensitive Type:** Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1.

**Underground-Type Plastic Line Marker:** Manufacturer's standard permanent, bright-colored, continuous-printed plastic type, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried pipe.

**Valve Tags:** Provide manufacturer's standard solid brass valve tags with piping system abbreviation in approximately 3/16" high letters and sequenced valve numbers approximately 3/8" high, and with 5/32" hole for fastener.

**Valve Tag Fasteners:** Manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

**Valve Schedule Frames:** For each page of the valve schedule, provide a glazed display frame, with screws for removable mounting on masonry walls. Provide frames of extruded aluminum or plastic with SSB-grade sheet glass or plastic.

**Plastic Equipment Markers:** Provide manufacturer's standard laminated plastic, color coded equipment markers.

**Lettering and Graphics:** Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers,

lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

## **Part 3 - EXECUTION**

**Coordination:** Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

**Ductwork Identification:** Identify air supply, return, exhaust, intake and relief ductwork with stenciled or plastic-laminate signs and arrows, showing ductwork service and direction of flow, in black or white (whichever provides most contrast with ductwork color).

Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures (shaft, underground or similar concealment), and at 50' spacings along exposed runs.

Access Doors: Provide stenciled or plastic-laminate type signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information.

Concealed Doors: Where access doors are concealed above acoustical ceilings or similar concealment, plasticized tags may be installed for identification in lieu of specified signs, at Installer's option.

**Piping Identification:** Install pipe markers on each system, and include arrows to show normal direction of flow:

Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

Near each valve and control device.

Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.

Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.

At access doors, manholes and similar access points which permit view of concealed piping.

Near major equipment items and other points of origination and termination.

Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.

On piping above removable acoustical ceilings, except omit intermediately spaced markers.

Pipes: 3" high yellow tape with 1" high black lettering "NON-POTABLEWATER" and smaller "DO NOT DRINK."



**Underground Piping Identification:** During back-filling/top-soiling of each exterior underground piping systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16", install single line marker. For tile fields and similar installations, mark only edge pipe lines of field.

**Valve Identification:** Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system. Provide a unique number for each valve.

**Valve Schedules:** Mount valve schedule frames and schedules in boiler rooms. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

**Glycol Notice:** Mount attached glycol notice (221190 - S) in frame similar to valve schedule frame and mount in boiler room next to valve schedules.

**Mechanical Equipment Identification:** Install plastic equipment marker on or near each major item of mechanical equipment and each operation device. Provide signs for the following general categories of equipment and operational devices:

Main control and operating valves, including safety devices and hazardous units such as gas outlets.

Meters, gages, thermometers and similar units.

Fuel-burning units including boilers, furnaces, heaters, and absorption units.

Pumps, compressors, chillers, condensers and similar motor-driven units.

Heat exchangers, coils evaporators, cooling towers, heat recovery units and similar equipment.

Fans, blowers, primary balancing dampers, and mixing boxes.

Packaged HVAC central-station and zone-type units.

Tanks and pressure vessels.

Strainers, filters, humidifiers, water treatment systems, and similar equipment.

**Thermometer and Gage Identification:** Install self-adhesive plastic strip identification labels on the glass of all dial thermometers and gages. Do not obscure scales.

**Ceiling Identification:** Provide 1/4-inch self-adhesive dots on ceiling T-bars and access panel frames to indicate location of valves and other service items above ceiling. Provide color-coding as follows unless otherwise designated by Owner: Red-fire dampers and fire sprinkler items (if specified), Green-HVAC, Blue-Plumbing, Yellow-Electrical (if specified).

**Volatile Fluid Tank Identification:** For any tank which accumulates volatile fluids (oil, gasoline, etc.) and is located underfloor or within a building, provide engraved sign, red with white letters, permanently affixed to wall above tank and adjacent to hand pump, if any, stating "CAUTION! CONTENTS OF PUMP DISCHARGE MAY CONTAIN VOLATILE FLUIDS WITH EXPLOSIVE VAPORS. DO NOT SMOKE WHEN SERVICING OR PUMPING OUT TANK. TANK SHOULD BE PUMPED OUT TWICE A YEAR OR MORE OFTEN DEPENDING ON OBSERVED ACCUMULATION."

**Final Labeling:** Final (owner) room numbers and names (not construction numbers) shall be used for all labeling of all types.

**END OF SECTION 221190** (revised September 29, 2011)

## **SECTION 221250 - PLUMBING INSULATION**

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### **Part 1 - GENERAL**

#### **Submittals:**

Product data for each type of mechanical insulation identifying k-value, thickness, and accessories.

Adhesives and Sealants: Submit product information for adhesives and sealants including MSDS and VOC limits and manufacturing location.

**Quality Assurance:** Conform to the following characteristics for insulation including facings, cements, and adhesives, when tested according to ASTM E 84, by UL or other testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

Exterior Insulation: Flame spread rating of 75 or less and smoke developed rating of 150 or less.

### **Part 2 - PRODUCTS**

#### **Glass Fiber**

**Manufacturer:** Armstrong, Certain Teed Corp., Knauf, Manville, Owens-Corning, or equal.

**Material:** Inorganic glass fibers, bonded with a thermosetting resin.

**Jacket:** All purpose, factory-applied, laminated glass-fiber-reinforced, flame-retardant kraft paper and aluminum foil having self-sealing lap.

**Preformed Pipe Insulation:** ASTM C 547, Class 1, rigid pipe insulation, jacketed.

**Large Diameter Pipe and Tank Wrap:** ASTM C 1393, E84, 2.5 pcf.

**Adhesives and Sealants:** Total volatile organic compounds (VOCs) shall not exceed the limits of SCAQMD Rule #1168

**Adhesive:** Produced under the UL Classification and Follow-up service, non-flammable.

**Vapor Barrier Coating:** Waterproof coating recommended by insulation manufacturer for outside service.

## Flexible Elastomeric Cellular

**Manufacturer:** *Aeroflex USA Aerocell* or equal submitted ten days prior to bid.

**Material:** Flexible expanded closed-cell EPDM-rubber flexible elastomeric product with smooth skin on both sides, ke 0.245. UV Resistance shall comply with ASTM G 7 and ASTM G 90. Material shall have a recommended service temperatures of at least -100°F to +250°F and be approved by manufacturer for installation above and below ground, indoors and outdoors with no protective finish required. Material shall NOT contain Microban or any other antimicrobial agent, nor any halogenated flame retardants, *nor any Living Building Challenge Red List material*.

**Tubular Materials:** ASTM C 534, Type I. Sheet Materials: ASTM C 534, Type II.

**Tube Sealing:** Tubes shall be either un-slit or sealed with a the manufacturer's dual tape system; Self-Seal with Protape (SSPT).

**Coating:** Water based latex enamel coating recommended by insulation manufacturer.

## Field Applied Jackets

**General:** ASTM C 921, Type 1, except as otherwise indicated.

**PVC Jacketing:** High-impact, ultra-violet-resistant PVC, 16-mils thick, roll stock ready for shop or field cutting and forming to indicated sizes. Self-lapping seam adhesive.

**PVC Fitting Covers:** Factory-fabricated fitting covers manufactured from 16-mil-thick, high-impact, ultra-violet-resistant PVC. Adhesive as recommended by insulation manufacturer.

**Aluminum Jacket:** ASTM B 209, 3003 Alloy, H-14 temper, roll stock ready for shop or field cutting and forming to indicated sizes.

## Part 3 - EXECUTION

### General

**Accessories:** Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

**Vapor Barriers:** Install vapor barriers on insulated pipes and equipment having surface operating temperatures below 60 deg F.

**Application:** Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions. Install insulation with smooth, straight, and even surfaces. Keep insulation materials dry during application and finishing.

**Sealing:** Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier. Seal penetrations for hangers, supports, anchors and other projections in insulation requiring a vapor barrier. Taper ends and seal with lagging adhesive.



## Plumbing Piping Insulation Applications

Insulate plumbing piping systems as scheduled. Omit insulation on chrome-plated exposed piping and air chambers. Omit insulation on the following when located in the Water Entrance Room or Mechanical Room: unions, strainers, flanges, backflow preventers, flow regulators, and pre-insulated equipment.

Where available space prevents the installation of the full thickness of fiberglass pipe insulation, Contractor may substitute flexible elastomeric cellular equal to one-half of the thickness specified for fiberglass.

## Pipe Insulation Installation

**General:** Tightly butt longitudinal seams and end joints. Bond with adhesive. Stagger joints on double layers of insulation. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated. Apply insulation with a minimum number of joints. Apply insulation with integral jackets: Pull jacket tight and smooth. Cover circumferential joints with butt strips, at least 3-inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

**Longitudinal Seams:** Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.

**Vapor Barrier Coatings:** Where vapor barriers are indicated, apply on seams and joints, over staples and at end butt to flanges, unions, valves and fittings. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating. Repair damage insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

**Roof Penetrations:** Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.

**Exterior Wall Penetrations:** For penetrations of below grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal termination with vapor barrier coating.

**Interior Walls and Partitions Penetrations:** Apply insulation continuously through walls and partitions.

**Fire-Rated Walls and Partitions Penetrations:** Apply insulation continuous through fire-rated walls and partitions. Seal around penetrations in accordance to Firestopping Detail Schedule, 221055-S.

**Elastomeric Pipe Insulation Exposed to View:** All flexible Elastomeric pipe insulation exposed to view shall be painted by the insulation subcontractor with the manufacturer's protective coating. Provide two coats on interior insulation and three coats on exterior insulation. Confirm color with Architect.

**Flanges, Fittings, and Valves - Interior Exposed and Concealed:** Coat pipe insulation ends with vapor barrier coating. Apply remolded, precept, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

Use same material and thickness as adjacent pipe insulation.

Overlap nesting insulation by 2 inches or 1-pipe diameter, which ever is greater.

Apply material with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

Insulate elbows and tees smaller than 3-inches pipe size with remolded insulation.

Insulate elbows and tees 3 inches and larger with remolded insulation or insulation material segments. Use at least 3 segments for each elbow.

Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.

**Hangers and Anchors:** Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Division 22 Section "Supports and Anchors". For cold surface piping, extend insulation on anchor legs a minimum of 12 inches and taper and seal insulation ends. Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

**END OF SECTION 221250** (updated May 5, 2015)

## **PLUMBING INSULATION SCHEDULE BARRINGTON TOWN OFFICES**

**PLEASE NOTIFY ENGINEER (603-352-4841) TEN DAYS BEFORE BID IF ANY INSULATION APPLICATIONS ARE MISSING FROM THIS SCHEDULE. THANK YOU.**

### **PLUMBING PIPING AND EQUIPMENT**

NOTE: THE SAME THICKNESS OF FLEXIBLE ELASTOMERIC CELLULAR CAN BE SUBSTITUTED FOR ANY GLASS FIBER INSULATION FOR ANY COMPLETELY CONCEALED LOCATION SUCH AS WITHIN WALLS – BE SURE TO MAKE ALL JOINTS PROPERLY TO ENSURE CONTINUOUS INSULATION AT ALL POINTS.

GLASS FIBER, 1/2":

POTABLE COLD WATER PIPING LESS THAN 1-1/2".  
TYPE L COPPER CONDENSATE.

GLASS FIBER, 1":

POTABLE COLD WATER PIPING 1-1/2" AND GREATER.  
POTABLE HOT/TEMPERED/RECIRCULATION WATER PIPING LESS THAN 1-1/2".  
PLUMBING VENTS WITHIN SIX FEET OF ROOF.

**END OF SCHEDULE 221250**

# **SECTION 221430 - WATER DISTRIBUTION SYSTEM**

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## **Part 1 - GENERAL**

**Plumbing Code:** Comply with applicable portions of the codes listed in Division 15 Section “Basic Requirements,” and other state and local codes. Review Drawings and Specifications with Plumbing Inspector prior to rough-in. Notify Mechanical Engineer of any significant changes.

**Riser Drawings:** If required by any Owner or authority having jurisdiction, supply riser drawings shall be prepared by Contractor, at no extra cost to Owner, to the satisfaction of the Owner or authority. Riser drawings shall be prepared as shop drawing submittals at the beginning of the construction phase of the project, and shall be revised as as-built drawings, where required by Owner or authority. Contractor shall have the drawings stamped by a Professional Engineer.

**Specification Revisions:** Recently revised portions of this specification are shown in italics.

## **Part 2 - PRODUCTS**

### **General**

**Manufacturers:** Comply with Division One requirements. Comply with Division 22 Section “Basic Requirements.”

**Low Lead:** All products supplied under this section shall be “lead-free” as defined in Section 8 of the Safe Drinking Water Act, and, in addition, shall contain no more than six percent lead by dry weight. Further, more stringent requirements are listed for specific products.

*No Antibacterial: No part of any product provided under this Division shall be anti-bacterial or anti-microbial using a chemical or physical biocide. Nanoparticle silver is prohibited.*

**Applicability:** Products described herein may or may not be applicable to this project. See Schedules and Drawings.

### **Pipe and Fittings**

**Above Ground, Within Building:** Copper tubing. Conform to ASTM B88, Type L, hard temper, copper tube. Fittings: ANSI B16.22 streamlined pattern wrought-copper fittings; soldered joints with lead-free solder.

**Below Ground, Pipe Sizes 3 Inches and Smaller:** Copper tubing; conform to ASTM B88, Type K, soft temper copper tube. Or for cold water only: CTS virgin natural HDPE polyethylene conforming to AWWA C901, ASTM D3350 and D2727, NSF certified, and rated at 200 PSI. No joints permitted below ground for either material. (CTS HDPE currently available: 300’ up to 1-1/4”, 100’ up to 2”). 10/2007

**Below Ground, Pipe Sizes Larger Than 3 Inches:** Ductile-iron pipe and fittings. Conform to ANSI A21.51 for Ductile-iron pipe, with ANSI A21.4 cement-mortar lining; AWWA C110 for Schedule 150, ductile-iron fittings, with AWWA C111 rubber-gasket joints.

**Steel or Copper Factory Pre-insulated Pipe:** Perma-pipe Poly Therm, 1-1/2" polyurethane insulation, FRP jacket. (Kenyon-Barstow Co., 617-426-5822)

## Other Products

**General Duty Valves:** See Division 22 Section "Valves."

**Ball Valves:** All domestic water and hydronic ball valves on this project shall be from the same listed manufacturer, except a second brand is allowed for sizes more than two inches. Minimum 400 PSI WOG; 2-piece construction; *bronze* body; standard or full port; stainless steel or chrome-plated brass ball; blowout proof stem; and zinc-plated steel handle. Equals to those listed below accepted only upon written confirmation of compliance with all requirements of these specifications. All submittals shall include a statement of lead content compliance.

All valves shall be manufactured (engineered, cast, machined, assembled, and tested) in the United States *or Italy*, shall be NSF 61-8 Annex G certified, shall be "lead free" in compliance with California Assembly Bill 1953 and Vermont Senate Bill S-0152, and shall have a published lead content of not more than a weighted average of 0.25%. Manufacturers/models: Apollo 70LF-200 series (sizes up to four inches); Hammond UP8501, UP8511 or Milwaukee UPBA-100, UPBA-150 (sizes up to two inches); Jomar T-100NEG (sizes up to two inches); *Watts LFB6080G2/LBF6081G2 (sizes up to two inches)*; or pre-approved equal. Note: Hammond UP8901, UP8911 or Milwaukee UPBA-475B, UPBA-485B are not acceptable; they are made in China. *A different brand of valves may be used for sizes above two inches.*

**Check Valves:** Bronze horizontal swing check valve; threaded ends; MSS SP-80, Type 3, 300 WOG. Sizes up to two inches shall be NSF 61-8 Annex G certified, shall be "lead free" in compliance with California Assembly Bill 1953 and Vermont Senate Bill S-0152, and shall have a published lead content of not more than a weighted average of 0.25%. Manufacturers/models: Hammond UP904, Milwaukee UP509 or equal.

**Solder and Flux:** Use lead-free solder throughout, such as tin-copper-silver, or tin-silver. Example: Harris Nick, Teracorp Solder Safe, Silvabrite 100. Solder containing lead is not permitted on the job site. Both solder and flux shall comply with NSF-61. Flux shall comply with ASTM B813. Example: RectorSeal Nokorode.

**Expansion Compensators:** Keflex or equal bellows-type expansion compensators with brass case, multi-ply stainless steel bellows, and factory guides.

**Reduced Pressure Backflow Preventers:** Not allowed in sizes larger than one inch except where specifically so directed in writing by Engineer and local water authority.

**Thermostatic Mixing Valves:** Reliable thermostatic motor; bronze body; union end stop and check inlets with stainless steel strainers; outlet temperature control within 3°F. Do not use valve manufacturer's thermometer; instead, provide thermometer and well per Division 15 Section "Meters and Gages". Manufacturer of any proposed "equal" valve must supply a written statement certifying the required flow range at the specified pressure drop, and provide copy of ASSE certificate.

**Water Meters:** For public water systems, provide meter and accessories as required by local authority, and use specified meter (if any) for bidding purposes only. Provide registration and remote readout (if required) in accordance with local water authority. Mount remote readout as directed by local water authority. Bronze maincase; sealed register magnetic drive; strainer; AWWA C-700 compliance; max. pressure 150 PSI; max. pressure drop at design continuous flow 4.0 PSI.

**Strainers:** Bronze body; 60 mesh stainless steel screen; 400 PSI @ 180°F WOG; maximum 0.25% lead certified; made in USA. Wilkins YBXL-60 or equal.

**Well Pressure Tanks:** 100 PSIG max. working pressure; FDA and/or NSF-approved materials in contact with the water; 100% lead-free; 100% free of PVC (vinyl); lead-free brass, malleable iron or stainless steel connection; floor stand. Provide ASME certified tanks where indicated or required.

**Expansion Tanks:** 150 PSIG max. working pressure; 200 °F max. operating temperature; steel shell; polypropylene liner; butyl diaphragm; 40 PSIG pre-charge pressure. Provide ASME certified tanks where indicated or required.

**Trap Primers:** All floor drains have trap primers unless specifically indicated otherwise on the Drawings. Provide Sioux Chief 695-01, with wye splitter and/or distributor unit as required, unless a different model is shown on the Water Distribution Schedule. If no model is shown on the Water Distribution Schedule, then provide Sioux Chief 695-01, with wye splitter and/or distributor unit as required.

**DHW Piping Heating Cable System:** Tyco Raychem HWAT-R2 heating cable system (208VAC or 240VAC), with 125 °F adjustable self-contained temperature setpoint (or 120°F in Vermont, or other temperature as required by Authority Having Jurisdiction. Provide HWAT-ECO controller to maintain the adjustable setpoint. Provide all other accessories as recommended by manufacturer. No other manufacturers allowed.

**Scheduled Products:** See Schedule at the end of this Section for additional descriptions of products.

## **Part 3 – EXECUTION**

### **General**

**Basic Identification:** Provide identification in accordance with Division 22 Section “Identification.” All valves installed in locations that are not adjacent to the fixture or appliance served shall be identified.

### **Piping Installation**

**Freeze Protection:** Except for non-freeze wall hydrants, no water piping is allowed in exterior walls or other unheated spaces. No exceptions. Wall hydrant valve housing must be located completely inside of interior wall facing. Where any type of water piping appears to be located in an unheated space, coordinate with GC to relocate piping, or to provide Ventilated Plumbing Chase with vapor barrier and full thickness insulation on the cold side of the piping cavity and wall or ceiling louvers between the piping cavity and heated space. Locate louvers every six feet along piping run, two louvers minimum. If contractor has any reason to suspect that any water piping is subject to freezing, notify Architect immediately.

**Boiler Rooms:** Do not locate any water piping within ten feet (in any direction) of combustion air louvers or combustion air fan outlets. If there are combustion air louvers, locate all water piping at least six inches above the floor (except for water entrance pipe up through floor). Provide housekeeping pads of sufficient thickness to facilitate this six-inch requirement. For water entrance piping up through floor, provide double thickness insulation for the lowest six inches, and ensure airtight seal at joint with floor.

**Placement:** Piping locations shown on Drawings are diagrammatic. Modify to suit actual field requirements. Coordinate piping locations to avoid conflict with other piping, ductwork, skylights, lighting, electrical conduit, structural elements, etc. Locate groups of pipes parallel to each other. Install piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Provide space to permit insulation application, with one-inch clearance outside the insulation. Allow six inches space above removable ceiling panels to allow for panel removal. Allow sufficient space for servicing of valves.

For service access, keep all piping, devices, and appurtenances a minimum of three feet from any electrical service panel, hinged panel door, or equipment door. To avoid hazard from leaks, keep all piping at least 12 inches from any part of the footprint of any electrical service panel, extended vertically up to the floor or roof deck above. No water piping is allowed *below*, within, or above a nonstructural ceiling of any room dedicated and named as an electrical room or elevator equipment room.

Route water piping to avoid passing through exit stairways, even when so indicated on the Drawings.

**Acoustic Isolation:** Isolate from structure all 1/2", 3/4", and 1" diameter piping passing through or near steel or wood studs. Use appropriate materials, such as acoustical pipe clamps equal to Hubbard Holdrite (1-800-321-0316) or Acousto-Plumb (1-800-854-3215). Pipes must never contact any structure. Any failure to comply with this requirement will be grounds for the Engineer to request that the GC open previously covered work at the contractor's expense to prove compliance with this requirement throughout the building.

**Concealed Piping:** Conceal all piping in walls, pipe chases, utility spaces, above ceilings, or below grade, unless specifically noted otherwise or permitted by Architect. Exposed piping is allowed in mechanical rooms and water entrance rooms. Coordinate with GC to ensure that all chases and soffits have clear space that is a minimum of four inches larger than the nominal pipe size, to allow for insulation and working clearance.

**Exposed Piping:** Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted unless expressly indicated. Coordinate with Architect prior to installation.

**Underground Piping:** For Type K copper below ground, below slab, or within slab, install pipe in 3/4-inch flexible elastomeric insulation, and provide sleeve at each floor/wall/foundation penetration. For HDPE below ground or below slab, install each pipe in individual sleeve; bring sleeve through finished floor and use long sweep 1/4 bend to allow replacement of piping without excavation. In all cases, provide thrust block at any piping bend per civil engineer or NFPA 24.

**Factory Pre-insulated Pipe:** Install factory pre-insulated piping systems for underground hot or chilled water piping systems outside buildings. Provide steel or copper pipe to match type of piping in interior of building. Provide factory recommended fitting and expansion compensation.

**Drains and Slope:** Install drains at low points in mains, risers, and branch lines consisting of tee fitting, 3/4-inch valve, and short 3/4-inch threaded nipple and cap. Install piping with 1/32 inch per foot (1/4 percent) downward slope toward drain point. Install an automatic air vent (AAV) at each trapped high point in the DHW system if there is a recirculation system; provide ready access to each AAV and locate it such that if it leaks, the leak is readily detectable and does not cause water damage.

**Fittings:** Use fittings for all changes in direction and branch connections. Bullhead tees are not allowed.

**Penetrations:** Seal pipe penetrations through exterior walls with sleeves and mechanical sleeve seals: "link-seal" or other approved alternate which is compatible with the foundation damp-proofing system specified. Pipe sleeves shall be galvanized steel pipe. For exposed pipes, provide escutcheons. Where pipes pass through fire-rated walls, partitions, ceilings, and floors, maintain the fire-rated integrity. Refer to Division 15 Section "Basic Materials and Methods."

**Expansion Compensation:** For domestic hot water piping, install expansion compensation offsets or expansion joints as required *or* as shown on the Drawings. *Minimum six-foot offsets, 90 degree elbows,* or expansion joints are required no more than 100 feet apart on straight runs.

**Piping Runouts to Fixtures:** Provide water piping runouts to plumbing fixtures, of sizes indicated; but in no case smaller than required by the Plumbing Code.

**Supports and Anchors:** Hangers, supports, anchors, and spacing are specified in Division 15 Section "Supports and Anchors." Seismic restraints may be required. See Division 15 Section "Seismic Restraints."

## Installation of Other Products

**Water Entrance:** Extend water distribution piping to connect to water service piping. Water service piping from source to the first flange inside the building normally is not work of this Section. However, coordinate with Site Contractor. Ensure proper separation of water service from building sewer, as required by the plumbing codes. Install shutoff valve at service entrance, inside building; complete with strainer, pressure gauge, and test tee with valve. It is acceptable to mount backflow preventer vertically if permitted by manufacturer and local water authority. See Detail on Drawings for additional requirements. It is Contractor's responsibility to coordinate the water entrance with all administrative authorities having jurisdiction, and to provide all parts and labor as required by them, even if different from or in addition to the Contract Documents, and to do so at no extra cost.

**General Duty Valves:** See Division 22 Section "Valves."

**Relief Valves (All Types):** Run full-size copper discharge line to a safe location as indicated.

**Sectional Valves:** Install on each branch so that each plumbing fixture and equipment item can be isolated (in addition to its shutoff valve); and on the base of every riser or downfeed pipe; and elsewhere as indicated. Install valves close to main, or as indicated. Also install sectionalizing valves on main water lines every 200 feet maximum.



**Shutoff Valves:** Install on each inlet of each plumbing equipment item, and on each inlet of each plumbing fixture or faucet, and elsewhere as indicated. Where applicable, exposed stop valves can serve as shutoff valves.

**Drain Valves:** Install on each plumbing equipment item and located so as to completely drain equipment for service or repair. Install drain valves at the base of each riser, at low points of horizontal runs, and elsewhere as required to completely drain distribution piping system.

**Sectional, Shutoff, and Drain Valves:** For valves 2 inches and smaller, use ball valves; for valves 2-1/2 inches and larger, use ball, gate, or butterfly valves.

**Check Valves:** Provide check valves, whether or not indicated elsewhere, for all devices which mix hot and cold water and have a shut-off valve on the outlet, or in any way have the potential for a cross connection between hot and cold. These devices include but are not limited to: washing machines, mixing valves, faucets with hose thread outlets, service sink faucets, electronic faucets, single inlet faucets, and kitchen sprays. Install in accessible location, and provide a union.

**Wall Hydrants:** Install between 12 and 60 inches above grade.

**Sill Faucets:** Install with outlet 14 inches above floor. If installed in ADA toilet stall, locate midway between toilet and near side wall, centered in the space; install in this location even if shown on Drawings otherwise in the stall. Coordinate final locations with Architect and Owner prior to rough-in.

**Unions:** Provide union for each connection to plumbing equipment, including all valves worth more than \$100, such as thermostatic mixing valves.

**Water Hammer Arrestors:** Install where shown on Drawings and at or near all flush valves and other quick-closing valves such as spring-loaded valves, electrically actuated valves, and electronically controlled faucets. Locate arrestors per manufacturer's recommendations. For horizontal arrangements on one floor, locate the arrestor between the last flush valve and the next-to-last flush valve.

**Pressure Reducing Valves:** Install pressure reducing valves with inlet and outlet shutoff valves, throttling valve bypass, and pressure gauge on valve outlet. Throttling valve bypass is not required if there are multiple parallel legs. For water entrance, set at 75 PSI unless indicated otherwise. Install valves where indicated and where required by fixture and equipment manufacturer's recommendations, for items including commercial dishwashers (Watts U5B-LP or equal) and other kitchen equipment.

**All Testable Backflow Preventers:** Install in a location that allows ready access, at a convenient height, without requiring a ladder. Distance from the floor to the bottom of the device shall be between 36 and 48 inches. Device shall be a minimum of 12 inches from any wall or other object that would impede access.

**Reduced Pressure Backflow Preventers:** (Note: maximum size 1 inch.) Must be located where relief outlet drainage is by a gravity drain line. Pipe relief outlet as shown on Drawings, or, if not shown, to air gap at nearest floor drain that has at least a 4-inch outlet, and provide a 6-inch diameter funnel for floor drain. Provide relief outlet drain pipe size as follows: 1/2-inch valve = 3-inch drain, 3/4-inch valve = 4-inch drain, 1-inch valve = 4-inch drain. Provide field-built air gap fitting including a 6-inch diameter funnel in order to capture the full flow of relief water under all failure modes.

**Thermostatic Mixing Valves:** Provide thermostatic mixing valve (Powers 480-3/8 or Watts USG-B-Strainer) to supply tempered water to each ADA lavatory, even if not so indicated elsewhere. For master mixing valves, provide factory start-up by valve manufacturer. For emergency fixture mixing valves, ensure that 45PSI minimum water pressure is available at the inlet. For all thermostatic mixing valves: inspect within 30 days of initial installation or operation, and clean strainer and cartridge as required; train Owner to reinspect monthly or more frequently as needed.

**Water Meter:** Install water meter in accordance with utility requirements. Locate remote readout (if any) at location directed by utility. If water meter is provided by utility, install rough-in piping and specialties in accordance with utility requirements. Install shutoff valve on discharge side of meter.

**Pressure Tanks:** Before installation, and with water connection open, check precharge pressure and boost to 38 PSIG if needed. Provide 3/4-inch drain valve for tanks up to 120 gallons nominal size; 1 inch drain valve for tanks 121 to 750 gallons. Provide 1/2 inch vacuum relief valve at the top of each tank. Provide pressure relief valve on the supply pipe to the tank; one valve may serve all tanks on that pipe.

**Trap Primers:** All floor drains have trap primers unless specifically indicated otherwise on the Drawings. Install trap primer valves where shown on Drawings, or, if not shown, at nearby convenient location. For primers which work off water pressure fluctuations, install on cold water piping not larger than 1 inch, and no closer than 40 feet apart. Install with piping T pointing upward to prevent foreign material from entering primer. Install ball valve immediately upstream of T to increase pressure drop if necessary. Water lines must be flushed prior to installing trap primers. Install components using Teflon tape, not pipe dope. Provide ready access, such as access panels, for all trap primers. Install all trap primers and distribution units minimum 12 inches above the finished floor, and pitch minimum 1/2 inch piping minimum 1/2 inch per foot. Install distribution units level. Cycle trap primer valve at least six times, and confirm that it is working properly and not leaking.

**Well Pump Pressure Switch:** Set to turn on pump at 70 PSI and off at 75 PSI, unless shown otherwise on Drawings.

**DHW Piping Heating Cable System:** Where indicated on the drawings, provide on main non-recirculated DHW line (up to 2 inches in size) from master mixing valve to end of main, and on all non-recirculated branch lines one inch size and larger, and on additional non-recirculated lines as indicated on the Drawings. Do not install in unheated areas such as a crawl space or uninsulated attic. Coordinate with other trades; this system requires revised pipe insulation work (generally one size larger insulation *to allow space for the heating cable*) and electrical work. MC shall provide complete installation of the heat trace system including any electrical work required but not shown in the Electrical Contract Documents. There shall be one or more electrical circuits with 30 mA ground-fault circuit breaker for each circuit, sizes as follows: 15A for max 250 feet, 20A for max 330 feet, and 30A for max 500 feet. See manufacturer's installation instructions and coordinate with EC.

## **Field Quality Control**

**Protection:** Protect water piping during remainder of construction period, to avoid contamination and damage. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

**Piping System Test:** Test for leaks and defects all new water distribution piping systems and parts of existing systems, which have been altered, extended or repaired. Conduct a test at a pressure not less than the maximum working pressure of the system, or 100 PSI, whichever is greater, for at least 15 minutes.

The water utilized for tests shall be obtained from a potable source of supply. Air testing is not permitted, except with specific permission of the appropriate plumbing inspector. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained. Use the procedure prescribed by the authority having jurisdiction, or per the applicable Plumbing Code.

**Cleaning:** Clean entire piping system of all dirt, sand, debris, flux residue, etc. with particular attention to water entrance line, water meter strainer, other strainers, backflow preventer, washing machine inlets, eyewashes, faucet aerators, and strainers at individual devices such as electronic faucets and laundry valves. Before admitting water to any terminal device that has a stop (such as a faucet or eyewash), connect a hose temporarily to the stop and run one-half gallon of water into a bucket. This Contractor shall be fully responsible for all corrective actions required because of obstruction or damage to all plumbing devices due to inadequately cleaned and flushed systems.

**Disinfecting:** Prior to use, purge and disinfect all new water distribution piping systems and parts of existing systems, which have been altered, extended, or repaired. Use the procedure prescribed by the authority having jurisdiction, or per the applicable Plumbing Code.

**Adjustment of Hot Water Temperature:** Adjust mixing valves, faucet and shower valve temperature limit stops, and hot water heater controls systems to provide the following hot water temperatures. Lavatories with single-inlet faucets: 100 °F. Shower valve and *all lavatory and sink* faucet temperature limit stops, mixing valves, and instantaneous water heaters (where provided): 110°F maximum. Commercial kitchen sinks served by a kitchen mixing valve: 125 °F (120 °F in Vermont) or as directed by the cook. Commercial kitchen dishwasher booster heater inlet: 145 °F. Hot water heaters: 145 °F. (The OSHA minimum is 140 °F; the higher nominal setpoint allows for the control differential.) Master mixing valve for general hot water circulation, and sinks not listed above: *130 °F*(120 °F in Vermont). (A temperature of *130°F is the ASHRAE Guideline 12* minimum on account of Legionella risk, allowing *a 3 °F droop around the setpoint plus a 3 °F drop* through the piping system). Change any of these initial setpoints when so directed by local health department or other appropriate administrative authority.

**END OF SECTION 221430** (revised April 30, 2015)

## **WATER DISTRIBUTION SCHEDULE BARRINGTON TOWN OFFICES**

**Alternate manufacturers.** See DRAINAGE AND VENT SCHEDULE for list of additional manufacturers. Note that some manufacturers may not have “equals” for the specified products, and are therefore not acceptable for this project. Contractors are cautioned that any proposed “equal” must have all listed features, required options, and other items listed in the main specification section. All proposed “equals” not listed above must be submitted prior to bid as described elsewhere.

**Submittals.** Provide submittals on all products shown in this schedule, plus the following products if used for this project:

Pipe and fittings, Valves, Solder, *Flux*, Expansion Compensators, Strainers

**Note to Contractors:** In addition to this Schedule, provide your suppliers with Specification Section 221430, Part 2 - Products, for important additional information.

**W-1. WALL HYDRANT:** Woodford Model 65; Zurn not available

*Features:* Non-freeze; integral vacuum breaker; self draining; 3/4 inch inlet; 3/4 inch hose connection; loose tee key; nickel bronze, chrome, or stainless steel face; brass body; fits one standard modular brick course; compression cartridge; no ceramic cartridge; 3 x approx. 4.5 inches.

*Required Options:* length to suit wall thickness.

**W-30 SINGLE-FIXTURE THERMOSTATIC MIXING VALVE:** Powers Hydroguard T/P Series LFe480; Watts USG-B-Strainer “Under Sink Guardian”; or equal. Other brands accepted prior to bid by approval of Engineer after receipt of a sample valve and complete engineering information. (Leonard Model 105 not acceptable because the check valves are shipped uninstalled.)

*Features:* integral, non-removable check valves on hot and cold inlets; 20 or 40 mesh stainless steel screen on both inlets; brass or bronze body with maximum 0.25% lead content; *rough brass finish*; 3/8-inch inlets and outlet; vandal-resistant maximum set point range 80-120°F with locking nut or screw; required flow range from 0.5 to 1.2 GPM (at 20 PSI drop); ASSE 1070 seal and certificate.

*Required Options:* Provide rough chrome finish for any exposed application.

*Note:* Set at 100°F, or as indicated otherwise.

**END OF WATER DISTRIBUTION SCHEDULE**

# **SECTION 221435 - DRAINAGE AND VENT SYSTEM**

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## **Part 1 - GENERAL**

**Plumbing Code:** Comply with applicable portions of the codes listed in Division 22 Section “Basic Requirements,” and other state and local codes. Review Drawings and Specifications with Plumbing Inspector prior to rough-in. Notify Mechanical Engineer of any significant changes.

**Riser Drawings:** If required by any Owner or authority having jurisdiction, drain/waste/vent and storm drain riser drawings shall be prepared by Contractor, at no extra cost to Owner, to the satisfaction of the Owner or authority. Riser drawings shall be prepared as shop drawing submittals at the beginning of the construction phase of the project, and shall be revised as as-built drawings, where required by Owner or authority. Contractor shall have the drawings stamped by a Professional Engineer.

**Specification Revisions:** Recently revised portions of this specification are shown in italics.

## **Part 2 - PRODUCTS**

### **General**

**Manufacturers:** Comply with Division One requirements. Comply with Division 22 Section “Basic Requirements.”

**No Antibacterial:** No part of any product provided under this Division shall be anti-bacterial or anti-microbial using a chemical or physical biocide. Nanoparticle silver is prohibited.

**Applicability:** Products described in this Section may or may not be applicable to this project. See Schedules and Drawings.

### **Pipe and Fittings**

***Applicability:** Piping products listed below are used for this project only when listed on the first page of the Drainage and Vent Schedule.*

**Cast Iron Pipe and Fittings:** Shall be manufactured in the United States. All cast iron soil pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and be listed by NSF International. Acceptable Manufacturers: Charlotte Pipe and Foundry, Tyler Pipe, AB&I Foundry.

**Hub-and-Spigot Cast Iron Soil Pipe:** Conform to ASTM A74, CISPI HS-74, for service weight, hub-and-spigot soil pipe and fittings, with neoprene compression gasket joints conforming to ASTM C564, CISPI HSN.

**Hubless Cast Iron Soil Pipe:** Conform to ASTM A888, CISPI Standard 301, service weight, cast-iron soil pipe and fittings, with stainless steel clamps and neoprene gaskets conforming to CISPI Standard 310. Coupling manufacturers: Charlotte, Mission, Tyler, or equal.

**Hubless Cast Iron Soil Pipe with Heavy Duty Couplings:** Pipe shall conform to ASTM A888, CISPI Standard 301, cast-iron soil pipe. Couplings shall conform to ASTM C-1540. Coupling shields shall be corrugated or semi-corrugated Type 304 stainless steel; minimum thickness 0.0075 inch; minimum width of three inches for pipe sizes 1-1/2 through 4 inches, four inches for pipe sizes 5 through 10 inches, and 5-1/2 inches for pipe sizes 12 and 15 inches. Couplings shall have at least four sealing bands, and six for pipe sizes 5 through 15 inches, and shall require 80 inch-pounds of torque applied to 5/16-inch hex head screws. Gaskets shall be neoprene, comply with ASTM C-564, and have multiple sealing ring pairs, one pair under each sealing band. Coupling manufacturers/models: Charlotte Heavy Duty, Husky SD 2000, Ideal MD, or Mission HW, as approved by Engineer after review of a sample provided by manufacturer's sales representative.

**Type K Copper:** Conform to ASTM B88, Type K, soft temper copper tube. No joints permitted on below ground copper tubing.

**Type L Copper:** Conform to ASTM B88, Type L, hard temper, copper tube. Fittings: ANSI B16.22 streamlined pattern wrought-copper fittings.

**Type M Copper:** Conform to ASTM B88, Type M, hard temper, copper tube. Fittings: ANSI B16.22 streamlined pattern wrought-copper fittings. *Used only for DWV applications, three inch maximum size unless shown otherwise, in lieu of Type DWV copper.*

**Aquatherm:** Pipe shall be Aquatherm Greenpipe Faser-composite SDR 11. Pipe shall be manufactured from a PP-R resin meeting the short-term properties and long-term strength requirements of ASTM F 2389. All pipe shall comply with the rated pressure requirements of ASTM F 2389. All pipe shall be certified by NSF International as complying with NSF 14, NSF 61, and ASTM F 2389 or CSA B137.11.

**Schedule 40 Flame Retardant Polypropylene:** Schedule 40 flame retardant polypropylene pipe, fittings and mechanical joints, Orion Blueline or equal, conforming to ASTM D3222.

## Other Products

**Backwater Valves:** Valve assembly shall be bronze fitted cast-iron, with bolted cover. Flapper shall provide a maximum 1/4-inch clearance between flapper and seat for air circulation. Valve ends shall suit piping material.

**Flashing Flanges:** Cast-iron watertight stack or wall sleeve with membrane flashing ring. Provide underdeck clamp and sleeve length as required.

**Vent Flashing Sleeves:** Provide 18 x 18 inch aluminum base, no-caulk vent flashing sleeves compatible with roof construction and material.

**Piping Heat Trace:** Normally 5 watts per foot, but provide wattage as required and recommended by manufacturer for application. Provide with junction box, end seal kit, glass cloth tape, thermostat set at 40°F, suitable for service on condensate line in freezer. Manufacturers: Thermon FLX, Raychem.

**Floor Drains:** All floor drains have trap primers unless specifically indicated otherwise on the Drawings. See Division 22 Section "Water Distribution System," paragraph "Trap Primers." Provide 4-inch diameter funnel if "with funnel" is noted on plans. Provide funnel or 1/2 grate for all indirect waste applications. All floor drains and floor sinks are for installation in concrete floors, unless specifically

noted otherwise. For floor drains or floor sinks for wood floors, if a wood deck drain is not specified, then consult drain manufacturer and submit a product modified to suit a wood floor (with deck plate, membrane clamp, etc.).

**Grease Interceptors:** Welded steel construction (cast iron permitted up to 15 GPM size); acid resistant epoxy coating; PDI rated; air relief bypass; removable screens; gasketed non-skid secured cover; for flush-with-floor installation unless noted otherwise on Drawings. Provide (1) angle type flow control device with plunger for cleaning orifice, or (2) flow control device with plug for ready access to orifice. Provide extension section if required by invert elevation.

**Elevator Pit Sump Pump:** Provide pump and control systems capable of pumping water while containing oil. The system shall function automatically and shall provide for a DDC alarm and separate local alarm and LED lights in the event of (a) the presence of oil in the sump, (b) high liquid in the sump, or (c) high amps or a locked rotor condition.

The pump shall be a submersible type, approved to UL 778 standards and shall include thermal and overload protection. The motor shall be fractional horsepower, and capable of operating continuously or intermittently. The motor housing shall be constructed of #304 stainless steel. Mechanical seats shall be housed in a separate oil-filled compartment.

The main control panel shall be approved to UL 508 standards and housed in a gasketed NEMA 4X enclosure. The control shall be equipped with a self-cleaning stainless steel sensor probe, high decibel warning horn with alarm silencing switch, dual floats, clearly marked terminal board and remote monitoring contact. A NEMA 4X junction box with 8-pin twist-lock electrical receptacle and mating 8 conductor cable shall be provided. The control unit, junction box, pump, floats and sensor shall be factory assembled as a complete, ready-to-use system. The system shall allow for the main control panel to be located outside of the elevator hoistway to be monitored for all functions without having to enter the elevator shaft. [DC 15160-4]

**Condensate Pumps:** It is Contractor's responsibility to provide condensate pumps where required, whether or not indicated on Drawings. Provide in-pan condensate pump (Little Giant 1-ABS or equal) where it will fit inside unit, otherwise provide condensate pump with tank (Little Giant VCMA-20ULS or equal) and locate outside of unit.

**Scheduled Products:** See Schedule at the end of this Section for additional descriptions of products.

## **Part 3 - EXECUTION**

### **General**

**Existing Piping:** Where ever new drainage (sewer or storm drain) piping connects into existing building drainage piping, Contractor shall mechanically clean (power auger or power water jetter) existing drainage piping as follows: (1) all existing drainage piping downstream of any new work, and (2) all existing building drainage lines four inches and larger. For both (1) and (2), cleaning shall continue all the way to the first manhole outside the building.

**Main Vent:** Every sanitary drainage system shall have a main vent that is either a vent stack or a stack vent that is not less than three inches in diameter and undiminished in size from the building drain to the open air. Provide as required by Code even if not shown on plans.

**Future Vents:** Within any habitable or occupiable spaces at the lowest level of a structure where plumbing fixtures are not installed, provide an accessible vent connection, not less than two inches in diameter, which is properly connected to the vent system to provide for future venting. Provide as required by Code even if not shown on plans.

**Sprinkler System Discharges:** Do not allow any sprinkler system test piping to discharge into the sanitary sewer system; allow no direct or indirect connection to any piping, floor drain, floor sink, mop basin, or other fixture. Where so indicated by the Plumbing Engineer, sprinkler system reduced pressure backflow preventers may discharge via an indirect waste fitting into an appropriate drain or fixture.

## **Piping Installation**

**Trenches:** Insure trench bottoms are smooth, firm, and free from rock throughout the length of the pipe before proceeding with pipe installation. Provide tamped sand bedding under pipe. At each pipe joint, dig bell holes to relieve the bell of the pipe of all loads, and to ensure continuous bearing of the pipe barrel on the foundation. Backfill trench with compacted select fill.

**Drain Piping:** Install underground building drains to conform with the Plumbing Code, and in accordance with the Cast Iron Soil Pipe Institute Engineering Manual. Lay underground building drains beginning at low point of systems, true to grades and alignment indicated, with unbroken continuity of invert. Place bell ends of piping facing upstream. Install required gaskets in accordance with manufacturer's recommendations for use of lubricants, cements, and other special installation requirements. Maintain swab or drag in line and pull past each joint as it is completed. Drainage piping "dead ends" shall be no longer than 24 inches, unless they end in a cleanout. Provide minimum two-inch branch size for building drains and sewers.

**Placement:** Piping locations shown on Drawings are diagrammatic. Modify to suit actual field requirements. Coordinate piping locations to avoid conflict with other piping, ductwork, skylights, lighting, electrical conduit, structural elements, etc. Install above-ground piping tight to slabs, beams, joists, columns, walls, and other permanent elements of the building. Allow six inches space above removable ceiling panels to allow for panel removal. Allow sufficient space for servicing of any items that might require service.

For service access, keep all piping, devices, and appurtenances a minimum of three feet from any electrical service panel, hinged panel door, or equipment door. To avoid hazard from leaks, keep all piping at least 12 inches from any part of the footprint of any electrical service panel or food preparation/storage/serving area/appliance/fixture, extended vertically up to the floor or roof deck above. No DWV piping is allowed within or above a nonstructural ceiling of any room dedicated and named as an electrical room or elevator equipment room.

Route DWV and storm drain piping to avoid passing through exit stairways, even when so indicated on the Drawings.

**Concealed Piping:** Conceal all above-ground piping in walls, pipe chases, utility spaces, above ceilings, or below grade, unless specifically noted otherwise or permitted by Architect. Exposed piping is allowed in mechanical rooms and water entrance rooms. Coordinate with GC to ensure that all chases and soffits have clear space that is a minimum of four inches larger than the nominal pipe size, to allow for insulation and working clearance.



**Exposed Piping:** Install exposed piping at right angles or parallel to building walls. Diagonal runs are not permitted unless expressly indicated. Coordinate with Architect prior to installation.

**Slope:** Install drainage piping pitched down at minimum slope of 1/4 inch per foot (2 percent) for piping 3 inches and smaller, and 1/8 inch per foot (1 percent) for piping 4 inches and larger, unless indicated otherwise elsewhere.

**Fittings:** Make changes in direction for drainage and vent piping using appropriate 45-degree wyes, half-wyes, or long sweep quarter, sixth, eighth, or sixteenth bends. Sanitary tees or short quarter bends may be used on vertical stacks of drainage lines where the change in direction of flow is from horizontal to vertical, except use long-turn tees where two fixtures are installed back to back and have a common drain. Straight tees, elbows, and crosses may be used on vent lines. No change in direction of flow greater than 90 degrees shall be made. Where different sizes of drainage pipes and fittings are connected, use proper size standard increasers or reducers. Reduction of the size of drainage piping in the direction of flow is prohibited.

**Penetrations:** Seal pipe penetrations through exterior walls with sleeves and mechanical sleeve seals: "link-seal" or other approved alternate which is compatible with the foundation damp-proofing system specified. Pipe sleeves shall be galvanized steel pipe. For exposed pipes, provide escutcheons. Where pipes pass through fire-rated walls, partitions, ceilings, and floors, maintain the fire-rated integrity. Refer to Division 22 Section "Basic Materials and Methods." No piping shall be run directly inside poured concrete without a sleeve.

**Piping Runouts to Fixtures:** Provide drainage and vent piping runouts to plumbing fixtures and drains, with approved trap, of sizes indicated; but in no case smaller than required by the Plumbing Code. Locate piping runouts as close as possible to bottom of floor slab supporting fixtures or drains. Provide proper size and length standpipe with air break where required by the Plumbing Code, for fixtures and equipment such as washing machines. Coordinate space in cabinetry for traps, tanks, and piping.

**Condensate Piping:** Provide condensate piping from each HVAC unit that produces condensate, or is indicated as "future cooling." ("Future cooling" includes the future addition of either condensing units, or a central chiller so that chilled water is circulated through the hydronic piping; units to have cooling include unit ventilators, fan coil units, air handling units, duct coils, etc.) Connect piping to all condensate connections on unit and to drip pan if provided. For each condensate outlet, provide a separate P-trap of sufficient depth and size to maintain the trap seal and to allow flow of condensate. Allow for P-trap depth when mounting equipment.

For rooftop equipment operated year-round, provide closed P-trap in heated space and increase piping downstream of the P-trap by one pipe size (combination drain and vent system). For all other equipment, provide open P-trap (with a vertical open pipe section on the downstream side of the trap) in each condensate line, near unit.

Extend piping as indicated. If not indicated, run piping, as directed by Architect, either (1) inside building to air gap or air break fitting to mop basin, lavatory, sink, floor sink, or floor drain into the sanitary sewer, but ONLY when Contractor has confirmed with the Authority Having Jurisdiction that this is accepted, (2) outside building to grade, (3) for rooftop equipment not operated in the winter, to roof drain, or (4) as specifically approved in writing by Engineer. Do not connect into storm drain piping. For floor-mounted unit ventilators, provide piping inside exterior walls, then to exterior above grade.

Insulate interior copper piping per Division 22 Section "Insulation." Provide accessible cleanouts as described in this Section. If pipe size is not indicated, size piping per "Condensate Pipe Size" paragraph and install at 1/4 inch per foot slope. Provide condensate pumps for all cooling fan coils and unit ventilators which are mounted flush with the ceiling, for other units where required, and for gravity drainage systems where available space does not allow a continuous gravity run.

For interior piping to a mop basin or similar fixture where an exposed pipe draining into the fixture is acceptable to the architect, provide 45-degree down discharge elbow ending one inch above rim, and chrome-plated escutcheon. For interior piping to a sink or similar fixture where an exposed pipe draining into the fixture is NOT acceptable to the architect, pipe concealed within wall, then out to an indirect drain fitting UPSTREAM of the p-trap serving the fixture. For interior piping to a floor drain (with funnel or 1/2 grate), maintain air gap or air break and install so that all condensate goes into the floor drain, with no splashing, and so that grate can be removed. For piping to exterior, provide 45-degree down discharge elbow 8 inches above splash block at grade. For exterior drains from future cooling units, attach cap on exterior end of drain pipe, and do not provide splash block.

*In locations where condensate is not approved for discharge into the sanitary sewer system by the authority having jurisdiction (e.g. Hanover NH), pipe condensate to grade even if shown otherwise on Drawings. Where required, provide Hartell LPT-1 or equal drain pump with tank to collect the condensate, then provide 1-inch pumped discharge piping to grade, location by Architect.*

**Condensate Pump Piping:** Where condensate pumps are provided, run insulated 3/4-inch copper tube vertically and/or horizontally as needed and make rigid, water-tight connection to rigid drain pipe that drains by gravity to approved location as indicated above. Size the rigid pipe per "Condensate Pipe Size" paragraph. Insulate all copper condensate piping per Division 22 Section "Insulation."

**Condensate Pipe Size:** For piping connection to the unit, match unit connection size or size per the following, or as indicated on the drawings, whichever is larger. *Then transition to larger pipe size per the following. For copper pipe: for up to five Tons of connected cooling load, provide 3/4 inch pipe; for 6 to 20 Tons, 1 inch; for 21 to 40 Tons, 1-1/4 inch; for 41 to 90 Tons, 1-1/2 inch; for 91 to 125 Tons, 2 inches. For PVC or ABS plastic pipe, provide DWV fittings and 1-1/2-inch minimum size up to 90 Tons, and for 91 to 125 Tons, 2 inches.*

**Condensate Pipe Acoustic Isolation:** Isolate from structure all 3/8", 1/2", 3/4", and 1" diameter piping passing through or near steel or wood studs. Use appropriate materials, such as acoustical pipe clamps equal to Hubbard Holdrite (1-800-321-0316) or Acousto-Plumb (1-800-854-3215). Pipes must never contact any structure. Any failure to comply with this requirement will be grounds for the Engineer to request that the GC open previously covered work at the contractor's expense to prove compliance with this requirement throughout the building.

**Supports and Anchors:** Hangers, supports, anchors, and spacing are specified in Division 22 Section "Supports and Anchors." Seismic restraints may be required. See Division 22 Section "Seismic Restraints."

**Sewer Connections:** Extend building drain to connect to sewer piping, of size and in location indicated for service exit from building. Install sleeve and mechanical sleeve seal through foundation wall for watertight installation. All building sanitary sewers which receive discharge from toilets shall be a minimum of four inches in diameter from the inside face of the foundation wall to the point of disposal.

**Pump Discharge Piping:** Make all turns with two 45-degree elbow fittings.

## **Installation of Other Products**

**Backwater Valves:** Install in sanitary building drain piping as indicated, and as required by the Plumbing Code, and to protect from backflow all fixtures or drains located at an elevation below the tops of the manhole for the relative portion of the sewer system. For interior installation, provide cleanout cover flush to floor centered over backwater valve cover and of adequate size to remove valve cover for service.

**Flashing Flanges:** Install flashing flange and clamping device with each stack and cleanout passing through waterproof membranes.

**Vents:** Offset plumbing vent terminations as required to maintain minimum 20 feet distance from any HVAC air intakes. Unless roof is designed for human occupancy, terminate vents nine inches above the roof (except as required otherwise by State or local code). Confirm all vent termination locations with Architect.

**Vent Flashing Sleeves:** Install on stacks passing through roof, secure over stack flashing in accordance with manufacturer's instructions, to assure leak-free performance.

**Piping Heat Trace:** Install on any condensate line that is inside freezer, or otherwise subject to freezing.

**Cleanouts:** For floor cleanouts: Don't locate floor cleanouts at transitions in flooring materials, especially carpet to tile/linoleum. For wall cleanouts, cut cover plate screw to required length; do not drill through threaded hole in plug. For all cleanouts: Install in drainage piping (1) as indicated, (2) as required by the Plumbing Code, (3) at each change in direction of piping greater than 45 degrees, (4) at minimum intervals of 50 feet for piping four inches and smaller and 100 feet for larger piping, (5) at base of each vertical soil or waste stack, and (6) at the junction of the building drain and the building sewer, with a maximum developed length of ten feet from the cleanout to the sewer exit from the building.

**Floor Drains:** Install floor drains *at locations* per Architectural Drawings, or, if not shown, as directed by Architect. Do not install elevator pit floor drain or sump pump without prior approval of the location and all other relevant aspects by the elevator company and by all authorities having jurisdiction. All floor drains receiving indirect waste must be located in non-traffic areas. Coordinate with GC to install floor drains at low points of surface areas to be drained. Set tops of drains flush with finished floor. Provide a water trap for all drains connected to the sanitary sewer. Mechanical traps are not allowed in Vermont, and are not allowed elsewhere except by specific written permission from plumbing inspector. Install drain flashing collar or flange so that no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes, where penetrated. For installations in existing floors, patch floor material as required and coordinate with GC. Position drains so that they are accessible and easy to maintain. All floor drains have trap primers unless indicated otherwise. Where allowed by state plumbing code, use of combination drain & vent is acceptable for floor drains.

**Boiler Room Floor Drains:** Per the Mechanical Code (for example, 2000 International Mechanical Code 1004.6), "Boiler rooms shall be equipped with a floor drain or other approved means for disposing of liquid waste." Any boiler room floor drain subject to receipt of toxic or oily wastes (including boiler water) shall have a deep seal trap (no trap primer) and shall discharge to an interior or exterior storage tank. Any boiler room floor drain that receives only clear-water waste (such as water heater pressure

relief valve discharge, air conditioning or steam condensate, or potable water backflow preventer discharge) shall have a trap primer and shall discharge into the building sewer. Where both types of floor drains exist, they shall be separated by a continuous eight-inch-high concrete berm.

**Floor Sinks:** Refer to “Floor Drains” paragraph above, except that Floor Sinks do not have trap primers unless used for seasonal drainage such as air conditioning condensate, or unless so indicated.

**Interceptors:** Install grease interceptors per Architectural Drawings, or, if not shown, as directed by Architect. Install grease interceptors with top flush with floor unless indicated otherwise. For all types of interceptors, provide ample clearance for basket removal and cleaning and coordinate with GC. Where interceptor serves as fixture trap, the vertical distance from the fixture outlet to the trap weir shall not exceed 24 inches. Install flow control device immediately underneath the sink served, and above the floor.

**Roof Drains:** Install roof drains per Architectural Drawings, at low points of roof areas. Install drain flashing collar or flange so that no leakage occurs between roof drain and adjoining roofing. Maintain integrity of waterproof membranes, where penetrated. Position roof drains so that they are accessible and easy to maintain.

**Sump Pumps:** Provide check valve, union, and shut-off valve on discharge line, with check valve on the pump side of the shut-off valve. Locate valves above pit level. Connect to storm drain unless shown otherwise on Drawings. Set float switch to have an on-off differential of twelve inches unless indicated otherwise. Where pump discharges indirectly into a fixture such as a mop basin, adjust valve on discharge line to avoid splashing or overflowing at the mop basin.

**Elevator Pit Sump Pumps:** Locate elevator pit and sump pump per elevator manufacturer; discharge shall terminate with an indirect connection to the sewer system (or where indicated by civil engineer and where allowed by environmental authority, to daylight); provide discharge pipe and route to one inch above rim of nearest mop basin, unless shown otherwise on the drawings; and adjust valve on discharge line to avoid splashing or overflowing at the mop basin. Elevator pit sump pump cord/cable shall be installed through a sleeve; the sleeve shall be fire caulked.

**Condensate Pumps:** Provide built-in or field-installed check valve on discharge line. For in-pan models, do not locate pump where condensate could drip onto exposed switch.

**Stack Drains:** Provide one-inch galvanized steel pipe from each stack drain fitting. Terminate each pipe five feet above floor with ball valve, vacuum breaker, and hose thread fitting. Owner to provide hoses and containers for disposal of rainwater, which may be contaminated with materials from the stack. Do not put contaminated rainwater into floor drain without approval of plumbing inspector and local wastewater authority. Do not put contaminated rainwater onto the ground or into the groundwater without approval of environmental authorities.

## **Field Quality Control**

**Protection:** Protect drains during remainder of construction period, to avoid clogging with dirt and debris, and to prevent damage from traffic and construction work. Place plugs in ends of uncompleted piping at end of day or whenever work stops.

**Inspections:** Arrange for inspection of the piping system before concealed or closed-in after system is roughed-in, and prior to setting fixtures. Arrange for a final inspection by the plumbing official to observe the tests specified below and to insure compliance with the requirements of the Plumbing Code.

**Piping System Test:** Test for leaks and defects all new drainage and vent piping systems and parts of existing systems, which have been altered, extended or repaired. Conduct a water test at a pressure not less than 10 feet, for at least 15 minutes, or more stringent requirements in accordance with the authority having jurisdiction, or per the Plumbing Code. Repair all leaks and defects using new materials and retest system or portion thereof until satisfactory results are obtained.

**Cleaning:** Thoroughly clean drain strainers, domes, and traps. Remove all dirt and debris.

**END OF SECTION 221435** (revised July 27, 2015)

## **DRAINAGE AND VENT SCHEDULE BARRINGTON TOWN OFFICES**

**Alternate manufacturers** for drainage products specified in this schedule: Josam, Smith, Wade, Zurn. Note that some of the above manufacturers may not have “equals” for all required products, and are therefore not acceptable for this project. Contractors are cautioned that any proposed “equal” must have all listed features, required options, and other items listed in the main specification section. All proposed “equals” not listed above must be submitted prior to bid as described elsewhere.

**Note to Contractors: In addition to this Schedule, provide your suppliers with Specification Section 221435, Part 2 - Products, for important additional information.**

### **Piping**

See Specifications 221435-1 and -2 for descriptions of each of the following piping types. Each piping type listed below matches one paragraph of 221435-1 and -2. Where more than one type of piping is listed for a given application, Contractor may select one or more of those listed.

#### **Above Ground Soil and Vent Pipe:**

Type L Copper (three inch maximum size)  
Hubless Cast Iron Soil Pipe

#### **Below Ground Soil and Vent Pipe:**

Hub-and-Spigot Cast Iron Soil Pipe  
Hubless Cast Iron Soil Pipe with Heavy Duty Couplings

#### **Above Ground Sump/Sewage Pump Discharge Lines:**

Type L Copper (**Future**)

#### **Above Ground Condensate:**

Sch. 40 PVC (**Gravity**)  
Type L Copper (**Pumped and where indicated**)

### **Other Products**

#### **D-1. FLOOR CLEANOUT:** Zurn ZN-1400-BP; Wade 6000

*Features:* Cast iron body; factory-applied latex paint coating; adjustable head height; gas-tight/water tight bronze/brass plug; round non-slip nickel bronze top.

*Required Options:* Provide model with anchor flange and clamp collar if membrane floor. Provide carpet marker if carpeted floor. Provide heavy-duty top where cover load exceeds 2000 lbs. Provide access wrenches.

*Note:* Match size of main up to 4 inches.

**D-2. WALL CLEANOUT:** Zurn Z-1446-BP; Wade 8590B/8480R

*Features:* Round 18- or 20-gauge stainless steel access cover, with screw.

*Required Options:* Provide cast iron cleanout tee adaptable to pipe, with brass cleanout plug.

*Note:* Cover size not to exceed 4 inches more than pipe size.

*Note:* For all concealed storm drain piping, and for all concealed drainage piping where the pipe is too far behind the finished wall for a D-2 to work, provide a cleanout tee and a conventional Steel Access Door per the BASIC MATERIALS AND METHODS Section.

**D-75 SMALL SIMPLEX SEWAGE PUMP PACKAGE:** Little Giant; Liberty P372LE41; Zoeller 0016 with 10-126 "A-PAC" alarm.

*System Features:* Factory pre-assembled system; polyethylene seam-free basin, minimum 24 x 24 inches; 4-inch inlet hub; structural foam gasketed water- and gas-tight cover with two 2-inch discharge and vent flange, complete with necessary sealing hardware and flanges; pump access opening.

*Pump Features:* 2 inch discharge; capacity 50 GPM at 15 ft. head; 4/10 HP motor; 115 volt, single phase service; submersible, oil-filled, hermetically filled motor with thermal overload protection; stainless steel rotor shaft supported by upper and lower ball bearings; cast iron impeller capable of passing two-inch solids; enamel-coated cast iron volute and housing; stainless steel handle and external fasteners; 20-foot power cord with quick-disconnect; 10 x 11 x 13 inches high (maximum).

*Control Features:* NEMA 4X waterproof enclosure; HOA switches; pump run lights; alarm beacon; two float switches.

*Control Required Option:* Alarm Auxiliary Contacts.

*Warranty on Package:* Two-year parts and one-year labor.

*Note:* Provide check valve, union, and gate valve on discharge line.

**D-83 MEDIUM TANK, LOW HEAD CONDENSATE PUMP:** Little Giant VCMA-20ULS with CV-15/20

*Features:* 3/8 Inch OD copper tubing connection; capacity 1.2 gpm at 5 ft. head and 0.9 gpm at 10 ft; 93 watt thermally protected motor; polystyrene 0.5 gal. tank; ABS cover; float operated switch activates pump in 2.4 inches of water and deactivates in 1.25 inch; 6-foot power cord; auxiliary DDC switch; built-in CV-15/20 brass check valve; 5 x 10.4 x 7 inches high.

*Required Options:* Provide 115V or 230V version as required.

*Note:* Confirm that the required space is available before ordering. If less height is required, substitute Model VCC-20ULS with CV-15/20 (0.3 gal. tank, 5.1 inches high).

**END OF DRAINAGE AND VENT SCHEDULE**

## **SECTION 221440 - PLUMBING FIXTURES**

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### **Part 1 - GENERAL**

**Plumbing Code:** Comply with applicable portions of the codes listed in Division 22 Section “Basic Requirements,” and other state and local codes. Review Drawings and Specifications with Plumbing Inspector prior to rough-in. Notify Mechanical Engineer of any significant changes.

**Plumbing Inspector:** Provide all work required by Plumbing Inspector(s), whether or not such work is shown in Contract Documents. Applies to all divisions. Contractors are encouraged to check with Plumbing Inspector(s) regularly during the course of the work.

**Specification Revisions:** Recently revised portions of this specification are shown in italics.

**Drench Shower/Eyewash Units:** In accordance with applicable regulations, every school, college and university room wherein corrosives or flammable liquids are handled or where open flame devices are used shall be equipped with an Emergency Drench Shower/Eyewash Unit, located as close to the main door of the room as possible (to provide an escape route), but not greater than 50 feet from an experimental area.

**Complete System:** For all fixtures, floor drains, sinks, appliances, faucets, and all other plumbing items indicated in the Contract Documents, provide all required piping, carriers, trim, appurtenances, and all other components required for a complete system, whether or not these auxiliary components are indicated elsewhere in the Contract Documents. Where a fixture is indicated but the specification of it is incomplete or missing, Contractor shall consult Engineer for clarification, or base the bid on the most similar specified fixture.

**Submittals:** Submit data on each product specified in this Section and in the Schedule at the end of this Section. See Division 22 Section “Basic Requirements” for important additional information on submittals. Note that even though electronic submittals may be used in this project, for the plumbing (and HVAC) submittals, we require that one copy be provided to us in paper, in a hard-sided 3-ring notebook organized by specification sections and tabbed. In O&M Manual: for Chicago Faucets, include “Maintenance/Repair Manual” (Item No. 1196-10M-CG); provide 8-1/2 x 11 maintenance schedule chart including, as applicable, strainers, mixing valves, sediment buckets, interceptors, neutralizing tanks, pumps, emergency eyewashes/showers, and water heaters.

**Pre-submittal Meeting:** It is REQUIRED that the Contractor meet with the Engineer at the office of the Engineer in Keene, N.H. to review in person the first draft of the plumbing submittals (prior to the final submission of multiple paper or electronic copies), and for assistance as requested in other aspects of the project. Contact the Plumbing Engineer (Roy Swain, 603-352-4841) for any questions regarding the submittals and the process. As soon as you have a signed contract, please call us to schedule this meeting, and bring with you two paper copies of the submittals. All plumbing submittals received prior to this meeting will not be reviewed; except that if there are a few long lead time or early installation items that need to be reviewed prior to the meeting, call us to let us know and then send them to us in paper or electronically, and we will review them promptly. Thank you.

**Alternate Submittal Meeting:** *For Contractors who have successfully completed an in-person submittal review meeting on a previous project as described above, the submittal meeting for this project may at*



*contractor's option be conducted by a remote virtual meeting (gotomeeting, joinme, etc.) initiated by the contractor and with a shared computer screen for reviewing each page of the submittal. The software shall include a markup tool that can be shared by both users to mark up the document as the review proceeds, and each user shall receive an electronic copy of the marked-up document at the conclusion of the meeting.*

## **Part 2 - PRODUCTS**

### **General**

**Manufacturers:** Comply with Division One requirements. Comply with Division 22 Section “Basic Requirements.”

**All Products** of a given type (vitreous china, stainless steel sinks, faucets, etc.) shall be from one manufacturer unless specifically approved otherwise in advance by Engineer.

**Lead Free:** All applicable products supplied under this section shall be “lead-free” as defined in current Federal law and shall have a published lead content of not more than a weighted average of 0.25%.

**No Antibacterial:** No part of any product provided under this Division shall be anti-bacterial or anti-microbial using a chemical or physical biocide. Nanoparticle silver is prohibited.

**No Plastic Tubing:** Rigid or flexible plastic tubing is not allowed in the waterway of any plumbing fixture or as any part of the water distribution system. Exceptions: kitchen sprays, hand-held shower hoses, washing machine hoses (armored). Plastic filter bodies or strainer bodies are not allowed.

**Applicability:** Products described herein may or may not be applicable to this project. See Schedules and Drawings.

### **Products**

**All Toilets:** 1.6 GPF maximum; vitreous china; fully glazed minimum 2-inch trapway; minimum water surface area 10.1 x 9 inches or equivalent; siphon jet flush action; color white unless indicated otherwise; floor outlet for floor-mounted toilets unless indicated otherwise. Show MaP number on submittal sheets.

**Flush Valve Toilets:** one-piece; cast iron floor mounted carrier to suit for wall-hung toilets; 1-1/2 inch top spud. Flush valve shall have ADA-compliant non-hold-open handle, integral filter or screen, and cast brass flange. Commercial seats shall be heavy duty, extra heavy weight, white, injection molded solid polypropylene, with integrally molded bumpers, stainless steel hardware, reinforced self-sustaining check hinges with one-piece posts, round top hinge bodies, and “Sta-Tite” hinges with one-piece nylon break-away nuts with integral washers. All flush valve toilets, bowl and flush valve combinations, shall have an MaP number of 1000; show this number on submittal.

**Gravity Tank Toilets:** solid brass or stainless steel tank-to-bowl bolts, ADA-compliant trip handle (on left or right side as required by ADA), and insulated tank liner or pressure tank. Liner must be sealed watertight along all edges, top and bottom, so that outside of liner remains dry; OR shall have passed the ASME A112.19.2-2003 Section 7.6 Insulated Tank Test, which includes a tank water temperature of 45 degrees Fahrenheit and ambient temperature of 80 degrees Fahrenheit with no condensation on the tank

for the testing period of three hours. Residential seats shall be heavy weight, white, injection molded solid polypropylene, with integrally molded bumpers, *slow closing*, and plastic hardware with concealed bolt top.

**Urinals:** 0.5 or 1.0 maximum GPF, as indicated; vitreous china; 3/4 inch top inlet spud; flushing rim; color white unless indicated otherwise; floor mounted carrier to suit. Flush valve shall have ADA-compliant non-hold-open handle, integral filter, and cast brass setscrew flange.

**Waterless Urinals:** Waterless urinals are allowed when connected to composter bins. Non-composter waterless urinals are allowed when specifically selected by Owner; in such case, urinal must show a visual indication when drain cartridge or fluid needs to be changed, and submittal must show approval of State regulatory agency.

**Lavatories:** vitreous china; faucet ledge; overflow; two faucet holes on 4 inch centers unless indicated otherwise; color white unless indicated otherwise; grid drain with non-removable strainer and 1-1/4 inch tailpiece unless indicated otherwise; floor-mounted steel/cast iron concealed arm carrier for wall-hung units unless indicated otherwise.

**Sinks, Stainless Steel:** Countertop mounting unless indicated otherwise; one-piece, type 302 or 304 stainless steel; satin finish; fully undercoated on sides and bottom; center drain location for regular sinks; off-center (toward the rear) drain location for all ADA sinks; strainer with 1-1/2 inch tailpiece; faucet holes on 4 inch centers. Note: Indicate correct number and placement of holes on submittal. Sinks with incorrect holes will have to be returned and replaced with the correct sinks. Confirm sink will fit in cabinet before ordering. Provide U-channel mounting system that includes tightening bolts; spring-loaded “quick-clip” systems not allowed (for Just sinks, the terminology is “lugs only, no grip rim clips”).

**Faucets:** All faucets shall have: cast brass bodies (except F-20 and F-50 series residential faucets); cast brass spouts unless tubular spouts are indicated; and polished chrome finish of all exterior parts unless indicated otherwise. All faucets except metering faucets shall have quarter-turn ceramic cartridges or shall have faucet handles whose closed position does not “slip” with use. Specified faucet dimensions are from centerline to tip. Provide aerators/outlets as specified, except substitute non-vandal-resistant aerators/outlets for residential applications and for commercial applications where only staff persons have access to the faucets. Provide vacuum breakers and check valves for all faucets with hose thread outlets. All faucets shall have a minimum warranty of five years on all aspects of the faucet; if any manufacturer does not meet this warranty requirement, contractor and/or distributor shall be required to make up the difference and provide the full, specified warranty. Pre-rinse spray valves shall have a flow rate not more than 1.6 gpm, per the Energy Policy Act of 2005.

**Water Fountains and Coolers:** Cooler refrigerant shall be R134A. The trap and all internal components shall be concealed completely within the case. Submittal shall state or show compliance with this requirement. All wall-hung fountains and coolers shall have floor-mounted steel/cast iron concealed carriers unless indicated otherwise.

**Shower/Tub Mixing Valves:** brass pressure-balancing design; metal single blade lever handle; outlet temperature control within 3 °F; integral service stops. Reverse lever action (for back-to-back mounting) is not allowed.

**Acrylic and Fiberglass Showers and Bathtubs:** Grab bars shall be 1-1/4 inch, textured, *or as indicated*. Provide Aquarius “EasyBase” factory installed self-sustaining shower base that eliminates the need for the use of bedding compound when shower is installed on a level floor.

**ADA Showers:** Provide modified units as required so that seat and grab bar shall not extend out farther than shower curtain. Ensure that shower curtain stays inside dam when shower is in use. Mount hand-held shower wall mount at 48 inches. Comply with State requirements on shape of seat, grab bar location, etc.

**ADA Bathtubs:** Mount valve below grab bar and three inches off center, toward front. Mount hand-held shower wall mount at 48 inches. Comply with State requirements on shape of seat, grab bar location, etc.

**Emergency Drench Shower Units:** The shower shall be capable of discharging a continuous spray at a rate of twenty gallons per minute (30 GPM in Massachusetts). An emergency shower mixing valve shall be provided to supply tempered water between 70°F and 90°F, initial setpoint 80°F.

**Emergency Eyewash Units:** Unit shall have stainless steel bowl and stay-open ball valve. Each head shall have a pressure-independent flow control, water filter, and flip-top cover integrated into the head. An emergency mixing valve shall be provided to supply tempered water between 70°F and 90°F, initial setpoint 80°F.

**Kitchen Plumbing Accessories:** Pipe up all kitchen fixtures and equipment complete. Provide strainers, P-traps and tailpieces, indirect waste piping, valved supply piping, vacuum breakers, pressure reducing valves, check valves, and other items so that all fixtures and equipment are fully functional and in accordance with manufacturer’s recommendations. (Submittal not required on P-traps, tailpieces, vacuum breakers or check valves.)

**Supplies and Stops:** Comply with “NSF Standard 61” paragraph in this Section. Provide maximum 30-inch long chrome-plated copper supplies at all locations including within cabinetry. Plastic tubing supplies are not allowed. Provide chrome plated lead-free “heavy” solid brass stops with brass ball valves, brass stems, chrome-plated brass quarter-turn removable handles, and sweat inlets: McGuire “Convertible” with “DF” suffix (BV170-DF, BV172-DF); or equal. Prior to bidding, submit sample of stop to Engineer for any proposed equal. (No equal stops available from: BrassCraft.) For Dartmouth College projects or where specifically indicated, provide IPS versions with 3-inch nipple, BV2165-N3-DF, BV2166-N3-DF, and provide FIPS adapter behind bell flange.

**Strainers, tailpieces and P-traps:** Provide strainers as specified for fixture, and 17-gauge polished chrome plated brass tailpieces. Provide McGuire 155A or equal grid drain for lavatories, unless shown otherwise. Provide McGuire 8090C/8092C or equal polished chrome cast brass P-traps (P-trap section minimum weight 1.00 pound), brass slip nuts, and 17-gauge polished chrome plated brass wall bend. If required for ADA compliance, provide McGuire 155WC or equal offset strainer assembly with polished chrome heavy cast brass elbow. Prior to bidding, submit sample to Engineer for any brand other than McGuire.

**Exposed Supplies and Drains:** *Shall be chrome plated. Where exposed long runs are required (as to a side wall), if chrome plated piping cannot be provided for the entire run, then use copper piping and paint with matching chrome colored paint.*

**Flanges for Stops and P-trap Tailpieces:** Provide chrome plated wrought brass deep flanges (bell type) equal to McGuire WEXXXD series, or “DF” suffix. Prior to bidding, submit sample of stop to Engineer for any proposed equal. Note: Engineer will test installed flanges with a magnet, and Contractor will be required to replace all those found to be steel.

**Strainers for S.S. Sinks.** For sinks with 3.5-inch drain openings: Ball-lock; chrome-plated brass or stainless steel basket, stem, and body; rubber or neoprene stopper; brass nuts. Basket strainers and stoppers shall hold water without leaking. Provide Dearborn Brass 15BN, or pre-approved equal. For sinks with 2.5-inch drain openings, provide Watts 2-10 Deep Junior Strainer with chrome plated deep bail basket. Submit sample to Engineer for any additional proposed equals.

**Bathtub Drains:** For bathtubs with access panel or accessible utility space, provide Gerber 41-812 17-gauge drain in tee with trip ADA lever (includes slip joints). For bathtubs without access panel or accessible utility space, provide similar quality ADA trip lever bath drain with all joints soldered or screwed, such as AB&A 14307. (or if plastic drainage pipe is separately approved, joints may also be solvent cemented).

**Solder:** Use lead-free solder throughout, such as tin-copper-silver, tin-silver, or tin-antimony. Solder containing lead is not permitted on the job site.

**Controls:** All controls (handles, knobs, etc.) for use by building occupants shall require a force no greater than 5 pounds to operate. This requirement applies to controls on all fixtures, not just ADA fixtures.

**Scheduled Products:** See Schedule at the end of this Section for additional descriptions of products.

## **Part 3 - EXECUTION**

### **Product Installation**

**All Fixtures:** Refer to Architectural Elevations or other indications on drawings for mounting heights of all fixtures, or if not shown, as directed by Architect. Install fixtures, including flush valves, level and plumb. Fasten fixtures securely to supports or building structure. Seal fixtures and equipment to walls and floors; this is required by Code. Match sealant color to fixture color, except use clear sealant for stainless steel fixtures. Caulk under flange of all countertop sinks. Check toilet seats for easy operation and readjust as needed.

**Fixtures, ADA Compliant:** All fixtures with an “H” in the mark number are accessible fixtures. Comply with accessibility requirements for all accessible fixtures, including the side of the toilet flush lever. Do not mount an “H” sink in a cabinet with closed-door storage below the sink, unless so instructed by Architect. Mount all accessible controls no higher than 48 inches above the floor. Install ADA lavatories two inches minimum from front edge of counter for ADA compliance. For dual showerheads, mount second showerhead 48 inches above the floor. For adult height ADA water fountains/coolers and lavatories, maintain minimum 27-inch knee clearance; for age 6-12 ADA lavatories (31 inch height), maintain minimum 24-inch knee clearance.

**Wet Wall Thickness:** Coordinate with GC to provide sufficient wall cavity for carriers for wall-hung toilets, urinals, lavatories, and water fountains. *Generally, horizontal adjustable closet carriers require 18 inches clear inside space for double-sided toilets and 11.5 inches for single-sided. Manufacturers also*

*have “narrow” closet carriers that can work with as little as 15 and 10 inches clear inside space, respectively. For both regular and narrow carriers, the clear inside space can intrude partially into the cavity between wall studs. Thus, double-sided toilets can require as little as 16 inches face-to-face with two-sided stud walls and narrow carriers—but this may vary by manufacturer, so Contractor must confirm and coordinate with other trades. Generally, urinals, lavatories, and water fountains require 6 inches clear inside space. For all types of fixtures, different brands have different dimensions, and it is the Contractor’s responsibility to select a brand to fit the space or vice versa. For all wet walls without carriers, provide minimum 2x6 stud walls or 5.5 inches clear inside space.*

**Flush Valves:** Locate so as not to interfere with grab bars. Adjust pressure and flow for proper operation, and to prevent splashing.

**Faucets:** Before turning on water to faucet, remove aerator and flush lines completely. Replace aerator. Set all blade faucet handles to be in a straight line, pointing away from spout, when in closed position. For deck-mounted faucets, set handles parallel to back wall. For wall- or back-mounted faucets, set handles to be horizontal. Prior to final inspection, remove debris from faucet aerators, remove visible putty, and clean up faucet finish with soap and water only.

**AC Electronic Flush Valves and Faucets:** MC and ATC subcontractor are responsible for all work not shown in the EC contract documents, in order to make the systems fully operational. Normally, MC provides transformers to EC, who powers and installs them. ATC contractor provides low voltage wiring from transformers to the flush valve or faucet electronic modules.

**Drinking Fountains and Water Coolers:** See Architectural Plans for proper orientation of dual units. Clean inlet filter. Adjust regulator to provide proper flow without splashing.

**Showers and Bathtubs:** see Drawings for left- vs. right-hand seat location; wet wall on side as indicated, with seat (if any) on opposite side. All listed dimensions are approximate; confirm with GC prior to ordering. Adjust shower valve handle to be vertical when in the off position (unless shown otherwise by manufacturer). Install shower curtain so its bottom is about 1/4-inch above the shower floor. Install showerhead so that the shower arm comes through the enclosure wall about six inches below the inside top of the enclosure, or, for tiled showers, as shown by Architect, or 6’-6” if not shown. *For 3 x 3 ADA showers, remember that an extra 12 inches of clear space outside the shower is required on the seat side of the unit.*

**Drench Shower/Eyewash Units:** Shall be installed in accordance with ANSI Z-358.1 and applicable state regulations. The location shall be clearly indicated by signs of contrasting color, either RED and WHITE or GREEN and WHITE. The signs shall be at least 70 square inches in area. Support assembly by anchoring to wall. All exposed supply and drain piping shall match that of the shower unit (galvanized or painted). Do not insulate. Do not install shut-off valve on supply line. Do not allow supply pipe to be stressed. If floor drain is provided immediately underneath shower and piped to wall, provide drain piping from eyewash to wall, and then connect behind wall/floor to floor drain piping upstream of trap. If there is no floor drain, leave eyewash drain outlet open and pointed toward wall.

**Emergency Eyewash Units:** Provide p-trap and pipe drain to sanitary drain and vent piping within adjacent wall.

**Kitchen Plumbing Installation:** Install fixtures, equipment, dishwashers, faucets, hose sprays and other items that are furnished by Kitchen Equipment Contractor and/or Owner. Refer to kitchen equipment

plans and kitchen equipment schedule if available. Provide all required work so that all fixtures and equipment are fully functional and in accordance with manufacturer's recommendations.

**Dishwashers:** See architectural drawings for dishwasher locations, which may or may not be shown on plumbing drawings. Commercial dishwashers shall drain via and air gap or air break into an adjacent floor sink. Residential dishwashers shall drain via and air gap or air break into an adjacent floor sink, OR into a wye-branch fitting on the tailpiece of an adjacent sink. The waste line shall rise and be securely fastened to the underside of the sink rim or counter, as described in the Plumbing Code.

**Mop Basins:** Tighten spout securely. Position hanger so mops drain into basin. Install dual dome strainer with one dome up and one dome down. Coordinate location with Architect, GC and EC to ensure minimum six feet distance from any electrical panel.

**Supplies and Stops:** Secure piping behind or within wall construction to provide rigid installation. Install escutcheons at each wall, floor, and ceiling penetration in exposed finished locations and within cabinets and millwork. Install a stop in an accessible location on each water line to all tank type toilets, lavatories, sinks, and other fixtures and equipment items as needed. Remove handles for all nonresidential applications and turn over to Owner.

**Strainers, tailpieces and P-traps:** Provide strainers, tailpieces and P-traps for all sinks, lavatories, and other fixtures and equipment as required.

**Secure Mounting:** Piping (supplies, shower arms, etc.) and valves (flush valves, shower valves, etc.) must be mounted securely so that they cannot be moved more than 1/8 inch.

## Field Quality Control

**Protection:** Provide protective covering for installed fixtures. Do not allow use of fixtures for temporary facilities unless expressly approved in writing by the Owner. Inspect each installed unit for damage. Replace damaged fixtures.

**Testing:** Test fixtures and equipment to demonstrate proper operation upon completion of installation and after units are water pressurized. Test drain piping with full bowl of water. Repair leaks, then retest. Repair leaking or dripping faucets, stops, piping, stoppers, etc.

**Adjustments:** Adjust water pressure at water fountains and coolers, faucets, shower valves, and flush valves to provide proper flow and stream. Adjust metering handwash faucets and valves to deliver 0.25 gallons of water during a cycle of 10 seconds minimum (the 10 seconds is an ADA requirement): 30 seconds at 0.5 GPM, 20 seconds at 0.75 GPM, 15 seconds at 1.0 GPM, 10 seconds at 1.5 GPM. Set temperature to 100°F. Adjust cycle duration of metering showers as directed by Owner. For other hot water system temperature adjustments, please see Division 22 Section "WATER DISTRIBUTION SYSTEM".

**Cleaning:** Clean fixtures, equipment, trim, faucet aerators, and strainers using manufacturer's recommended cleaning methods and materials.

**END OF SECTION 221440**

## PLUMBING FIXTURE SCHEDULE BARRINGTON TOWN OFFICES

**Alternate manufacturers:** For vitreous china products: *Kohler—NO OTHER MANUFACTURERS ALLOWED*. For toilet seats: Bemis or Church (no known equals). For water cooler/fountains: Elkay, Halsey Taylor, Oasis. For mop basins: Fiat, Swan, Zurn. Note that some of the above manufacturers may not have “equals” for all required products, and are therefore not acceptable for this project. Contractors are cautioned that any proposed “equal” must have all listed features, required options, and other items listed in the main specification section. All products of the same type (vitreous china, stainless steel sinks, faucets, etc.) must be from one manufacturer unless exceptions are specifically indicated. All proposed “equals” not listed above must be submitted prior to bid as described elsewhere.

**Submittals.** Provide submittals on all products shown in this schedule, plus the following products if used for this project:

Supplies, Stops, Strainers, Tailpieces, P-traps, Solder

**Note to Contractors:** In addition to this Schedule, provide your suppliers with Specification Section 221440, Part 2 - Products, for important additional information.

**P-17H FLOOR MOUNTED 1.28 GPF - 17/18-INCH TOILET, ADULT ADA:** Kohler Highline K-3999-U or -UR (right hand flush).

*Features:* min. MaP = 1000; 1.28 GPF; elongated bowl; 16 to 17 inch rim height; gravity flush action; close-coupled tank; insulated tank liner; ADA trip lever on left side except on right side where required (see plans) (RIGHT TRIP LEVER NOT AVAILABLE FROM MANSFIELD); 12 inch rough-in; 30 x 18 x 31 inches high.

*Required Options:* Bemis 1655SSCT or Church 9500SSCT open front seat (no known equals, see 231440-2). Left or right side flush lever per ADA.

**P-31/P-31H WALL CARRIER CHINA LAV, ADA:** Kohler K-2005 Kingston.

*Features:* self-draining deck area; back splash; drilled for concealed arm carrier; minimum 14 x 10 x 4 inch bowl; overall 20 inches wide x minimum 18 inches deep.

*Required Options:* 1-3/4 inch maximum distance from the front edge of the center faucet hole to the back of the bowl. *Please add this dimension to the submittal.*

*Faucet:* F-2H

*Pipe Guard:* P-99H for ADA locations.

*Note:* Fixture model number may change if a faucet is used having other than 4-inch centers; Contractor to coordinate prior to submitting.

**P-46HE. ECONOMY COUNTERTOP S.S. LARGE SINK, 25x21, ADA:** Elkay GECR-2521; Just SBW-2125-AGR

*Features:* 20 gauge; 21 x 16 x 5 inch bowl; overall 25 (L to R) x 21 inches.

*Required Options:* No. of holes (4-inch centers) as required for faucet, etc. Provide drain at left position unless directed otherwise by Architect.

*Note:* Confirm sink will fit in cabinet before ordering.

*Note:* Submittal must show correct number of holes or it will be rejected.

*Faucet:* F-38H

*Pipe Guard:* P-99H

**P-47HE ECONOMY COUNTERTOP S.S. SMALL SINK, 15x15, ADA:** Elkay BPSR-15; Just SBL-1515-BGR

*Features:* 20 gauge; 12 x 9 x 6 inch bowl; overall 15 x 15 inches.

*Required Options:* Two holes for faucet at back. Watts 2-10 deep strainer.

*Note:* Confirm sink will fit in cabinet before ordering.

*Note:* Submittal must show correct number of holes or it will be rejected.

*Faucet:* F-38H

*Pipe Guard:* P-99H

**P-64H. WATER FOUNTAIN, WITH CABINET, DUAL, ADA:** Halsey Taylor HACFSDBL/LR-ADA with 45392C; Oasis. (Note: Not available from Elkay.)

*Features:* Stainless steel top; flush-to-wall mounting; 100% lead-free copper/brass waterways; pushbar front and both sides; single drain and water supply; 37 x 19 x 27 inches high.

*Required Option:* Stainless steel cabinet; chrome-plated vandal-resistant solid brass bubbler (flexible plastic guard permitted).

*Required Option:* Carrier, as recommended by manufacturer -- Zurn Z-1225-BL-L2, Smith 800 series, or Wade W-400 series. Coordinate with Architect to determine which side -- left or right -- shall extend further.

*Required Option:* Factory-installed Halsey Taylor #96852CA glass filler.

**P-83E. 36 x 24 x 10 MOP BASIN:** Fiat MSB-3624; Swan MS-2436-3

*Features:* Molded compressed ground stone/resin/fiber composition; color white; one inch shoulders; removable stainless steel dome strainer and lint basket; three inch outlet; 36 x 24 x 10 inches.

*Required Options:* 30 inch long 5/8 inch hose; stainless steel hanger for three mops; 12-inch high, 20-ga. stainless steel guards for all adjacent walls; neoprene drain adapter for three-inch pipe.

*Faucet:* F-66H

**P-99H. HANDICAP PIPE GUARD - STAINLESS STEEL:** Apollo hcp. Shield Model AP1009 and/or AP1013

*Features:* 22 gauge stainless steel construction; soft bottom edge guard; curved shape 10 inches diam. x 9 inches high with one-inch wall flanges.

*Required Options:* Install with wall anchors and stainless steel vandal-resistant screws.

*Note:* Install with edge guard down, and peel off protective cover.

*Note:* For lavatories, provide AP1009 10-inch version and offset strainer assembly.

*Note:* For stainless steel sinks, provide AP1013 13-inch version. Carefully locate the sink far enough back in the countertop so that the drain pipe is behind the pipe guard.

*Note:* Available from Apollo Manufacturing, Lawrence, Mass., 978-688-1755, fax 978-683-5933.



## FAUCETS

- F-2H. ADA SINGLE INLET METERING LAV FAUCET:** Chicago 857-665- E37VP-AB  
*Features:* 4 inch centers; locking brass cover plate; single inlet for tempered water; 6 inch projection spout with outlet at 4 inches; self-closing, adjustable, metering valve with solid brass ADA “PUSH” handle at end of spout; 1.5 GPM vandal-resistant *laminar flow* outlet.  
*Required Option:* Unless a separate *individual lavatory* mixing valve or instantaneous water heater is shown on the Drawings, provide for each faucet a “W-30” SINGLE-FIXTURE THERMOSTATIC MIXING VALVE (Powers “Hydroguard” Series 480-3/8; Watts USG-B-Strainer “Under Sink Guardian”); also see Section 15430. Where a rigid pipe guard (P-99H stainless steel, or a pipe guard by GC) is provided, locate valve behind pipe guard below sink.
- F-38H ADA SINK FAUCET WITH 5-INCH GOOSENECK:** Chicago 895-GN2FCXK-AB  
*Features:* 4 inch centers; 5 inch projection gooseneck swing spout; 2-1/2 inch cast brass lever ADA handles; 1.6 GPM flow control in base of spout; plain spout end (no aerator).
- F-66H ADA MOP BASIN FAUCET WITH INTEGRAL CHECK VALVES – 5-3/4” SPOUT:**  
Chicago 445-897SRCXKCP  
*Features:* cast brass body; adjustable 8 inch centers; integral vacuum breaker spout (*screw-in vacuum breaker at the outlet is not allowed*); pail hook with wall support; cast brass lever ADA handles; 3/4 inch hose thread outlet; ceramic cartridges; integral stop/check valves on inlets.

## END OF PLUMBING FIXTURE SCHEDULE

## **SECTION 221455 - ELECTRIC WATER HEATERS**

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### **Part 1 - GENERAL**

#### **Code Compliance**

**Plumbing Code:** Comply with applicable portions of the codes listed in Division 15 Section “Basic Requirements,” and other state and local codes. Review Drawings and Specifications with Plumbing Inspector prior to rough-in. Notify Mechanical Engineer of any significant changes.

**ASHRAE:** Provide water heaters with Performance Efficiencies not less than prescribed in ASHRAE 90 (as applicable).

**GAMA:** Provide water heaters which have an Energy Factor rating provided by the GAMA Efficiency Certification Program (as applicable).

**NAECA:** Provide water heaters which meet or exceed the energy efficiency requirements of the National Appliance Energy Conservation Act (as applicable).

**NEC:** Install electric water heaters in accordance with NFPA 70, “National Electrical Code.”

**IEC:** Water-heating equipment and hot water storage tanks shall meet the requirements of the International Energy Conservation Code. The efficiency shall be verified through data furnished by the manufacturer or through certification under an approved certification program.

#### **Submittals**

Submit data on each product specified in the Schedule at the end of this Section, and on all additional products listed below, unless indicated “(Submittal Not Required).”

### **Part 2 - PRODUCTS**

#### **General**

**Country of Origin:** Water heaters shall be manufactured in the United States. Those manufactured in or near New England are preferred. *Heat pump hot water heaters may also be manufactured in Germany.*

**Manufacturers:** Bradford-White, Hubbell, Rheem, Ruud, State, Stiebel Eltron, or equal. Comply with Division One requirements. Comply with Division 23 Section “Basic Requirements.”

#### **Water Heaters and Accessories**

**Water Heaters:** All electric water heaters shall have the following characteristics, *except as shown otherwise on the schedule:* 3/4 inch water connections; T&P relief valve opening; steel tank *with cement or glass lining as indicated;* non-CFC foam insulation; thermostat; high temperature cut-off, and 150 PSI working pressure. Provide warranty on: tanks, thermostats, elements, anode rods, dip tubes, and drain

valves, with length of warranty as specified in the Schedule. See Schedule at the end of this Section for additional characteristics.

**Accessories:** Provide vacuum breaker and T & P relief valve. If required by the type of installation, provide high-impact polystyrene drain pan with 1-1/4 inch outlet fitting, and other accessories. On Hot Water outlet pipe, provide thermometer as specified under the Division 15 Section "Meters and Gages." If none is specified, provide non-mercury thermometer with scale divisions of 5 degrees F or less. Provide ASSE listed mixing valve on outlet, set to a safe temperature such as 110 degrees F or as directed by Owner.

## **Part 3 - EXECUTION**

### **Water Heater Installation**

**All Installations:** Install water heaters plumb and level, firmly anchored in locations indicated, and maintain manufacturer's recommended clearances and the clearances required below. Connect hot and cold water piping to units with shutoff valves and unions. Provide vacuum breaker on Cold Water line, located above top of tank. Provide T&P relief valve, with full size copper discharge piping to a safe location as indicated below, unless indicated otherwise on the Drawings. Orient unit so that thermostat, valves, and any other devices needing service and maintenance are readily accessible. If indicated on the Drawings, provide in-line expansion tank with upstream check valve. Provide heat traps unless factory installed.

**Minimum Clearances:** *Provide three inches clearance on back and both sides, six inches on the front, and two feet above the top of the water heater for piping and valves. If there is a door opening directly into the water heater room, it should have a clear width of four inches wider than the water heater. The floor of the water heater room needs to have a floor drain with trap primer, or the floor of the water heater room shall pitch out to the outer room floor drain, with no threshold under the door, so the relief valve water has a place to go.*

**Concrete Floors On Grade:** For installations on bare concrete floors on grade with nearby floor drain, coordinate with GC to provide four inch high concrete housekeeping pads. Run T&P relief pipe to four inches above floor.

**Waterproof Floors On Grade:** For installations on dry, waterproof floors on grade with nearby floor drain, install water heater directly on floor. Run T&P relief pipe to four inches above floor.

**Other Floors:** For installations on other types of floors, including all floors above the lowest level of the building, provide Mustee Durapan 98 or equal two inch high drain pan under water heater. Drain pan shall have two inch minimum clearance around the tank, and one inch drain line. Connect T&P relief pipe to drain line 12 inches below drain pan outlet, then run 1-1/4 inch line to floor drain or as indicated on the Drawings.

**Raised Platforms:** For installations on raised platforms above mop basins or laundry tubs, coordinate with GC to provide suitable platform. Provide Mustee Durapan 98 or equal two inch high drain pan under water heater. Drain pan shall have two inch minimum clearance around the tank, and one inch drain line. Connect T&P relief pipe to drain line 12 inches below drain pan outlet, then run 1-1/4 inch line to one inch above rim of mop basin or laundry tub, or four inches above floor with floor drain.

**Heat Pump Water Heaters:** *Install per manufacture's instructions. Observe manufacture's requirements for minimum room size; do not install with less than 800 cubic feet of airspace unless manufacturer reviews the installation design and includes a statement of approval with the heat pump water heater submittal. Do not install in spaces that will drop below 50 degrees F. Provide 3/4" condensate drain piped to nearby floor drain or as shown on plans.*

**Electrical:** Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements of Division 16. Do not proceed with water heater start-up until wiring installation is acceptable to Water Heater Installer.

**Field Quality Control:** Start-up, test, and adjust electric water heaters in accordance with manufacturer's start-up instructions. For storage tank water heaters: check controls, and set thermostat(s) as indicated on the Drawings, or, if not indicated, to maintain minimum 140 degrees F for Legionella control. *Ensure that there is a Master Mixing Valve set at a lower temperature as indicated elsewhere. For instantaneous water heaters: check controls, and set thermostat(s) as indicated on the Drawings, or, if not indicated, at 120 degrees F, or as directed by Owner.*

**END OF SECTION 221455** (revised Feb. 17, 2015)

## **ELECTRIC WATER HEATER SCHEDULE BARRINGTON TOWN OFFICES**

Alternate manufacturers for the products specified in this schedule: *As indicated in the specific water heater schedule. Submit proposed equals minimum ten days prior to bid. Do not order any products before reading Specification Section 221455, Part 2 - Products, for important additional information.*

**WH-8      20-KW 3-PHASE INSTANTANEOUS ADJUSTABLE TEMPERATURE WATER  
HEATER:** Hubbell TX020-3R (208-3). Submit any proposed “equals” to Engineer

ten days prior to bidding.

*Features:* 17 inches high x 17 inches wide x 4 inches deep maximum dimensions; incoloy 800 electric elements; stainless steel enclosure; copper and bronze heating chamber; UL listing; 25-150 PSI pressure range; 0.2 to 8.0 GPM flow range; adjustable thermostat with modulating control and digital display; temperature control within 1 °F; high limit thermostat; minimum 60 °F temperature rise at 2.25 GPM; nominal 20.0 KW, 208V, 3 phase, 56 Amps maximum (balanced power draw).

*Required Options:* Factory air scoop. Install on inlet. (Required for well water systems.)

*Required Options:* Provide voltage and phase as shown on Electrical drawings. Confirm electrical voltage before ordering and provide alternate model numbers as required to achieve the same (minimum) KW.

*Note:* For pricing, contractor should contact Sean Clarke, 203-378-2659 x119.

*Note:* Follow manufacturer’s installations instructions.

**END OF ELECTRIC WATER HEATER SCHEDULE**

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## **SECTION 231006 - ALTERNATES**

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### **Part 1 - GENERAL**

**Alternates:** An alternate is an amount proposed by Bidders and stated on the Bid Form that will be added to or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either scope of work or in products, materials, equipment, systems or installation methods described in Contract Documents.

**Coordination:** Coordinate related work and modify or adjust adjacent work as required to ensure that work affected by each accepted alternate is complete and fully integrated into the project.

**Notification:** Immediately following award of Contract, prepare and distribute to each party involved, notification of the status of each alternate. Indicate whether alternates have been accepted, rejected or deferred for consideration at a later date. Include a complete description of negotiated modifications to alternates, if any.

### **Part 2 - PRODUCTS**

Not used.

### **Part 3 - EXECUTION**

**Schedule:** A "Schedule of Alternates" is included at the end of this section.

Include as part of each alternate, miscellaneous devices, appurtenances and similar items incidental to or required for a complete installation whether or not mentioned as part of the alternate.

**END OF SECTION 231006 (12/11/15)**

## **MECHANICAL ALTERNATES BARRINGTON TOWN OFFICES**

**Alternate #5. Simultaneous Heating and Cooling.** Provide alternate outdoor heat pump units, piping system, and other components as required to allow some indoor units to be heating while others are cooling. See page 231675-S2 for alternate outdoor unit schedule. See also section 004323-3.



# **SECTIONS 231007 - DEFINITIONS AND STANDARDS**

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## **Part 1 - GENERAL**

### **Definitions**

**General Requirements:** Provisions of Division-1 sections, General Requirements, apply to the entire work of the Contract.

**Indicated:** Shown on drawings or written into other portions of contract documents.

**Approved by Architect/Engineer:** In no case releases Contractor from responsibility to fulfill requirements of contract documents.

**Furnish:** Supply and deliver to project site, ready for unloading, unpacking, assembly, installation, and similar subsequent requirements.

**Install:** Operations at project site, including unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar requirements.

**Provide:** Furnish and install, complete and ready for intended use.

**Coordinate:** Work together harmoniously in a common action or effort to accomplish specified work.

**Installer:** Entity (firm or person) engaged to install work, by Contractor, subcontractor or sub-subcontractor. Installers are required to be skilled in work they are engaged to install.

**Specification Text Format:** Imperative language is directed at Contractor, unless otherwise noted.

**Overlapping/Conflicting Requirements:** Most stringent (generally) requirement written directly into contract documents is intended and will be enforced, unless specifically detailed language written into the contract documents clearly indicates that a less stringent requirement is acceptable. Refer uncertainties to Architect/Engineer for decision before proceeding.

**Minimum Requirements:** Indicated requirements are for a specific minimum acceptable level of quality/quantity, as recognized in the industry. Actual work must comply (within specified tolerances), or may exceed minimums within reasonable limits. Refer uncertainties to Architect/Engineer before proceeding.

**Abbreviations, Plural Words:** Abbreviations, where not defined in contract documents, will be interpreted to mean the normal construction industry terminology, determined by recognized grammatical rules, by the Architect/Engineer. Plural words will be interpreted as singular and singular words will be interpreted as plural where applicable for context of contract documents.

**Change Orders:** All change order proposals by Contractor must include a complete breakdown of time, hourly rate, materials cost, and overhead/profit markups.

**Testing Laboratory:** An independent entity engaged for the project to provide inspections, tests, interpretations, reports and similar services.

## **Standards and Regulations**

**Industry Standards:** Applicable standards of construction industry have same force and effect on performance of the work as if copied directly into contract documents or bound and published therewith. Standards referenced in contract documents or in governing regulations have precedence over non-referenced standards, insofar as different standards may contain overlapping or conflicting requirements. Comply with standards in effect as of date of contract documents, unless otherwise indicated.

## **Part 2 - PRODUCTS**

Not used.

## **Part 3 - EXECUTION**

Not used.

**END OF SECTION 231007**

# **SECTION 231010 - BASIC REQUIREMENTS**

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## **Part 1 - GENERAL**

### **Related Documents**

The general provisions of Contract, including General and Supplemental General Conditions of the Contract and Division 1 Specification Sections, apply to this Section and to all Contractors, Subcontractors, or other persons supplying materials and/or labor, entering into the Project site and/or premises, directly or indirectly.

The Specifications and Drawings are intended to be complementary. A particular section, paragraph or heading in a Division may not describe each and every detail concerning work to be done and materials to be furnished. The Drawings are diagrammatic and may not show all of the work required or all construction details. Dimensions are shown for critical areas only; all dimensions and actual placements are to be verified in the field. It is to be understood that the best trade practices of the Division will prevail.

All trade subcontractors are to note that the organization of these Specifications into divisions, sections, and paragraphs, and likewise the arrangement of the Drawings, is set up for the convenience of understanding the scope of the Work only. This structuring shall not control the General Contractor in dividing the Work among trade subcontractors or in establishing the extent of the Work to be performed by any trade.

### **Commissioning Requirements**

Where there is a third party Commissioning Agent, Contractor shall comply with the commissioning requirements specified in various Divisions, Sections, and Schedules, as provided by the Commissioning Agent. These Sections and Schedules may include, but shall not be limited to, Project Closeout; Operations and Maintenance Data; Direct Digital Control System; Testing, Adjusting and Balancing; Mechanical Systems Commissioning; Prefunctional Checklists; and Commissioning Requirements. Each of these Sections and Schedules, including those that are part of Division 23, shall include the name of the Commissioning Agent, and Contractor shall direct any questions regarding these requirements to the Commissioning Agent.

### **Reference Symbols**

Symbols shown on the drawings show approximate location of fixtures, ductwork, piping, and other equipment, unless otherwise detailed. The exact location will be governed by structural conditions, appearance and obstructions. This is not to be construed so as to permit redesigning systems.

It is not intended that the drawings show in detail every fitting and appurtenance, etc., but all material necessary to complete the systems in accordance with the practices of the trade and to the complete satisfaction of the Architect will be provided without additional recompense under this Division of the specifications.

No deviations from the layout will be made without written approval of the Architect.

## Conflicting Requirements

In case of overlapping or conflicting requirements or indications of any type, in any part or parts of any of the Contract Documents, follow the most expensive/stringent version unless approved otherwise in writing by Engineer.

## Submittals

**Shop Drawings and Product Data:** Refer to Division 1 for requirements. The following paragraphs supplement the requirements of Division 1, when not in conflict with them.

Submittal Binder. Submit to Mechanical Engineer all mechanical shop drawings and product data at one time to the extent reasonably possible, organized by specification section. (If there are a few long lead time products, it is acceptable to submit them early before the rest of the submittal is assembled. Controls submittals often come later.)

Digital Submittals. All submittals shall be issued to the engineer in digital “PDF” format. Submittals shall either be a single file (broken into multiple parts to keep file sizes below 20 MB) or with a separate file for each specification section. If submitted with separate files for each section use the specification number as a prefix, such as “231540\_Pumps” so that files can be sorted by section. Digital submittals may be sent via mail on CD-R discs or flash drives or they may be issued through an FTP site or other online hosting site for the engineer to download. If files are issued for download they must be uploaded in a “zip file” or similar, in such a way that all submittal files can be downloaded with a single click.

Controls Submittal: It is requested that a paper copy of the controls submittal be provided in addition to the digital copy.

Submittal Contents. For all proposed products, submittal data must include the complete model number and all required options and accessories, such as size, material, and finish. For proposed products that are not an exact match to a specified model number, submittal data must also show in writing all features and required options listed in the Specifications and in the Schedules. For all products, any specified requirements that are not met by the proposed product shall be specifically listed and noted. Provide shop drawings of mechanical room layout as part of the submittal package.

See “Part 3 – Execution” for requirements for the submittal process.

**Record Documents:** Refer to Division 1 for requirements. The following paragraphs supplement the requirements of Division 1.

Provide a new, complete clean set of CAD generated mechanical/plumbing drawings to indicate, in a distinctive CAD generated line weight, revisions to piping and ductwork, size and location both exterior and interior; including locations of coils, dampers and other control devices, filters, boxes, and similar units requiring periodic maintenance or repair; actual equipment locations, dimensioned for column lines; actual inverts and locations of underground piping; concealed equipment, dimensioned to column lines; mains and branches of piping systems, with valves and control devices located and numbered, concealed unions located, and with items requiring maintenance located (i.e., traps, strainers, expansion compensators, tanks, etc.); Change Orders; concealed control system devices.

Provide an additional drawing(s) as required showing equipment schedule summaries in table format of all major installed HVAC equipment and for plumbing items if specifically requested by Owner.

Bind drawings into a set with a cover sheet indicating the job name and location, and the name and address of the Contractor. Also provide a copy of the as-built drawings on CD.

Mark Specifications to indicate approved substitutions; Change Orders; actual equipment and materials used.

**HVAC System Completion.** Prior to the issuance of a Certificate of Occupancy, the Contractor shall provide evidence of system completion as follows:

Air System Balancing Report.

Hydronic System Balancing Report.

Manuals. An operating and maintenance manual shall be provided to the building Owner by the Mechanical Contractor. The manual shall include, but not be limited to, the following:

1. Equipment capacity (input and output) and required maintenance actions.
2. Equipment operation and maintenance manuals.
3. HVAC system control maintenance and calibration information, including wiring diagrams, schematics and control sequence descriptions. Desired or field-determined setpoints shall be permanently recorded on control drawings, at control devices or, for digital control systems, in programming comments accessible to the Owner.

**Operation and Maintenance Data:** Refer to the Division 1 Section for procedures and requirements for preparation and submittal of maintenance manuals. In addition to the information required by Division 1 for Maintenance Data, include the following information:

Manufacturer's printed operating procedures to include start-up, break-in, routine and normal operating instructions; regulation, control, stopping, shut-down, and emergency instructions; and summer and winter operating instructions.

Maintenance procedures for routine preventative maintenance and troubleshooting; disassembly, repair, and reassembly; aligning and adjusting instructions.

Servicing instructions and lubrication charts and schedules.

A periodic preventative maintenance and inspection schedule for each system and for the components in the system, listing inspection and maintenance operations to be performed daily, weekly, monthly, quarterly and annually as required to provide for long life and faithful performance of the systems. The schedule shall be prepared by the Mechanical Contractor. It shall be presented in a concise 8-1/2x11 chart format to serve as a checklist for maintenance personnel. (Copies of manufacturer's product literature do not satisfy this requirement.)

One copy of the valve charts in clear plastic covers and one copy bound in each operating and maintenance manuals.

**Warranties:** Compile and assemble the warranties specified in Division 23, into a separated set of three ring binders, tabulated and indexed for easy reference.

Provide complete warranty information for each item of product or equipment to include date of beginning of warranty or bond; duration of warranty or bond; and names, addresses, and telephone numbers and procedures for filing a claim and obtaining warranty services.

## **Quality Assurance**

**Permits and Inspections:** Refer to General Conditions and Requirements.

**Codes:** Refer to the General Conditions and Requirements. Comply with the applicable requirements of the applicable editions of the following publications in addition to codes referenced elsewhere in this Division.

International Plumbing Code

International Mechanical Code

NFPA

Life Safety Code

*State Energy Codes as applicable, including Vermont Commercial Building Energy Standards (VT), IECC (NH, MA), and Ashrae 90.1 (MA).*

Applicable State and Local Codes

## **Delivery, Storage, and Handling**

Deliver products to project in the manufacturer's original, unopened packages and containers properly identified with names, model numbers, types, grades, compliance labels, and similar information needed for distinct identifications; adequately packaged and protected to prevent damage during shipment, storage, and handling.

Coordinate delivery of materials supplied by Contractor to be built into work done by others to avoid delay.

Coordinate deliveries of mechanical materials and equipment to minimize construction site congestion. Limit each shipment of materials and equipment to the items and quantities needed for the smooth and efficient flow of installations.

Store equipment and materials at the site, unless off-site storage is authorized in writing. Storage of materials and equipment on-site will be in a clean, well-ventilated area designated by General Contractor. Protect stored equipment and materials from damage.

## Part 2 - PRODUCTS

**General Product Requirements:** Provide products as indicated and as required for a complete system. Products must comply with every item of the descriptions in the Specifications and in the Schedules. In case of a discrepancy between the specified make/model and the description, the more expensive/stringent version shall prevail.

**Manufacturers:** Comply with Division One requirements. For products not specified by make and model number, or for those so specified but accompanied by the term “or equal,” Contractor may propose any available products that comply with the Contract Documents.

Many products are specified by make and model number. The designation of a specific manufacturer or manufacturer’s product in the Mechanical Schedules is for the purpose of establishing the minimum requirements for the mechanical equipment specified. Provide either the product designated, or, where more than one manufacturer is listed, the equal product of one of the other listed manufacturers that complies with minimum requirements, warranty coverage, utility connections, capacity, type of construction, available finishes, available colors, operational features, accessories, controls, efficiency, energy consumption, and availability, etc. Note that where an alternate manufacturer is listed without a model number, there may or may not be an “equal” product available. In all cases, all products within a given type must be from a single manufacturer. It shall be the contractor’s responsibility to provide all necessary information for comparison.

**Substitutions:** Where a product is specified by make and model number, products from manufacturers not listed are not allowed except as follows: Contractors wishing to substitute comparable products by manufacturers not listed must submit a written request to the Mechanical Engineer for approval at least ten (10) days prior to the date for receipt of Bids. Each such request shall include catalog data and any other information necessary for a complete evaluation. Any deviations from the product specified must be noted.

The Contractor shall be solely responsible for coordinating the installation of accepted substitutions of comparable products making such changes as may be required for the work to be completed in all respects. Any additional cost, or any loss or damage arising from the substitution of any material or method for those originally specified shall be borne by the Contractor, notwithstanding approval or acceptance of such substitution by the Owner, Architect or Mechanical Engineer, unless such substitution was made at the written request or direction of the Owner, Architect or Mechanical Engineer.

**Manufacturers--Control Systems:** Because Automatic Temperature Control (ATC) contractors usually use the products of a single major control system manufacturer, the specification of a control manufacturer is virtually the same as specifying an ATC contractor. Therefore, in this Specification, control system manufacturers and ATC contractors are specified jointly.

The Engineer has completed a pre-qualification process for all known ATC contractors in the project area. Pre-qualified firms are listed in the control system Section of this Division. The criteria for being approved are for the ATC contractor to:

- (1) Have good company resources, including physical facilities, organizational structure, experienced personnel, positive references, and geographic coverage including the current project location. Contractor must be an authorized branch office or distributor (such as Johnson Controls ABCS) of Manufacturer. Contractor must maintain a commercial office and be

accessible via telephone, receptionist, and/or pager; and installers/service technician(s) for the project must be located within 100 miles of the project site.

(2) Have a good record of similar project experience, including size of projects, quality of work, timely performance of work, change order fairness, response to and documentation for submittal reviews and punch lists, warrantee performance, and coordination and cooperation with other contractors.

(3) Be able to provide products and documentation in compliance with the Contract Documents.

Firms shall demonstrate compliance with these criteria by the following steps.

*Step 1.* Provide general information to the Engineer as follows: a) company brochure or resume describing physical facilities, organizational structure, personnel at each site, years of experience, education and training of key people, etc. b) up to five letters of recommendation from satisfied Owners, Architects, Mechanical Contractors, or Engineers, during the last five years. c) geographic area in which work is conducted. (d) letter or publication from Manufacturer describing the relationship between Manufacturer and Contractor.

*Step 2.* Receive a net positive recommendation from mechanical contractors surveyed by the Engineer. That is, receive more “recommended” than “not recommended” evaluations. (The survey of mechanical contractors will be updated at least every three years.) Secondly, have experience with at least one similar project of similar or larger size within the last five years. Finally, have a record of satisfactory performance on previous Kohler & Lewis projects (if any) within the last five years.

*Step 3.* For those contractors who successfully complete Steps 1 and 2: attend a minimum four-hour meeting at the Engineer’s office in Keene to discuss the company’s products and their compliance with the Kohler and Lewis Specifications. Provide Engineer with all requested product information in format as requested, and provide continual updates as required. Provide all requested product samples.

Other firms who have not yet been evaluated may submit to Engineer a written request to be listed a minimum of fourteen days before the bid. Included in the request must be complete information for Step 1. The Engineer will pursue Step 2 and, if positive, conduct the meeting (Step 3). Approved Contractors will then be added to the list by addendum prior to the bid.

## **Part 3 - EXECUTION**

### **Preparation**

**Pre-bid Site Visit:** The Contractor, before submitting a proposal, shall visit the site with plans and specifications in hand to determine the conditions under which work will be performed. No request for extra compensation will be considered for hardships encountered that would have been disclosed or made evident by a reasonable examination of the site.

**Pre-submittal Meeting:** The Engineer is available to meet with the Contractor at the office of the Engineer in Keene, N.H. to review in person the first draft of the submittals (prior to formal submission), and for assistance as requested in other aspects of the project. The Engineer has found that this meeting



significantly expedites the submittal preparation and review process, and results in fewer time-consuming and potentially expensive errors.

**Submittal Process:** Refer to Division 1 for requirements. The following paragraphs supplement the requirements of Division 1, when not in conflict with them.

Prior Contractor Review: Submittal of shop drawings, product data, and samples will be accepted only when stamped or indicated "Approved," "Reviewed," or "No Exception Taken" by the Contractor in accordance with the provisions of "Shop Drawings, Product Data and Samples" Section of AIA Document A201 and Division 1 "SUBMITTALS". Data submitted from subcontractors and material suppliers directly to the Architect/Engineer will not be processed. The Contractor is responsible for: noting any omissions in the submittal; confirming and correlating all quantities, weights and dimensions; selecting fabrication processes and techniques of construction; and coordinating work with that of all other trades. Where an alternate manufacturer is submitted, Contractor shall verify that the alternate product has all the features and required options as specified, and that these features and options are shown on the submittal, and that all dimensions are compatible, and shall make all required adjustments at no extra cost to Owner.

Engineer Review: The Engineer will review submittals to check general conformance with the Contract Documents. This review in no way relieves the Contractor of responsibility to comply with the Contract Documents as described above and elsewhere.

**Coordination:** Coordinate equipment and materials installation with other building components.

Coordinate exact location of exposed ducts, pipes, and equipment with Architect before installation.

Verify all dimensions by field measurements.

Arrange for chases, slots, and openings in other building components to allow for mechanical installations.

Coordinate the installation of required supporting devices and sleeves to be set in poured in place concrete and other structural components, as they are constructed.

Coordinate the cutting and patching of building components to accommodate the installation of mechanical equipment and materials.

Coordinate the installation of mechanical materials and equipment above ceilings with suspension system, light fixtures, and other installations.

Coordinate connection of mechanical systems with exterior underground and overhead utilities and services. Comply with requirements of governing regulations, franchised service companies, and controlling agencies. Provide required connection for each service.

## **Installation**

**General:** Install products in accordance with manufacturer's written instructions. Comply with manufacturer's recommendations for types of materials, project conditions, and intended use. Coordinate

the installation in accordance with final shop drawings, field measurements, manufacturer's data, and as specified herein. Refer to Division-1 Section on "Project Coordination" Paragraph 3.1.

Sequence, coordinate, and integrate installations of mechanical materials and equipment for efficient flow of the Work. Give particular attention to large equipment requiring positioning prior to closing-in the building.

Where mounting heights are not detailed or dimensioned, install mechanical services and overhead equipment to provide the maximum headroom possible.

Install mechanical equipment to facilitate maintenance and repair or replacement of equipment components. As much as practical, connect equipment for ease of disconnecting, with minimum of interference with other installations.

**Access:** Install equipment and materials to provide required access for servicing and maintenance. Install access panel or doors where units are concealed behind finished surfaces. Access panels and doors are specified in Division 23 Section 231055 "BASIC MECHANICAL MATERIALS AND METHODS."

Coordinate the final location of concealed equipment and devices requiring access with final location of required access panels and doors. Allow ample space for removal of all parts that require replacement or servicing. Extend all grease fittings to an accessible location.

Install all horizontal cabinet unit heaters, fan coils, and unit ventilators mounted in spaces with finished ceilings such that the bottom of the unit is flush with the ceiling in order to permit access for maintenance and filter changes. Coordinate the exact locations with the reflected ceiling plan where available.

Where units are suspended from a high ceiling, ensure that they are accessible via a lift, catwalk, ladder, etc. as coordinated with Owner.

**Rough-In:** Verify final locations for rough-ins with field measurements and with the requirements of the actual equipment to be connected. Refer to equipment specifications for rough-in requirements.

## **Cutting and Patching**

Do not endanger or damage installed Work through procedures and processes of cutting and patching.

Arrange for repairs required to restore other work, because of damage caused as a result of mechanical installations.

No additional compensation will be authorized for cutting and patching Work that is necessitated by ill-timed, defective, or non-conforming installations.

Perform cutting, fitting, and patching of mechanical equipment and materials required to:

Uncover Work to provide for installation of ill-timed Work;

Remove and replace defective Work;

Remove and replace Work not conforming to requirements of the Contract Documents;

Remove samples of installed Work as specified for testing;  
Install equipment and materials in existing structures; and

Upon written instructions from the Architect/Mechanical Engineer, uncover and restore Work to provide for Architect/Mechanical Engineer observation of concealed Work.

Cut, remove and legally dispose of selected mechanical equipment, components, and materials as indicated, including, but not limited to removal of mechanical piping, heating units, plumbing fixtures and trim, and other mechanical items made obsolete by the new Work.

Protect the structure, furnishings, finishes, and adjacent materials not indicated or scheduled to be removed.

Locate identify, and protect mechanical and electrical services passing through remodeling or demolition area and serving other areas required to be maintained operational. When transit services must be interrupted, provide temporary services for the affected areas and notify the Owner prior to changeover.

### **Air Sealing**

Identify and properly seal all penetrations through the building air barrier system as described in the Air Barriers section of the specifications.

### **Temporary Heat**

Refer to other Division-23 Sections for additional requirements when utilizing HVAC systems for temporary heat (when allowed). If air-handling units must be used during construction, filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 must be used at each return air grille, as determined by ASHRAE 52.2-1999. Replace all used filters for all units used for temporary heat on the day of beneficial occupancy and provide spare set of filters to the owner.

Limit heating to maintain a temperature in the space no higher than 60 °F. If the control system is not operational, use nonadjustable temporary thermostats such as ICM Controls Model SC060 (1-207-885-9476 or 1-800-365-5525).

### **Protection**

Initiate and maintain protection and other precautions required throughout the construction period to ensure that mechanical systems components will be free of damage or deterioration, and are visibly clean of dirt and debris at the time of Substantial Completion.

### **Correction of Defective Work**

Promptly correct work rejected by Architect or failing to conform to requirements of the Contract Documents. Refer to General Conditions.

## **Work Area Clean-Up**

**During Construction:** Keep premises and surrounding areas free from accumulation of waste materials or rubbish; Each Contractor and Subcontractor shall dispose of his waste materials and rubbish daily off site. Refer to General Conditions and applicable Division-1 Sections.

**Final Clean-up:** Remove waste materials, rubbish, tools, equipment, and surplus materials. Refer to General Conditions and Division-1 Sections.

## **Factory Start-up and Owner's Training**

Provide factory start-up and Owner's training for the following equipment: Boilers, Roof Top Units, Energy Recovery Units, Air Handling Units, Chillers, Dust Collection Systems and other equipment as specified in the individual mechanical specification sections. Factory start-up and training shall be performed by the manufacturer's authorized representative. The Contractor may assist and augment the start-up and training, but in no cases shall this assistance be in lieu of the work required of the authorized factory representative.

Submit copy of "Confirmation of Factory Start-Up and Owner's Training" form signed by Owner's representative at completion of Project.

Demonstrate operation and maintenance of mechanical systems to Owner's personnel prior to completion and final payment.

## **Cleaning**

Refer to Division-23 Section 231990 "TESTING, ADJUSTING, AND BALANCING" for requirements for cleaning filters, strainers, and mechanical systems prior to final acceptance.

## **Touch-up Painting**

Touch-up all marred, scratched, or rusty surfaces on factory painted equipment, with touch-up paint provided by manufacturer.

## **Final Inspection**

**Final Inspection Checklist:** Prior to any request for the Engineer to perform a Final Inspection of the work, or any portion thereof, the Contractor shall complete a Contractor Final Inspection Check List on a form provided by the Engineer.

**END OF SECTION 231010** (revised 3/5/2015)

**CONFIRMATION OF FACTORY START-UP  
AND OWNER'S TRAINING  
BARRINGTON TOWN OFFICES**

Owner's representative affirms that:

- He/she has read the "Factory Start-up" and "Owner's Training" paragraphs near the end of applicable specifications sections, and that
- All start-up work and training required has been provided, and has been fully satisfactory as far as can be determined at this time.
- Factory Start-up and Owner's Training sessions took place at the following place, dates, and times:

Energy Recovery Units: \_\_\_\_\_

Heat Pump Systems: \_\_\_\_\_

Other (list): \_\_\_\_\_

Owner's representative: \_\_\_\_\_

Date \_\_\_\_\_

# CONTRACTOR FINAL INSPECTION LIST - MECHANICAL

Project: \_\_\_\_\_ Contractor: \_\_\_\_\_ Date: \_\_\_\_\_

*Instructions:* Place a check mark in the box for each line item that is complete. Use "NA" for items that are Not Applicable. Return the list and we will arrange for a final inspection.

Item	Notes/Location
<b>Record-Keeping Items Have Been Submitted</b>	
<input type="checkbox"/> Balance report. ( <i>Required before Final Inspection.</i> ) <=====	<b>Note</b>
<input type="checkbox"/> As-built drawings.	
<input type="checkbox"/> Maintenance manual in binder.	
<input type="checkbox"/> Maintenance and Inspection Chart.	
<input type="checkbox"/> Warranty (>1 yr) information in binder. (e.g. 7-yr compressor).	
<input type="checkbox"/> Spare Parts Receipt.	
<b>Project Close-Out</b>	
<input type="checkbox"/> Control system instruction to Owner completed.	
<input type="checkbox"/> Clean filters have been installed in units.	
<input type="checkbox"/> Spare Parts (filters, belts, fusible links, etc.) to owner.	
<input type="checkbox"/> Bypass balance valves for all three way valves have been set.	
<input type="checkbox"/> Seismic Bracing has been inspected by Registered Engineer.	
<b>Mechanical Room</b>	
<input type="checkbox"/> Pipes are labeled.	
<input type="checkbox"/> Pipes are insulated.	
<input type="checkbox"/> Room and all equipment is clean, with packing labels removed.	
<b>Exterior Walls</b>	
<input type="checkbox"/> Louvers and wall-mounted exhaust fans are sealed and free from dents.	
<b>Roof</b>	
<input type="checkbox"/> Roof-mounted fan equipment is mounted securely, without vibration.	
<b>Equipment, Ductwork and Piping</b>	
<input type="checkbox"/> Equipment and ductwork is visibly clean of dust and debris.	
<input type="checkbox"/> Air handling equipment has vibration isolators and operates quietly.	
<input type="checkbox"/> Equipment and exposed ducts and pipes are labeled.	
<input type="checkbox"/> Ducts are sealed and insulated (spot-check in hallways).	
<input type="checkbox"/> Fire dampers are installed with access panels.	
<input type="checkbox"/> Pipes are insulated; with all seams taped or glued.	
<b>General Rooms</b>	
<input type="checkbox"/> Heat pump covers are properly fastened, and clean and have new filters where applicable.	
<input type="checkbox"/> Heat pumps are neatly installed, and cleaned.	
<input type="checkbox"/> Diffusers and Registers are correct and clean and mounted properly.	
<input type="checkbox"/> Restroom, etc. doors are undercut or have specified grilles.	
<input type="checkbox"/> Thermostats are installed and set, with guards where indicated.	
<input type="checkbox"/> Room temperature is being maintained near setpoint.	

## **SECTION 231030 - ELECTRICAL REQUIREMENTS**

### **Part 1 - GENERAL**

**Summary:** This section specifies the basic requirements for electrical components for mechanical equipment. These components include, but are not limited to starters, disconnect switches and motors. It includes motors that are factory-installed as part of equipment and appliances as well as field-installed motors.

**Starters, Disconnects and Variable Frequency Drives:** Provide disconnects and starters and variable frequency drives as required for proper installation and operation of equipment. Confirm electrical characteristics of equipment specified with electrical installer before ordering. Coordinate starter and drive characteristics with Control Contractor. See Division 23 Section "Variable Frequency Drives."

**Motors:** Confirm electrical characteristics of all motors, including factory installed motors provided with pumps, air handling units, energy recovery units, condensing units, and other equipment, with Electrical Contractor before ordering.

**Electrical Characteristics:** Confirm electrical characteristics of all starters, disconnects, variable frequency drives, motors, and other equipment with electrical installer before ordering. This Contractor shall be responsible for all action that may be necessary (by any contractor or subcontractor) to correct any problems due to the failure of Contractor to adhere to this paragraph.

**Codes and Standards:** Comply with National Electrical Code (NFPA 70). Electrical components and materials shall be UL labeled.

### **Part 2 - PRODUCTS**

#### **Starters, Electrical Devices and Wiring**

**Motor Starter Characteristics:** NEMA 1, general purpose enclosures with padlock ears, except in wet locations shall be NEMA 3R with conduit hubs, or units in hazardous locations which shall have NEC proper class and division. Type and size of starter shall be as recommended by motor manufacturer and the driven equipment manufacturer for applicable protection and start-up condition. All motor starters must be compatible with DDC controls.

**Manual Switches Characteristics:** Pilot lights and extra positions for multi-speed motors. Melting alloy type thermal overload relays where motors are not internally overload protected.

**Magnetic Starters Characteristics:** Maintained contact push buttons and pilot lights, properly arranged for single speed or multi-speed operation as indicated. Trip-free thermal overload relays, each phase. Interlocks, switches and similar devices as required for coordination with control requirements of Division-23 Controls sections. Built-in 120 volts control circuit transformer, fused from line side, where service exceeds 240 volts. Externally operated manual reset. Under-voltage release or protection.

**Motor Connections:** Flexible conduit, except where plug-in electrical cords are specifically indicated.

## **Disconnects**

**Fusible Switches:** Fused, each phase; heavy duty; horsepower rated; non-teasible quick-make, quick-break mechanism; dead front line side shield; solderless lugs suitable for copper or aluminum conductors; spring reinforced fuse clips; electro silver plated current carrying parts; hinged doors; operating lever arranged for locking in the "OPEN" position; arc quenchers; capacity and characteristics as indicated.

**Non-Fusible Switches:** Horsepower rated; toggle switch type; quantity of poles and voltage rating as indicated. For equipment larger than 2 horsepower, switches shall be the same as fusible type.

## **Motors**

**General:** Requirements below apply to motors covered by this section except as otherwise indicated.

**Frequency rating:** 60 Hz.

**Voltage rating:** Determined by voltage of circuit to which motor is connected.

**Capacity:** Sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100 percent of rated capacity.

**Temperature Rise:** Based on 40°C ambient except as otherwise indicated.

## **Polyphase motors**

**General:** Squirrel-cage induction-type conforming to the following requirements except as otherwise indicated. NEMA Design Letter Designation: "B".

**Motor Efficiency:** Nominal efficiency equal to or greater than that listed in Minimum Three Phase Motor Efficiency Schedule for that type and rating of motor, unless otherwise stated.

**Internal Thermal Overload Protection for Motors:** For motors so indicated, protection automatically opens control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.

**Bearings:** Double-shielded, prelubricated ball bearings suitable for radial and thrust loading of the application.

**Multi-Speed Motors:** Provide separate winding for each speed

**All Polyphase Motors:** Corona free, inverter-duty rated, energy efficient, squirrel-cage induction, design B units with ratings, characteristics, and features coordinated with and approved by drive manufacturer.



**Rugged Duty Motors:** Totally enclosed with 1.25 minimum service factor. Provide motors with regreasable bearings and equipped with capped relief vents. Insulate windings with nonhygroscopic material external finish shall be chemical resistant paint over corrosion resistant primer. Provide integral condensate drains.

**Motors for Reduced Inrush Starting:** Coordinate with indicated reduced inrush controller type and with characteristics of drive equipment load. Provide required wiring leads in motor terminal box to suit control method.

## **Single Phase Motors**

**General:** Conform to the following requirements except as otherwise indicated.

**Energy Efficient Motors:** One of the following types as selected to suit the starting torque and other requirement of the specific motor application.

Permanent Split Capacitor.

Split-Phase Start, Capacitor-Run.

Capacitor-Start, Capacitor-Run.

**Shaded-Pole Motors:** Use only for motors smaller than 1/20 hp.

**Internal Thermal Overload Protection for Motors:** For motors so indicated, protection automatically opens the power supply circuit to the motor, or a control circuit arranged for external connection. Protection operates when winding temperature exceeds a safe value calibrated to the temperature returns to normal range except as otherwise indicated.

**Bearings:** Belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, prelubricated sleeve bearings may be used for other single phase motors.

**END OF SECTION 231030**

## **SECTION 231055 - BASIC MATERIALS AND METHODS**

### **Part 1 - GENERAL**

**Submittals:** Submit product data for each specialty and for access doors.

### **Part 2 - PRODUCTS**

**Zinc Content:** Brass alloys of valves and all other hydronic/plumbing products shall contain no more than 15% zinc. Compliance with this requirement shall be shown on all relevant product submittals.

**No Antibacterial:** *No part of any product provided under this Division shall be anti-bacterial or anti-microbial using a chemical or physical biocide. Nanoparticle silver is prohibited.*

**Mercury:** Products and materials containing mercury are not allowed on this project. Prohibited products include, but are not limited to mercury thermostats (whether wall mounted or unit mounted), mercury float switches, mercury thermometers, mercury boiler pressure or temperature controls, and mercury switches.

**Propylene Glycol:** Unless otherwise noted, charge systems with non-toxic (Gosselin Rating = 1), inhibited propylene glycol solution sufficient to achieve a freeze point of 1°F. Systems should be charged with glycol as soon as possible. Prolonged operation with plain water may result in leaking seals when the system is charged with glycol and there is a greater risk of damage due to frozen pipes if the system is operated without glycol during cold weather.

**Gaskets and Seals:** Provide thickness, material, and type suitable for fluid to be handled, and design temperatures and pressures. Pipe lubricants and sealants such as fluorocarbon resin tape and pipe dopes (Teflon<sup>®</sup>) are not recommended due to evidence that they are subject to leakage when used with propylene glycol solutions. Do not use Viton A, Neoprene, or Nitrite Buna N gaskets or other materials that are not compatible with propylene glycol at elevated temperatures.

**Unions:** Malleable-iron, Class 150 for low pressure service and class 250 for high pressure service; hexagonal stock, with ball-and-socket joints, metal-to-metal bronze seating surfaces; female threaded ends.

**Dielectric Unions:** Provide dielectric unions with appropriate end connections for the pipe materials in which installed (screwed, soldered, or flanged), which effectively isolate dissimilar metals, to prevent galvanic action, and stop corrosion.

**Escutcheons:** Chrome-plated, stamped steel, hinged, split-ring escutcheon, with set screw. Inside diameter shall closely fit pipe outside diameter. Outside diameter shall completely cover the opening in floors, walls, or ceilings.

**Sleeves:** Steel Sleeves: Schedule 40 steel pipe, ASTM A120.

**Sleeve Seals:** Modular type, consisting of interlocking synthetic rubber links shaped to continuously fill annular space between pipe and sleeve, connected with bolts and pressure plates which cause rubber sealing elements to expand when tightened, providing watertight seal and electrical insulation.

**Drip Pans:** Provide drip pans fabricated from corrosion- resistant sheet metal with watertight joints, and with edges turned up 2-1/2". Reinforce top, either by structural angles or by rolling top over 1/4" steel rod. Provide hole, gasket, and flange at low point for watertight joint and 1" drain line connection.

**Steel Access Doors:** Factory-fabricated and assembled units, complete with attachment devices and fasteners ready for installation. Joints and seams shall be continuously welded steel, with welds ground smooth and flush with adjacent surfaces.

**Frames:** 16-gauge steel, with a 1-inch-wide exposed perimeter flange for units installed in unit masonry, pre-cast, or cast-in-place concrete, ceramic tile, or wood paneling, or with a perforated flanges with wallboard bead for units installed in gypsum wall board.

**Flush Panel Doors:** 14-gauge sheet steel, with concealed spring hinges or concealed continuous piano hinge set to open 175 degrees; factory-applied prime paint.

**Wet Areas:** Provide stainless steel access doors and frames if located in toilet rooms or wet areas.

## **Part 3 - EXECUTION**

**Unions:** Install unions at the final connection to each piece of equipment and plumbing fixture having 2" and smaller connections, and elsewhere as indicated.

**Dialectric Unions:** Install dielectric unions to connect piping materials of dissimilar metals.

**Pipe Sleeves:** Install pipe sleeves where piping passes through masonry walls, floors, roofs, and fire-rated assemblies. Do not install sleeves through structural members of work, except as detailed on drawings, or as reviewed by Architect/Engineer. Install sleeves accurately centered on pipe runs. Size sleeves so that piping and insulation (if any) will have free movement in sleeve, including allowance for thermal expansion; but not less than 2 pipe sizes larger than piping run. Where insulation includes vapor-barrier jacket, provide sleeve with sufficient clearance for installation. Install length of sleeve equal to thickness of construction penetrated, and finish flush to surface; except floor sleeves. Extend floor sleeves 1/4" above level floor finish, and 3/4" above floor finish sloped to drain. Provide temporary support of sleeves during placement of concrete and other work around sleeves, and provide temporary closure to prevent concrete and other materials from entering sleeves. Sleeves are not required for core drilled holes.

**Acoustic Sealing of Pipes and Duct Penetration:** For all pipe and duct penetrations that are not fire-sealed, pack space around duct or pipe with fiberglass material and caulk with non hardening resilient caulk.

**Escutcheons:** Install escutcheons on pipes exposed to view that pass through walls, floor or ceilings unless Architect waives this requirement and accepts a neat firestopping job as acceptable. Fasten escutcheons securely to pipe and tight to surface. Note that for insulated piping, the insulation should pass through the wall opening and the opening should be firestopped. If the escutcheon/insulation cannot completely cover the opening, then patch the opening to match existing surface.

**Field Quality Control:**

Follow safety procedures recommended in the Material Safety Data Sheets.

Finish surfaces of firestopping which are to remain exposed in the completed work to a uniform and level condition.

All areas of work must be accessible until inspection by the applicable Code Authorities.

Correct unacceptable firestops and provide additional inspection to verify compliance with this specification.

**Cleaning:**

Remove spilled and excess materials adjacent to firestopping without damaging adjacent surfaces.

Leave finished work in neat, clean condition with no evidence of spill overs or damage to adjacent surfaces.

**Drip Pans:** Locate drip pans under piping passing over or within 3' horizontally of electrical equipment, and elsewhere as indicated. Hang from structure with rods and building attachments; weld rods to sides of drip pan. Brace to prevent sagging or swaying. Connect 1" drain line to drain connection, and run to nearest plumbing drain or elsewhere as indicated.

**Access Doors:** Install access doors for all equipment or devices that require access for servicing, maintenance or replacement. Equipment requiring access doors includes, but is not limited to the following; valves, in-line expansion compensators, water hammer arresters, trap primers, balance valves, air vents, heating and cooling coils, fire dampers, dampers, kitchen exhaust ductwork (for cleaning), control valves and dampers.

Coordinate location of access doors with Architect before installing equipment requiring access where access doors may have aesthetic implications.

Set frames accurately in position and securely attached to supports, with face panels plumb and level in relation to adjacent finish surfaces.

Adjust hardware and panels after installation for proper operation.

**Smoke Detectors:** Install smoke detectors furnished by fire alarm supplier.

**Painting - General:** Paint all exposed steel or cast iron or wrought iron piping and fittings that are not insulated, including hydronic piping (Black), oil piping (Black), and gas piping (Yellow). Paint all steel brackets and support structures in the mechanical room that are not galvanized (Black). Paint all expansion tanks, air separators, and other equipment that is not insulated and that does not come with a finish coat of gloss enamel paint (Blue, to match boilers). Remove all packing labels before painting. Touch up any damaged paint on pumps, boilers and other equipment. There should be absolutely no visible rust anywhere in the mechanical room or elsewhere in the building and any mechanical system components.

**Painting - Preparation:** Clean all equipment before painting and remove all shipping labels. Do not remove warning labels of manufacturer name tags. Use high quality oil based industrial enamel paint.

**END OF SECTION 231055**

# **SECTION 231084 - FIRESTOPPING FOR MECHANICAL SYSTEMS**

## **Part 1 - GENERAL**

**Related Documents:** Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Section, apply to work specified in this section.

**Definitions:** Firestopping: Material or combination of materials used to retain integrity of fire-rated construction by maintaining an effective barrier against the spread of flame, smoke, and hot gases through penetrations in fire rated wall and floor assemblies.

**General Description Of The Work Of This Section:** Only tested firestop systems shall be used in specific locations as follows:

Penetrations for the passage of duct, piping, and other mechanical equipment through fire-rated vertical barriers (walls and partitions), horizontal barriers (floor/ceiling assemblies), and vertical service shaft walls and partitions.

**Related Work Of Other Sections:** Coordinate work of this section with work of other sections as required to properly execute the work and as necessary to maintain satisfactory progress of the work of other sections, including:

**Quality Assurance:** A manufacturer's direct representative (not distributor or agent) to be on-site during initial installation of firestop systems to train appropriate contractor personnel in proper selection and installation procedures. This will be done per manufacturer's written recommendations published in their literature and drawing details.

Firestop System installation must meet requirements of ASTM E 814 or UL 1479 tested assemblies that provide a fire rating equal to that of construction being penetrated.

Proposed firestop materials and methods shall conform to applicable governing codes having local jurisdiction.

Firestop Systems do not reestablish the structural integrity of load bearing partitions/assemblies, or support live loads and traffic. Installer shall consult the structural engineer prior to penetrating any load bearing assembly.

For those firestop applications that exist for which no UL tested system is available through a manufacturer, a manufacturer's engineering judgment derived from similar UL system designs or other tests will be submitted to local authorities having jurisdiction for their review and approval prior to installation. Engineering judgment drawings must follow requirements set forth by the International Firestop Council.

**Submittals:** Submit Product Data: Manufacturer's specifications and technical data for each material including the composition and limitations, documentation of UL firestop systems to be used and manufacturer's installation instructions to comply with Section 1300.

Manufacturer's engineering judgment identification number and drawing details when no UL system is available for an application. Engineering judgment must include both project name and contractor's name who will install firestop system as described in drawing.

Submit material safety data sheets provided with product delivered to job-site.

**Installer Qualifications:** Engage an experienced Installer who is certified, licensed, or otherwise qualified by the firestopping manufacturer as having been provided the necessary training to install manufacturer's products per specified requirements. A manufacturer's willingness to sell its firestopping products to the Contractor or to an Installer engaged by the Contractor does not in itself confer qualification on the buyer.

The work is to be installed by a contractor with at least one of the following qualifications:

- FM 4991 Approved Contractor
- UL Approved Contractor
- Firestop Manufacturer's Accredited Fire Stop Specialty Contractor

**Delivery, Storage, And Handling:**

Deliver materials undamaged in manufacturer's clearly labeled, unopened containers, identified with brand, type, and UL label where applicable.

Coordinate delivery of materials with scheduled installation date to allow minimum storage time at job-site.

Store materials under cover and protect from weather and damage in compliance with manufacturer's requirements.

Comply with recommended procedures, precautions or remedies described in material safety data sheets as applicable.

Do not use damaged or expired materials.

**Project Conditions:** Do not use materials that contain flammable solvents.

**Scheduling:** Schedule installation of cast in place firestop devices after completion of floor formwork, metal form deck, or composite deck but before placement of concrete.

Schedule installation of other firestopping materials after completion of penetrating item installation but prior to covering or concealing of openings.

Verify existing conditions and substrates before starting work. Correct unsatisfactory conditions before proceeding.

**Weather conditions:** Do not proceed with installation of firestop materials when temperatures exceed the manufacturer's recommended limitations for installation printed on product label and product data sheet.

During installation, provide masking and drop cloths to prevent firestopping materials from contaminating any adjacent surfaces.

## **Part 2 - PRODUCTS**

**Firestopping, General:** Provide firestopping composed of components that are compatible with each other, the substrates forming openings, and the items, if any, penetrating the firestopping under conditions of service and application, as demonstrated by the firestopping manufacturer based on testing and field experience.

Provide components for each firestopping system that are needed to install fill material. Use only components specified by the firestopping manufacturer and approved by the qualified testing agency for the designated fire-resistance-rated systems.

Use only firestop products that have been UL 1479 or ASTM E 814 tested for specific fire-rated construction conditions conforming to construction assembly type, penetrating item type, annular space requirements, and fire-rating involved for each separate instance.

**Acceptable Manufacturers:** Subject to compliance with through penetration firestop systems (XHEZ) listed in Volume II of the UL Fire Resistance Directory, provide products of the following manufacturers as identified below:

Hilti, Inc.  
3M Electrical Products Div./3M.  
Specified Technologies, Inc.

## **PART 3 - EXECUTION**

### **Preparation**

**Verification of Conditions:** Examine areas and conditions under which work is to be performed and identify conditions detrimental to proper or timely completion.

Verify penetrations are properly sized and in suitable condition for application of materials.

Surfaces to which firestop materials will be applied shall be free of dirt, grease, oil, rust, laitance, release agents, water repellents, and any other substances that may affect proper adhesion.

Provide masking and temporary covering to prevent soiling of adjacent surfaces by firestopping materials.

Comply with manufacturer's recommendations for temperature and humidity conditions before, during and after installation of firestopping.

Do not proceed until unsatisfactory conditions have been corrected.



**Coordination:** Coordinate location and proper selection of cast-in-place Firestop Devices with trade responsible for the work. Ensure device is installed before placement of concrete. Responsible trade to provide adequate spacing of field run pipes to allow for installation of cast-in-place firestop devices without interferences.

## **Installation**

Regulatory Requirements: Install firestop materials in accordance with UL Fire Resistance Directory.

Manufacturer's Instructions: Comply with manufacturer's instructions for installation of through-penetration joint materials.

Seal all holes or voids made by penetrations to ensure an air and water resistant seal.

Consult with mechanical engineer, project manager, and damper manufacturer prior to installation of UL firestop systems that might hamper the performance of fire dampers as it pertains to duct work.

Protect materials from damage on surfaces subjected to traffic.

## **Field Quality Control**

Examine sealed penetration areas to ensure proper installation before concealing or enclosing areas.

Keep areas of work accessible until inspection by applicable code authorities.

Inspection of through-penetration firestopping shall be performed in accordance with ASTM E 2174, "Standard Practice for On-Site Inspection of Installed Fire Stops" or other recognized standard.

Perform under this section patching and repairing of firestopping caused by cutting or penetrating of existing firestop systems already installed by other trades.

## **Adjusting And Cleaning**

Remove equipment, materials and debris, leaving area in undamaged, clean condition.

Clean all surfaces adjacent to sealed holes and joints to be free of excess firestop materials and soiling as work progresses.

## **Identification**

Identify through-penetration firestop systems with pressure-sensitive, self-adhesive, preprinted vinyl labels. Attach labels permanently to surfaces of penetrated construction on both sides of each firestop system installation where labels will be visible to anyone seeking to remove penetrating items or firestop systems. Coordinate with Architect before installing if labels will be exposed to view in finished spaces. Include the following information on labels:

The words: “Warning-Through-Penetration Firestop System-Do Not Disturb. Notify Building Management of Any Damage.”

Contractor’s name, address, and phone number.

Through-penetration firestop system designation of applicable testing and inspecting agency.

Date of installation.

Through-penetration firestop system manufacturer’s name.

Installer’s name.

**END OF SECTION 231084**

# FIRESTOPPING DETAIL SCHEDULE BARRINGTON TOWN OFFICES

**MANUFACTURER: SPECIFIED TECHNOLOGIES, INC.**

CONSTRUCTION TYPE	CONCRETE/MASONRY			FRAME	
ASSEMBLY TYPE	FLOOR	WALL	WALL	FLOOR	WALL
RATING	1 OR 2	1 OR 2	3 HR	1 OR 2	1 OR 2
STEEL ( $\leq 6"$ ) CAST IRON ( $\leq 12"$ ) OR COPPER ( $\leq 4"$ ) PIPE WITH 2" MAX INSULATION	CAJ-5087 LCI Intumescent	CAJ-5087 LCI Intumescent	CAJ-5165 LCI Intumescent	FC-5043 LCI Intumescent	WL-5014 LCI Intumescent
STEEL ( $\leq 8"$ ) CAST IRON ( $\leq 12"$ ) OR COPPER ( $\leq 6"$ ) UNINSULATED	CAJ-1240 LCI Intumescent	CAJ-1240 LCI Intumescent	CAJ-1240 LCI Intumescent	FC-1074 LCI Intumescent	WL-1049 LCI Intumescent
ABS/PVC PIPE $\leq 4"$ WITHOUT INSULATION	CAJ-2574 SSBLU Wrap Strip	CAJ-2574, SSWBLU Wrap Strip	CAJ-2594 SSWBLU Wrap Strip	FC-2034 LCC Collar	WL-2059 LCC Collar
ROUND DUCTS (Non-Damp)	$\leq 24"$ ROUND CAJ-7023 LCI	$\leq 24"$ ROUND CAJ-7023 LCI	24" ROUND CAJ-7023 LCI	$\leq 10"$ ROUND FC-7014 LCI	$\leq 20"$ ROUND WL-7026 LCI
RECTANGULAR DUCTS (Non-Damp)	60" x 36" CAJ 7027 LCI	60" x 36" CAJ 7027 LCI	60" x 36" CAJ 7027 LCI	8" x 8" FC-7023 LCI	$\leq 100"$ x 100" WL-7025 LCI
RECTANGULAR INSULATED DUCTS (Non-Damp)	60" x 36" CAJ-7143 LCI	60" x 36" CAJ-7143 LCI	STI EJ	STI EJ	100" x 100" WL-7149 LCI
RECTANGULAR GREASE DUCTS (Non-Damp)	24" x 12" CAJ-7048 LCI	24" x 12" CAJ-7048 LCI	STI EJ	STI EJ	24" x 12" WL-7099 LCI

NOTES: REFER TO ARCHITECTURAL PLANS FOR ALL ASSEMBLY RATINGS. SUBMIT DRAWING FOR EACH APPLICATION INCLUDING APPLICATIONS ENCOUNTERED ON JOB BUT NOT INDICATED ABOVE. SUBMIT PRODUCT INFORMATION ON ALL FIRE-STOP PRODUCTS. CONTRACTOR SHALL LABEL PENETRATIONS IN CONCEALED LOCATIONS WITH DETAIL IF USING PERMANENT MARKER.

EJ- IS A SYSTEM DESIGNED AND DRAFTED BY SPECIFIED TECHNOLOGIES, INC. IF THE FIELD APPLICATION DOES NOT MEET A UL SYSTEM

Specified Technologies, Inc.  
210 Evans Way  
Somerville, NJ 08876  
800.992.1180  
[www.stifirestop.com](http://www.stifirestop.com)

## **SECTION 231140 - SUPPORTS AND ANCHORS**

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### **Part 1 - GENERAL**

**MSS:** Materials, design, manufacture, fabrication, selection, application, and installation shall comply with MSS SP-58, SP-69, and SP-89.

**Submittals:** Submit product data for hangers, clamps, saddles and shields, pipe guides and anchors, threaded rod, and hex nuts.

### **Part 2 - PRODUCTS**

**General:** Except as otherwise indicated, for each piping system provide factory-fabricated piping hangers and supports, selected by Installer to suit piping systems, in accordance with manufacturer's published product information. Use only one type by one manufacturer for each piping service. Select size of hangers and supports to exactly fit pipe size for bare piping, and to exactly fit around piping insulation with saddle or shield for insulated piping.

**Copper Pipe:** Provide copper-plated hangers and supports for copper-piping systems.

**Manufacturer:** B-Line Systems; Newman Associates (PHD); or Grinnell.

**Adjustable Swivel Rings:** Not allowed. Use clevis hangers or three-bolt clamps.

**Anchor Bolts and Structural Supports:** Provide anchoring and structural supports to meet seismic structural requirements as outlined in the International Building Code or applicable state code. Provide manufacturer's recommended fastening of equipment rigidly mounted to slabs or equipment pads. Provide seismic snubbers on all equipment mounted on vibration isolation springs and devices. Size anchor bolts and snubbers to withstand lateral forces. Refer to Division 15 section "Seismic Restraints."

**Malleable Iron Beam Clamps:** Electro-galvanized malleable iron, center load.

**C-Clamps:** Not allowed. Use malleable iron beam clamps.

**Steel Beam Clamps:** Not allowed. Use malleable iron beam clamps.

**Clevis Hangers:** For uninsulated copper piping, provide standard weight, low carbon steel with copper finish. For all other piping, provide standard weight, electro-galvanized low carbon steel.

**Heavy-Duty Steel Trapezes:** Fabricate from steel shapes selected for loads required; weld steel in accordance with AWS standards.

**Hex Nuts:** Electro-galvanized steel, "heavy."

**Pipe Guides:** Provide factory-fabricated guides, of cast semi-steel or heavy fabricated steel, consisting of bolted two-section outer cylinder and base with two-section guiding spider bolted tight to pipe. Size guide and spiders to clear pipe and insulation (if any), and cylinder. Provide guides of length recommended by manufacturer to allow indicated travel.

**Riser Clamps:** Electro-galvanized steel or copper finish for copper piping.

**Saddles and Shields:** Except as otherwise indicated, provide saddles and shields under piping hangers and supports, factory-fabricated, for all insulated piping. Size saddles and shields for exact fit to mate with pipe insulation.

**Saddles:** Plain finish steel.

**Shields:** Pre-galvanized steel.

**Threaded Rod:** Electro-galvanized steel.

**Three-Bolt Clamps:** Standard weight, electro-galvanized steel.

**Pipe Supports for Roof Mounted Piping:** Pipe support base shall combine UV protected 33% fiberglass reinforced 6/6 Nylon with an adjustable stainless steel threaded rod and axel assembly and which securely attaches to the base. Base for Pipe Support shall have flat sold lower surface with neoprene roof pad adhered to bottom surface. Pad shall provide for cushion between support and roof surface. Support shall be adjustable up to 10" above roof surface. Assembly shall include a hard cast rubber roller assembly capable of providing impact resistance to prevent damage to roof or support during pipe installation. Supports shall conform to MSS SP-58-2002, MSS SP-69-2002 and where appropriate MSS SP127-2001.

Products shall be: MAPA Products, MS-4 for piping 3" diameter and smaller. (Max load 140 lbs.) Or MAPA Products, MS-5 for piping 5" diameter and smaller (Max. load 165 lbs.) Or equal. New England sales representative: K Ross Co., Kingston, MA, phone 508-747-4493, fax 508-746-6678, email [krosscompany@aol.com](mailto:krosscompany@aol.com). Provide a submittal on this product. (7/1/05)

## **Part 3 - EXECUTION**

**Building Attachments:** Install at required locations within concrete or on structural steel for proper piping support. Install additional building attachments where support is required for additional concentrated loads, including valves, flanges, guides, strainers, expansion joints, and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts securely to forms. Where concrete with compressive strength less than 2500 PSI is indicated, install reinforcing bars through openings at top of inserts.

**Hangers and Supports, General:** Install hanger and supports in accordance with the following requirements.

Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers and other accessories. Except as otherwise indicated for exposed continuous pipe runs, install hangers and supports of same type and style as installed for adjacent similar piping.

Arrange for grouping of parallel runs of horizontal piping to be supported together on trapeze type hangers where possible. Where piping of various sizes is to be supported together by trapeze hangers, space hangers for smallest pipe size or install intermediate supports for smaller diameter pipe.

Install hangers and supports to allow controlled movement of piping systems and to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends and similar units.

Install hangers and supports so that piping live and dead loading and stresses from movement will not be transmitted to connected equipment.

Install hangers and supports to provide indicated pipe slopes, and so that maximum pipe deflections allowed by ANSI B31 Pressure Piping Codes are not exceeded.

Support fire-water piping independently of other piping.

Do not use wire or perforated metal to support piping, and do not support piping from other piping.

**Hanger and Support, Applications:** Install the following hangers and supports:

For horizontal pipes with runs of 20 feet or greater, install with articulated joints at top and bottom of threaded rod, to allow for pipe movement along the length of the piping. For insulated piping, this is normally accomplished using clevis hangers and malleable iron beam clamps.

Support vertical piping with riser clamps at each floor.

**Hanger Spacing:** Comply with the spacing indicated below:

<u>Material</u>	<u>Size (inches)</u>	<u>Maximum Spacing (feet)</u>
Copper	1/2	4
	5/8 to 1-1/4	6
	1-1/2 or greater	10
Steel	1/2	6
	5/8 to 1	8
	1-1/4 or greater	10
Cast Iron	all sizes	8--also install hangers 2 feet from each side of each joint
Sch. 40 PVC	all sizes	5

**Insulated Piping:**

Except as otherwise indicated, provide saddles or shields for all insulated piping. For hot piping, use saddles or shields; for cold piping, use shields only. Size saddles and shields for exact fit to mate with pipe insulation.

Pipe Clamps: Attach clamps, including spacers (if any), to piping with clamps projecting through insulation; do not exceed pipe stresses allowed by ANSI B31.

**Shields:** Where low-compressive-strength insulation such as fiberglass is used, install shields at all hangers.

**Hanger Adjustment:** Adjust hangers so as to distribute loads equally on attachments.

**Support Adjustment:** Provide grout under supports so as to bring piping and equipment to proper level and elevations.

**Anchors:** Install at ends of principal pipe-runs, at intermediate points in pipe-runs between expansion loops and bends at proper locations to prevent stresses from exceeding those permitted by ANSI B31, and to prevent transfer of loading and stresses to connected equipment. Make provisions for preset of anchors as required to accommodate both expansion and contraction of piping.

**Housekeeping Pads:** Provide concrete housekeeping bases for floor mounted equipment furnished as part of the work of Division 15. Size bases to extend minimum of 4" beyond equipment base in any direction; and 4" above finished floor elevation. Construct of reinforced concrete, roughen floor slab beneath base for bond, and provide steel rod anchors between floor and base. Locate anchor bolts using equipment manufacturer's templates. Chamfer top and edge corners.

**Stands:** Provide structural steel stands to support equipment not floor mounted or hung from structure. Construct of structural steel members or steel pipe and fittings. Provide factory-fabricated tank saddles or tanks mounted on steel stands.

**Protective Padding:** Provide protective high density foam padding on all hangers and equipment supports that are hung at "head-height" (5' to 7') in occupied spaces or mechanical rooms. Attach foam with adhesive. Do not use duct tape.

**Pipe Supports for Roof Mounted Piping:** Supports should be spaced so that weights are evenly distributed typically 6' to 10' apart unless otherwise stated in this specification. Supports should be positioned so that piping rests evenly on the base without undue strain. Coordinate exact support locations with roofing work. Maintain minimum 6" clearance above roof for all piping. The assemblies shall be leveled using the adjustment feature and the stands spaced so that weights are evenly distributed. Install per manufacturer's recommended installation procedures. (7/1/05)

**END OF SECTION 231140**

## **SECTION 231150 - SEISMIC RESTRAINT**

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### **Part 1 - GENERAL**

**Codes and Standards:** This facility shall be provided with seismic restraints in accordance with the applicable edition of the International Building Code, and all applicable codes and standards.

**Mechanical Systems Seismic Restraint Shop Drawings:** Appropriate information for the seismic restraints required shall be submitted to the Structural Engineer.

**Seismic Hazard Level:** For seismic hazard level, see the Basis of Design on Structural Drawing S1 or as otherwise indicated by the Structural Engineer. Unless indicated otherwise by Structural Engineer, Category A and B buildings have no seismic restraint requirements for mechanical systems.

### **Part 2 - PRODUCTS**

**Materials and Equipment:** Manufacturers/Manufacturer's Representatives: Mason Industries, Mechanical Control Systems (978-640-9994); VibraCon (508-393-8221); Novia Associates, Inc. (603-898-8600); B-Line (618-654-2184); or equal.

### **Part 3 - EXECUTION**

**Delegated Design:** Design and detailing of seismic restraints for mechanical equipment and systems is Delegated Design. Mechanical Contractor shall hire a Licensed Professional Structural Engineer to perform this work.

**Inspection:** Following completion of the Seismic Restraint portion of the work, the Mechanical Contractor's Licensed Professional Structural Engineer shall inspect the work and provide a signed letter indicating that the Seismic Restraints comply with the Contract Documents and with all applicable codes and standards. Such letter shall be submitted to the Structural Engineer for review.

**END OF SECTION 231150**



## **SECTION 231190 - IDENTIFICATION**

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### **Part 1 - GENERAL**

**Submittals:** Submit product data for pipe markers and valve tags.

**ANSI Compliance:** Comply with ANSI A13.1 for lettering size, length of color field, colors, and installed viewing angles of identification devices.

**Schedules:** Submit valve schedule for each piping system, typewritten and reproduced on 8-1/2" x 11" bond paper. Tabulate valve number, piping system, system abbreviation (as shown on tag), location of valve (room or space), and variations for identification (if any). Mark valves which are intended for emergency shut-off and similar special uses, by special "flags," in margin of schedule.

### **Part 2 - PRODUCTS**

**Manufacturers:** Allen Systems; W.H. Brady; Brimar; Industrial Safety Supply; or Seton Name Plate.

**Plastic Pipe Markers; Snap-On Type:** Provide manufacturer's standard pre-printed, semi-rigid, snap-on, color-coded, pipe markers, complying with ANSI A13.1.

**Plastic Pipe Markers; Pressure-Sensitive Type:** Provide manufacturer's standard pre-printed, permanent adhesive, color-coded, pressure-sensitive vinyl pipe markers, complying with ANSI A13.1.

**Underground-Type Plastic Line Marker:** Manufacturer's standard permanent, bright-colored, continuous-printed plastic type, intended for direct-burial service; not less than 6" wide x 4 mils thick. Provide tape with printing which most accurately indicates type of service of buried pipe.

**Valve Tags:** Provide manufacturer's standard solid brass valve tags with piping system abbreviation in approximately 3/16" high letters and sequenced valve numbers approximately 3/8" high, and with 5/32" hole for fastener.

**Valve Tag Fasteners:** Manufacturer's standard solid brass chain (wire link or beaded type), or solid brass S-hooks of the sizes required for proper attachment of tags to valves, and manufactured specifically for that purpose.

**Valve Schedule Frames:** For each page of the valve schedule, provide a glazed display frame, with screws for removable mounting on masonry walls. Provide frames of extruded aluminum or plastic with SSB-grade sheet glass or plastic.

**Plastic Equipment Markers:** Provide manufacturer's standard laminated plastic, color coded equipment markers.

**Lettering and Graphics:** Coordinate names, abbreviations and other designations used in mechanical identification work, with corresponding designations shown, specified or scheduled. Provide numbers, lettering and wording as indicated or, if not otherwise indicated, as recommended by manufacturers or as required for proper identification and operation/maintenance of mechanical systems and equipment.

## Part 3 - EXECUTION

**Coordination:** Where identification is to be applied to surfaces which require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, install identification after completion of covering and painting. Install identification prior to installation of acoustical ceilings and similar removable concealment.

**Ductwork Identification:** Identify air supply, return, exhaust, intake and relief ductwork with stenciled or plastic-laminate signs and arrows, showing ductwork service and direction of flow, in black or white (whichever provides most contrast with ductwork color).

Location: In each space where ductwork is exposed, or concealed only by removable ceiling system, locate signs near points where ductwork originates or continues into concealed enclosures (shaft, underground or similar concealment), and at 50' spacings along exposed runs.

Access Doors: Provide stenciled or plastic-laminate type signs on each access door in ductwork and housings, indicating purpose of access (to what equipment) and other maintenance and operating instructions, and appropriate safety and procedural information.

Concealed Doors: Where access doors are concealed above acoustical ceilings or similar concealment, plasticized tags may be installed for identification in lieu of specified signs, at Installer's option.

**Piping Identification:** Install pipe markers on each system, and include arrows to show normal direction of flow:

Locate pipe markers and color bands as follows wherever piping is exposed to view in occupied spaces, machine rooms, accessible maintenance spaces (shafts, tunnels, plenums) and exterior non-concealed locations.

Near each valve and control device.

Near each branch, excluding short take-offs for fixtures and terminal units; mark each pipe at branch, where there could be question of flow pattern.

Near locations where pipes pass through walls or floors/ceilings, or enter non-accessible enclosures.

At access doors, manholes and similar access points which permit view of concealed piping.

Near major equipment items and other points of origination and termination.

Spaced intermediately at maximum spacing of 50' along each piping run, except reduce spacing to 25' in congested areas of piping and equipment.

On piping above removable acoustical ceilings, except omit intermediately spaced markers.

Pipes: 3" high yellow tape with 1" high black lettering "NON-POTABLEWATER" and smaller "DO NOT DRINK."



**Underground Piping Identification:** During back- filling/top-soiling of each exterior underground piping systems, install continuous underground-type plastic line marker, located directly over buried line at 6" to 8" below finished grade. Where multiple small lines are buried in common trench and do not exceed overall width of 16", install single line marker. For tile fields and similar installations, mark only edge pipe lines of field.

**Valve Identification:** Provide valve tag on every valve, cock and control device in each piping system; exclude check valves, valves within factory-fabricated equipment units, HVAC terminal devices and similar rough-in connections of end-use fixtures and units. List each tagged valve in valve schedule for each piping system. Provide a unique number for each valve.

**Valve Schedules:** Mount valve schedule frames and schedules in boiler rooms. Where more than one major machine room is shown for project, install mounted valve schedule in each major machine room, and repeat only main valves which are to be operated in conjunction with operations of more than single machine room.

**Glycol Notice:** Mount attached glycol notice (231190 - S) in frame similar to valve schedule frame and mount in boiler room next to valve schedules.

**Mechanical Equipment Identification:** Install plastic equipment marker on or near each major item of mechanical equipment and each operation device. Provide signs for the following general categories of equipment and operational devices:

Main control and operating valves, including safety devices and hazardous units such as gas outlets.

Meters, gages, thermometers and similar units.

Fuel-burning units including boilers, furnaces, heaters, and absorption units.

Pumps, compressors, chillers, condensers and similar motor-driven units.

Heat exchangers, coils evaporators, cooling towers, heat recovery units and similar equipment.

Fans, blowers, primary balancing dampers, and mixing boxes.

Packaged HVAC central-station and zone-type units.

Tanks and pressure vessels.

Strainers, filters, humidifiers, water treatment systems, and similar equipment.

**Thermometer and Gage Identification:** Install self-adhesive plastic strip identification labels on the glass of all dial thermometers and gages. Do not obscure scales.

**Ceiling Identification:** Provide 1/4-inch self-adhesive dots on ceiling T-bars and access panel frames to indicate location of valves and other service items above ceiling. Provide color-coding as follows unless otherwise designated by Owner: Red-fire dampers and fire sprinkler items (if specified), Green-HVAC, Blue-Plumbing, Yellow-Electrical (if specified).

**Volatile Fluid Tank Identification:** For any tank which accumulates volatile fluids (such as oil, gasoline, and any other volatile fluids) and is located underfloor or within a building, provide engraved sign, red with white letters, permanently affixed to wall above tank and adjacent to hand pump, if any, stating "CAUTION! CONTENTS OF PUMP DISCHARGE MAY CONTAIN VOLATILE FLUIDS WITH EXPLOSIVE VAPORS. DO NOT SMOKE WHEN SERVICING OR PUMPING OUT TANK. TANK SHOULD BE PUMPED OUT TWICE A YEAR OR MORE OFTEN DEPENDING ON OBSERVED ACCUMULATION."

**Final Labeling:** Final (owner) room numbers and names (not construction numbers) shall be used for all labeling of all types.

**END OF SECTION 231190**

## SECTION 231250 - INSULATION

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### Part 1 - GENERAL

#### Submittals:

Product data for each type of mechanical insulation identifying k-value, thickness, and accessories.

Adhesives and Sealants: Submit product information for adhesives and sealants including MSDS and VOC limits and manufacturing location.

**Shop Drawings:** Include plans, elevations, sections, details, and attachments to other work.

Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.

Detail attachment and covering of heat tracing inside insulation.

Detail removable insulation at equipment connections and access panels.

Detail application of field-applied jackets.

Detail application at linkages of control devices.

Detail field application for each equipment type.

#### Quality Assurance:

**Manufacturer's:** Firms regularly engaged in manufacture of mechanical insulation products, of types and sizes required, whose products have been in satisfactory use in similar services for not less than 10 years.

**Installer's:** Firms with at least 5 years successful installation experience on projects with mechanical insulation systems similar to that required for this project.

**Flame/Smoke ratings:** Conform to the following characteristics for insulation including facings, cements, and adhesives, UL/ULC classified per UL 723 or meeting ASTM E 84, by a testing or inspecting organization acceptable to the authority having jurisdiction. Label insulation with appropriate markings of testing laboratory.

Interior Insulation: Flame spread rating of 25 or less and a smoke developed rating of 50 or less.

Exterior Insulation: Flame spread rating of 75 or less and smoke developed rating of 150 or less.

**Formaldehyde Free:** Third party certified with UL Environment Validation.

**Bio soluble:** As determined by research conducted by the International Agency for Research on Cancer (IARC) and supported by revised reports from the National Toxicology Program (NTP) and the California Office of Environmental Health Hazard Assessment, and Certified by the European Certification Board for Mineral Wool Products (EUCB).

**Recycled Content:** A minimum of 50 percent Post-Consumer recycled glass content certified and UL Validated.

**Low Emitting Materials:** For all thermal and acoustical applications of Glass Mineral Wool Insulation Products, provide materials complying with the testing and products requirements of UL GREENGUARD Gold Certification.

**Living Building Challenge** - Declare Red List Free.

## **Part 2 – PRODUCTS**

**General:** Products shall not contain formaldehyde, asbestos, lead, mercury, or mercury. Products shall be Certified UL GREENGUARD Gold or Indoor Advantage Gold.

Insulation materials applied to carbon steel shall be Mass Load Corrosion Rate (MLCR) tested per ASTM C 1617.

Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

**Adhesives and Sealants:** Total volatile organic compounds (VOCs) shall not exceed the limits of SCAQMD Rule #1168

### **Piping Insulation Materials**

#### **Fiberglass Preformed Pipe Insulation:**

**Material:** Inorganic glass fibers, formaldehyde free.

**Pipe fittings:** Molded fiberglass fabricated specifically for pipe size, type, and adjacent insulation thickness. Only molded products are acceptable. Products manufactured from mitered and glued from sections of straight run insulation or machine routed from flat stock board are unacceptable.

**Large Diameter Pipe and Tank Wrap:** ASTM C 1393, E84, 2.5 pcf.

#### **Flexible Elastomeric Cellular:**

**Material:** Flexible expanded closed-cell EPDM-rubber flexible elastomeric product with smooth skin on both sides, ke 0.245. UV Resistance shall comply with ASTM G 7 and ASTM G 90. Material shall have a recommended service temperatures of at least -100°F to +250°F and be approved by manufacturer for installation above and below ground, indoors and outdoors with no protective finish required. Materials shall NOT contain Microban or any other antimicrobial agent.

**Color:** Black except provide gray if so indicated on the Insulation Schedule. Provide gray ONLY where insulation will be painted.

**Tubular Materials:** ASTM C 534, Type I.

**Sheet Materials:** ASTM C 534, Type II.

**Tube Sealing:** Tube Sealing: Tubes shall be either un-slitted or sealed with the manufacturer's dual tape system; Self-Seal with Protape (SSPT). Use Aeroseal LVOC adhesive or Cel-Link self adhesive discs to seal butt joints then wrap joint circumferentially with Protape.

**Two Piece Fittings:** Preformed and sized for the specified pipe and insulation thickness.

**Coating:** Aerocell Aerocoat latex paint provided by insulation manufacturer where indicated by Architect. Color by Architect (white, or may be tinted with standard latex paint pigments such as Benjamin Moore).

**Manufacturer:** Aeroflex Aerocell.

## **Pipe Insulation Cover**

**Foil and Paper Jacket:** White kraft bonded to aluminum foil, fiberglass reinforced (ASTM E 96 (procedure A), D 781, & D 828).

**PVC Jacketing:** High-impact, ultra-violet-resistant PVC, 16-mils thick, roll stock ready for shop or field cutting and forming to indicated sizes. Self-lapping seam adhesive.

**PVC Fitting Covers:** Factory-fabricated fitting covers manufactured from 16-mil-thick, high-impact, ultra-violet-resistant PVC. Adhesive as recommended by insulation manufacturer.

**Aluminum Jacket Pipe Insulation:** 0.010" thick, corrugated finish, with a one mil polyethylene film / forty pound kraft paper integral vapor barrier affixed to the interior of the cover in conformance with ASTM B-209.

## **Ductwork Insulation Materials**

**Material:** Inorganic glass fibers, formaldehyde free.

**Rigid Fiberglass Ductwork Insulation:** UL/ULC Classified unfaced, ASJ and FSK; FHC 25/50 per ASTM E 84 PSK only. Comply with ASTM C 612, Type IA or Type IB.

**Flexible Fiberglass Ductwork Insulation:** Comply with ASTM C 553, Type I, II, and III and ASTM C 1290, Type I. UL/ULC Classified per UL 723 for FSK; FHC 25/50 per ASTM E 84 for PSK only. UL GREENGUARD Gold certified and UL Environment Validated to be formaldehyde free.

**Duct Insulation Cover:** Fiberglass reinforced foil and paper (Foil Scrim Kraft) jacket conforming with ASTM C 1136. Install per manufacturer's written instructions.

**Aluminum Jacket:** ASTM B 209, 3003 Alloy, H-14 temper, roll stock ready for shop or field cutting and forming to indicated sizes.

**Self Adhering Cover:** Membrane shall be a pre-manufactured self adhering product with an UV resistant, stucco embossed facing. Water vapor transmission of the installed product shall be .020 perms or less. Product shall be suitable for continuous use in low temperatures of -10°F.

**Manufacturers:** Flex-Clad 400, MFM Building Products Corp. or Alumaguard 60, Polyguard Products, Inc.

**Non-Self Adhering Cover:** Mechanically attached .060 or greater EPDM roofing membrane.

## **Equipment Insulation Materials**

**Material:** Inorganic glass fibers, formaldehyde free.

**Rigid Fiberglass Equipment Insulation:** UL/ULC Classified unfaced; ASJ and FSK; FHC 25/50 per ASTM E 84 for PSK only. Comply with ASTM C 612, Type IA or Type IB.

## **Kitchen Hood Insulation Materials**

**Material:** High temperature insulation fabricated from calcia magnesium silicate fiber encapsulated with aluminum foil fiberglass reinforced scrim covering bonded with a silica based adhesive.

**Manufacturer:** Unifrax I, LLC; New Carlisle, IN

## **1200 F Mineral Fiber Board and Preformed pipe Insulation**

**Material:** Inorganic mineral fiber board.

**Combustibility:** Non-combustible

**Service Temperature:** -120°F to 1200°F.

**Adhesive:** As recommended by manufacturer.

**Manufacturer:** Partek

## **Part 3 - EXECUTION**

### **General**

**Accessories:** Select accessories compatible with materials suitable for the service. Select accessories that do not corrode, soften, or otherwise attack the insulation or jacket in either the wet or dry state.

**Vapor Barriers:** Install vapor barriers on insulated pipes, ducts, and equipment having surface operating temperatures below 60 deg F.

**Application:** Apply insulation material, accessories, and finishes according to the manufacturer's printed instructions. Install insulation with smooth, straight, and even surfaces. Keep insulation materials dry during application and finishing.



**Sealing:** Seal joints and seams to maintain vapor barrier on insulation requiring a vapor barrier. Seal penetrations for hangers, supports, anchors and other projections in insulation requiring a vapor barrier. Taper ends and seal with lagging adhesive.

## **HVAC Piping Insulation Applications**

Insulate HVAC piping systems as scheduled. For heating only applications, omit insulation on heating piping within radiation enclosures or unit cabinets; on unions, flanges, strainers, flexible connections, and expansion joints, and on boiler and circulator isolation valves.

## **Pipe Insulation Installation**

**General:** Tightly butt longitudinal seams and end joints. Bond with adhesive. Stagger joints on double layers of insulation. Apply insulation continuously over fittings, valves, and specialties, except as otherwise indicated. Apply insulation with a minimum number of joints. Apply insulation with integral jackets: Pull jacket tight and smooth. Cover circumferential joints with butt strips, at least 3-inches wide, and of same material as insulation jacket. Secure with adhesive and outward clinching staples along both edges of butt strip and space 4 inches on center.

**Longitudinal Seams:** Overlap seams at least 1-1/2 inches. Apply insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches on center.

**Vapor Barrier Coatings:** Where vapor barriers are indicated, apply on seams and joints, over staples and at end butt to flanges, unions, valves and fittings. At penetrations in jackets for thermometers and pressure gages, fill and seal voids with vapor barrier coating. Repair damage insulation jackets, except metal jackets, by applying jacket material around damaged jacket. Adhere, staple and seal. Extend patch at least 2 inches in both directions beyond damaged insulation jacket and around the entire circumference of the pipe.

**Roof Penetrations:** Apply insulation for interior applications to a point even with the top of the roof flashing. Seal with vapor barrier coating. Apply insulation for exterior applications butted tightly to interior insulation ends. Extend metal jacket for exterior insulation outside roof flashing at least 2 inches below top of roof flashing. Seal metal jacket to roof flashing with vapor barrier coating.

**Exterior Wall Penetrations:** For penetrations of below grade exterior walls, terminate insulation flush with mechanical sleeve seal. Seal termination with vapor barrier coating.

**Hydronic Pipe exposed to Weather:** For hydronic heating or chilled water piping, install aluminum jacket with MEI 44-05 ECO-joint sealant with joints, or EPDM membrane jacket, or weatherproof mastic with glass cloth reinforcing over fiberglass pipe insulation.

**Refrigerant Pipe exposed to Weather.** Flexible elastomeric cellular with weatherproof jacket as per specifications and/or equal to K-Flex Clad Al and/or equal to Venture Clad 1577CW.

**Interior Walls and Partitions Penetrations:** Apply insulation continuously through walls and partitions.

**Fire-Rated Walls and Partitions Penetrations:** Apply insulation continuous through fire-rated walls and partitions. Seal around penetrations in accordance to Firestopping Detail Schedule, 15055-S.

**Elastomeric Pipe Insulation:** All elastomeric pipe insulation shall be un-slit type where possible. Where slit type insulation is used the pipe insulation must be of a type with a reinforced double seal equal to Armaflex LapSeal™ or K-Flex Insul-Lock DS.

**Elastomeric Pipe Elbows:** All elbows shall fully mitered or shall use factory fabricated fittings.

**Elastomeric Pipe Insulation Exposed to View:** All flexible Elastomeric pipe insulation exposed to view in finished spaces shall be white and shall be painted by the insulation subcontractor with the manufacturer's protective coating.

**Flanges, Fittings, and Valves - Interior Exposed and Concealed:** Coat pipe insulation ends with vapor barrier coating. Apply premolded, precut, or field-fabricated segments of insulation around flanges, unions, valves, and fittings. Make joints tight. Bond with adhesive.

Use same material and thickness as adjacent pipe insulation.

Overlap nesting insulation by 2 inches or 1-pipe diameter, which ever is greater.

Apply material with adhesive, fill voids with mineral fiber insulating cement. Secure with wire or tape.

Insulate elbows and tees smaller than 3-inches pipe size with premolded insulation.

Insulate elbows and tees 3 inches and larger with premolded insulation or insulation material segments. Use at least 3 segments for each elbow.

Cover insulation, except for metal jacketed insulation, with PVC fitting covers and seal circumferential joints with butt strips.

**Hangers and Anchors:** Apply insulation continuously through hangers and around anchor attachments. Install saddles, shields, and inserts as specified in Division 23 Section "Supports and Anchors". For cold surface piping, extend insulation on anchor legs a minimum of 12 inches and taper and seal insulation ends. Cover hanger inserts and shields with jacket material matching adjacent pipe insulation.

Piping insulated with elastomeric insulation shall use factory insulated pipe supports to prevent the compression of insulation at hangers and pipe shields.

## **Equipment Insulation Applications**

Insulate all equipment not factory insulated. For heating only applications, omit insulation on hydronic expansion tanks and air separators. Large Diameter Pipe and Tank Wrap may be used in lieu of Board and Block Insulation for water storage tanks and garn storage boilers. Use AP facing and paint with two coats of white latex paint.

## Equipment Insulation Installation

**General:** Install board and block materials with minimum dimension of 12 inches and a maximum dimension of 48 inches.

Groove and score insulation materials as required to fit as closely as possible to the equipment and to fit contours of equipment. Stagger end joints.

Insulation Thickness Greater than 2 Inches: Install insulation in multiple layers with staggered joints.

Bevel insulation edges for cylindrical surfaces for tight joint.

Secure sections of insulation in place with anchor pins and speed washers. Space anchors at maximum intervals of 18 inches in both directions and not more than 3 inches from edges and joints.

Protect exposed corners with corner angles under wires and bands.

Apply 2 coats of vapor barrier compound to minimum thickness of 1/16 inch. Install a layer of glass cloth embedded between layers with 2" overlap at joints.

**Block and Board Insulation:** Install block and board insulation as follows

Adhesive and Band Attachment: Secure block and board insulation tight and smooth with at least 50 percent coverage of adhesive. Install bands spaced 12 inches apart. Protect insulation under bands and at exterior corners with metal corner angles. Fill joints, seams and chipped edges with vapor barrier compound.

Speed Washers Attachment: Secure insulation tight and smooth with speed washers and welded pins. Space anchor pins 18 inches apart each way and 3 inches from insulation joints. Apply vapor barrier coating compound to insulation in contact, open joints, breaks, punctures, and voids in insulation.

**Glass Cloth Jackets:** Install glass cloth jacket directly over insulation. On insulation with factory applied jacket, install the glass cloth jacket over the factory applied jacket. Install jacket drawn smooth and tight with a 2-inch overlap at joints. Embed glass cloth between (2) 1/16-inch-thick coats of lagging adhesive. Completely encapsulate the insulation with the jacket, leaving no exposed raw insulation.

**Manholes, Handholes, and Information Plates:** Bevel and seal insulation ends around manholes, handholes, ASME stamps, and nameplates.

**Removable Insulation:** Install insulation on components that require periodic inspecting, cleaning, and repairing for easy removal and replacement without damage to adjacent insulation.

## Duct Insulation

Install insulation products in accordance with manufacturer's written instructions, and in accordance with recognized industry practices to ensure that insulation serves the intended purpose.

Maintain integrity of vapor barrier on ductwork insulation, and protect it to prevent puncture and other damage. Where punctures occur, patch tears with a tape of the same facing. Excessive damage will require the insulation to be replaced.

Extend ductwork insulation without interruption through walls, floors and similar ductwork penetrations, except where penetrations go through fire rated construction.

Protect insulation on exterior ductwork from weather by installing outdoor protective finish or jacketing as recommended by manufacturer.

**Blanket Insulation:** Install tight and smooth. Meet manufacturer's installation requirements.

**Foil and Paper Jackets (FP):** Install jackets drawn tight. Install lap or butt strips at joints with material same as jacket. Secure with adhesive. Install jackets with 1-1/2 inch laps at longitudinal joints and 3-inch wide butt strips at end joints. Seal openings, punctures, and breaks in vapor barrier jackets and exposed insulation with vapor barrier compound.

**Jackets for Ductwork Exposed to Weather:** Equal to 0.16 aluminum jacket with MEI 44-05 ECO-joint sealant, or EPDM rubber jacket.

**Ductwork Exposed to Weather (Contractors Option):** Insulate ductwork exposed to weather with 2" foil faced polyisocyanurate insulation board and Flex-Clad 400 jacket.

**Flexible Elastomeric Cellular Insulation Exposed to Weather:** After adhesive has fully cured, apply K-Flex AL aluminum finish jacket (or equal).

**Damper handles:** To assist balance contractor, insulator shall assure balancing handles are not covered by insulation or jacket. Insulator shall attach a florescent orange surveyors ribbon to each handle so ribbon will extend below finished ceiling or in areas without ceiling a minimum 3' 0" length.

**END OF SECTION 231250** (December 11, 2015)

## **HVAC INSULATION SCHEDULE BARRINGTON TOWN OFFICES**

**PLEASE NOTIFY ENGINEER (603-352-4841) SEVEN DAYS BEFORE BID IF ANY INSULATION APPLICATIONS ARE MISSING FROM THIS SCHEDULE. THANK YOU.**

### **HVAC PIPING SYSTEMS**

FLEXIBLE ELASTOMERIC CELLULAR 3/4" (WHITE IN EXPOSED LOCATIONS)

HEAT PUMP REFRIGERANT PIPING.

FLEXIBLE ELASTOMERIC CELLULAR 2" WITH WEATHERPROOF JACKET AS PER SPECIFICATIONS AND/OR EQUAL TO K-FLEX AL CLAD (1-800-765-6475) AND/OR EQUAL TO VENTURE CLAD 1577CW.

EXTERIOR HEAT PUMP REFRIGERATION PIPING.

PVC JACKETS, .020:

EXPOSED PIPING IN FINISHED AND SEMI-FINISHED AREAS.

### **DUCTWORK INSULATION**

INSULATE THE FOLLOWING DUCTWORK:

HEAT PUMP SUPPLY DUCTWORK (ALL AREAS): R-8 GLASS FIBER.  
ENERGY RECOVERY UNIT OUTSIDE AIR AND EXHAUST DUCTWORK FROM UNIT  
TO EXTERIOR (ALL AREAS): R10 GLASS FIBER.

R-8 GLASS FIBER:  
2.5" @ .75 PCF WRAP (R7 INSTALLED); CONCEALED LOCATIONS.  
2.0" @ 1.5 PCF WRAP (R6.4 INSTALLED); CONCEALED LOCATIONS.

R-10 GLASS FIBER:  
3.0" @ 0.75 PCF WRAP (R8.4 INSTALLED); CONCEALED LOCATIONS.

**END OF SCHEDULE 231250**

## **SECTION 231675 – VRF MULTIZONE SPLIT SYSTEM HEAT PUMPS**

### **Part 1 - GENERAL**

**Submittals:** Submit product data on Variable Refrigerant Flow (VRF) Multizone Split System Heat Pump units, including capacity at scheduled conditions, dimensioned drawings, and weight. Include a complete list of materials showing model numbers and quantities for each piece of equipment, as well as heating and cooling capacities for each indoor unit at design conditions (for the heating mode this should be the minimum rated outdoor operating temperature). **Factory piping diagrams showing pipe size, length and actual routing must be submitted for approval as part of the submittal package. The contractor must submit their factory training certification as part of the submittal package.**

**System Description:** The variable capacity, heat pump air conditioning system shall be a Variable Refrigerant Flow split system. The system shall consist of multiple evaporators using PID control, and VRF outdoor unit. The outdoor unit shall be a direct expansion (DX), air-cooled heat pump air-conditioning system, variable speed driven compressor multi zone split system, using R410A refrigerant. The outdoor unit may connect an indoor evaporator capacity up to 130% of the outdoor condensing unit capacity. All indoor units are each capable of operating separately with individual temperature control.

**Electrical Requirements:** Confirm electrical characteristics, including voltage, phase, power requirements with Electrical Contractor before ordering equipment.

**ETL:** The units shall be listed by Electrical Laboratories (ETL) and bear the ETL label.

**NEC:** All wiring shall be in accordance with the National Electric Code (NEC).

**Energy Star:** The system will bear the Energy Star label.

**ISO:** The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.

**Warranty on Indoor and Outdoor Components:** Manufacturer shall provide written warranty, including materials and labor, to replace/repair, within warranty period any failed units or components thereof including but not limited to compressors, fans, valves, electronic components, due to inadequate or defective materials or failure. Contractor shall provide written warranty, including materials and labor, to to replair/replace, within warranty period, any failures due to improper workmanship or assembly, including leakage, breakage, or failure to perform as required. Warranty period shall be 5 years from date of substantial completion for Manufacturer's warrantee and three years for Contractor's warrantee. Warranty period for compressor shall be 6 years from date of substantial completion.

### **Part 2 - PRODUCTS**

**Air-cooled outdoor units:** Provide as indicated air-cooled outdoor units of type, capacity, electrical characteristics, and having accessories as scheduled.

**Air Indoor Units:** Provide as indicated split system air handling units of type, capacities, arrangement, and accessories as scheduled.

**Air-to-water heat exchangers:** Provide as indicated. Follow all of manufacturer's installation guidelines and recommendations. Ensure that water-circuit pumps are interlocked with HEX unit operation to prevent unit damage.

**Heat Recovery:** Where heat recovery type systems are specified they may use either a two-pipe or three-pipe configuration. Piping and heat recovery equipment layouts vary significantly between two-pipe and three-pipe systems. If a system is designed as two-pipe system and a manufacturer chooses to provide a three-pipe system (or visa-versa), the manufacturer must provide new CAD drawings on the Architectural floor plans showing the revised pipe routing and heat recovery equipment locations as part of the submittal. Revised equipment locations must be approved by the Architect and Engineer.

**Condensate Drain Pan System:** Provide condensate drain system in accordance with the International Mechanical code. Provide condensate drain pan with drain outlet at the lowest point of the pan so that there is no standing water in the pan during normal operation.

**Water Detection Device:** Provide device conforming to UL 508 that will shut off the cooling function in the event that the drain outlet is blocked; locate the sensing portion of this device at a point higher than the drain line connection and below the overflow rim of the pan. Provide auxiliary contacts for connection of an external monitoring and control system so that it can detect when the device has tripped. When available, condensate switches shall be provided by VRF system manufacturer for all units.

**Refrigerant Ball Valves:** Valves shall be full port type, line size valves with Schrader Valve for refrigerant service. Valves shall be suitable for use with R-410A and designed for a working pressure of 700 PSIG and a temperature range of -40 to 325 °F. Valves shall be provided with a factory insulation kit. Valves shall be installed at each final branch serving an indoor heat pump unit and as shown on plans.

**Accepted Manufacturers of VRF Multizone Split System Heat Pumps:** Mitsubishi Electric Corporation.

**Motor Starters and Disconnects:** Motor starters and disconnects are specified in Division 23 section, "Electrical Requirements for Mechanical Equipment."

**Refrigerant Piping:** Install hard-drawn copper tubing with brazed joints for all exposed and all accessible refrigerant piping unless otherwise noted. Do not install concealed or inaccessible refrigerant joints under any circumstances.

## **Part 3 - EXECUTION**

**General:** Install indoor and outdoor units where indicated, in accordance with equipment manufacturer's published installation instructions, and with recognized industry practices. Install units plumb and level, firmly anchored in locations indicated. Coordinate with other work as necessary to interface installation of air handling and outdoor units with other work.

**Installation Requirements:** The system must be installed by a contractor/dealer who has been trained and is currently certified by the manufacturer. The contractor must be certified prior to the time of bidding (retro-active certification is not acceptable). The contractor must have completed the installation

of a VRF multi-zone split system of a similar size prior to the time of the bid. For all Mitsubishi City-Multi systems the contractor must be a Diamond Certified Installer.

**Refrigerant Piping:** Provide services of factory technical service representative to design refrigeration piping.

**Refrigerant Ball Valves:** Valves may be located either at piping mains or at indoor unit unless otherwise indicated. Apply a small amount of refrigerant oil to the flare face during installation and use a torque wrench to tighten flare connections to manufacturers approved level. Do not overtighten. Carefully install insulator kit and secure with tie bands for additional security.

**Concrete Pads:** Install ground-mounted units on 6" thick reinforced concrete pad, 4" larger on each side than condensing unit and extending a minimum of 4" above grade. Coordinate installation of anchoring devices. Pads shall be pitched away from buildings, walkways and entrances to prevent ice build-up in these areas.

**Outdoor unit frames:** All outdoor units not protected from snowfall by a roof, enclosure or other means MUST be mounted on a raised frame to protect from snow damage. The frame height shall be twice as high as the expected snowfall and in no case less than 18". The frame base shall be made of angle steel or equivalent and shall not exceed that of the width of the unit (to prevent snow and condensate accumulation on the frame) and shall be of sufficient strength to properly support units. The frames shall be made from galvanized steel plate 1.2T and painted with polyester powder to match the color of the unit.

For units installed under roofs or within enclosures the height of the raised frame shall be 6" to allow the unit to shed defrost condensate during the heating mode. Failure to mount unit on raised frame may result in damage from ice build-up on the units.

**Electrical Wiring:** Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer for power wiring. Provide a 115V convenience outlet and a spare electrical circuit at every outdoor unit location. The spare circuit is for the purpose of future heat trace wiring at the base of the unit in case of defrost condensate build-up.

**Electrical Clearances:** Provide required electrical clearances to air handling and outdoor unit electrical panels.

**Access:** Provide access space around air handling and outdoor units for service as indicated, but in no case less than that recommended by manufacturer. Provide access panels for service per manufacturer's instructions and/or as indicated on plans.

**Ductwork Connections:** Refer to Division-23 "Ductwork" sections. Provide flexible connections on duct connections to air handling units.

**Vibration Isolation:** Install air handling units with vibration isolators. Provide vibration isolators for all piping connections.

**Refrigerant:** Connect refrigerant piping to units; run piping so as not to interfere with access to unit. Install furnished field- mounted accessories.



**Condensate:** Provide trapped condensate drain piping from unit to building drain system as indicated or required. Provide factory condensate pumps for all units as necessary to achieve condensate routing shown on drawings.

**Charging:** Charge systems with refrigerant and oil, and test for leaks. Repair leaks and replace lost refrigerant and oil.

**Temporary Heat:** (When allowed.) Protect each return air grille with filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 if air-handling type heat pumps must be used for temporary heating, ventilating or air conditioning during construction. Ductless heat pumps with long life filters may not be used for tempering heating without written permission.

**Cleaning:** After construction is completed, clean unit exposed surfaces, vacuum clean coils and inside of cabinets. Retouch any marred or scratched surfaces of factory-finished cabinets, using finish materials furnished by manufacturer. Install clean filter units for units requiring same.

**Factory Start-up and Commissioning:** Provide services of factory technical service representative to start-up and commission VRF Multizone Split System Heat Pump Systems in accordance with manufacturer's instructions and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment. **All Mitsubishi City-Multi Systems must be commissioned by a Diamond Distributor. It is the responsibility of the Distributor to complete the commissioning paperwork and submit them to Mitsubishi to activate the extended warranty. The commissioning report (complete with warranty number provided by Mitsubishi Electric US) must be provided to the owner as part of the O&M manual.**

Note: Turn on power to outdoor units at least 12 hours prior to starting operation. Failure to do so can result in irreversible damage to internal parts.

The commissioning report shall include the following data:

- Record Pressure Test (Holding Pressure)
- Confirmation of Record Drawings
- Record Pipe Lengths
- Record Pipe Diameters
- Additional and Total Refrigerate Volumes
- Addressing of Fan Coils
- Cooling Start Up Check
- Heating Start Up Check
- Complete and Issue Documents and Certificates to Consultant/Client.

Should it deemed necessary full access should be afforded to the site during the installation of the VRF System to allow the Equipment Supplier's representative/engineer to verify that the installation methods being used comply and are fully in accordance with the VRF System Installation Instructions, requirement in order that the equipment warranties will not be invalidated.

**Controls Coordination:** See Control System specifications sections for additional work by VRF factory, and coordinate with ATC Contractor as indicated or required. For projects with factory provided controls including local controllers (thermostats), touch screen controllers or web-browser enabled controllers a

factory technical service representative shall provide on-site owner training. For projects with a LON or BACnet integration the manufacturer shall provide support to the ATC contractor to assist in the mapping of all available points.

**Balancing:** Refer to Division-23 section "Testing, Adjusting, and Balancing" for balancing VRF heat pump air and water systems; not work of this section.

**Spare Parts:** Provide one complete extra set of filters for each indoor unit, including units with long life reusable filters.

**Owner's Training:** Provide initial training services at the time of project turn-over. Provide up to 4 hours of initial owner training. For projects with an ATC system this training should be scheduled as part of the comprehensive ATC system training. It should be assumed that this initial training session will occur at a time other than the equipment start-up and commissioning processes and will require a separate site visit. Provide a second 4 hour training session at the owner's request at any time within the first 2 years after project turn-over. Cover the following topics: general instruction on the user interface; questions from Owner. Per Owner, make all requested screen changes of identifiers (names and numbers of rooms, equipment, etc.). Review all screens with Owner. Specifically train on common setpoint adjustments, trends, alarms, maintenance schedules, time schedules and overrides, heating/cooling mode changeover options, and local thermostat lock-out capabilities. Provide written step-by-step instructions for common Owner user interface actions. Training that is conducted informally, or without proper notice, will not be counted toward the required number of hours. Return a signed "Confirmation of Owner's Training and Acceptance of Control System" form when initial training is complete.

**END OF SECTION 231675**

**VRF MULTIZONE HEAT PUMPS  
OUTDOOR UNITS  
BARRINGTON TOWN OFFICES**

OUTDOOR UNIT	
PLAN NO.	HP-192
MANUFACTURER	mitsubishi
REFRIGERANT	R-410A
MODEL NO.	PUHY-HP192TSJMU-A
COOLING	
CAP (MBTUH)	192 @ 80 DB/67 WB, 95 DB
RANGE (F)	23 TO 109
HEATING	
CAP (MBTUH)	216 @ 70 DB, 47 DB/43 WB
RANGE (F)	-13 TO +60
dB(A) @ 3 FT	60
AIRFLOW	7,950 + 7,950
ELECTRICAL	
VOLTS	208/230/3/60
MAX FUSE AMPS	120/110 + 120/110
MIN CIR AMPS	74/68 + 74/68
DIMENSIONS	
H x W x D	65 x 48 x 30 + 65 x 48 x 30
WT - LBS.	585 + 585 + ACCESSORIES
ACCESSORIES (ALL)	- DISCONNECT*, - BASE PAN HEATER, - TWINNING KIT (CMY-Y100CBK3), - HAIL/SNOW GUARDS - HAIL /SNOW HOODS - FACTORY REFRIGERATION PIPING DESIGN - FACTORY STARTUP

\*NOTE THAT EACH MODULE REQUIRES A SEPARATE POWER FEED AND DISCONNECT. PROVIDE CONVENIENCE OUTLET AT EACH OUTDOOR UNIT.

**VRF MULTIZONE HEAT PUMPS  
OUTDOOR UNITS – ALTERNATE FOR SIMULTANEOUS  
HEATING AND COOLING  
BARRINGTON TOWN OFFICES**

OUTDOOR UNIT	
PLAN NO.	HP-192-ALTERNATE
MANUFACTURER	mitsubishi
REFRIGERANT	R-410A
MODEL NO.	PURY-HP192TSKMU-A
COOLING	
CAP (MBTUH)	192 @ 80 DB/67 WB, 95 DB
RANGE (F)	23 TO 115
HEATING	
CAP (MBTUH)	215 @ 70 DB, 47 DB/43 WB
RANGE (F)	-13 TO +60
dB(A) @ 3 FT	61
AIRFLOW	6,200 + 6,200
ELECTRICAL	
VOLTS	208/230/3/60
MAX FUSE AMPS	80 + 80
MIN CIR AMPS	60/54 + 60/54
DIMENSIONS	
H x W x D	65 x 48 x 30 + 65 x 48 x 30
WT - LBS.	552 + 552 + ACCESSORIES
ACCESSORIES (ALL)	<ul style="list-style-type: none"> <li>- DISCONNECT*,</li> <li>- BASE PAN HEATER,</li> <li>- TWINNING KIT (CMY-Y100CBK3),</li> <li>- HAIL/SNOW GUARDS</li> <li>- HAIL /SNOW HOODS</li> <li>- FACTORY REFRIGERATION PIPING DESIGN</li> <li>- FACTORY STARTUP</li> <li>- PROVIDE BRANCH CONTROLLERS AS REQUIRED.</li> </ul>

\*NOTE THAT EACH MODULE REQUIRES A SEPARATE POWER FEED AND DISCONNECT. PROVIDE CONVENIENCE OUTLET AT EACH OUTDOOR UNIT.

## VRF MULTIZONE HEAT PUMPS

### Indoor Units

### BARRINGTON TOWN OFFICES

Plan #	Model #	Unit Type	Cooling Capacity *	Heating Capacity **	Airflow (High/Low)	Sound Pressure (High/Low)	Weight	Dimensions (H x W x D)	Condensate Drain Pipe Diameter	Cond. Pump	Min. Circuit Amps	Max. Fuse Amps
			(BTU/H)	(BTU/H)	CFM	Db(A)	Lbs	In.	O.D, In.		Amps	Amps
<b>Wall – Small</b>												
HP-W06	PKFY-06NBMU-E	Wall-Small	6,000	6,700	200/170	36/32	22	11-5/8 x 32-1/8 x 8-7/8	5/8 (I.D)	Field	0.19	15
<b>Wall – Medium</b>												
HP-W12	PKFY-12NHMU-E	Wall-Medium	12,000	13,500	390/320	42/34	29	11-5/8 x 35-3/8 x 9-13/16	5/8 (I.D)	Field	0.38	15
<b>Ceiling Recessed – 2x2</b>												
HP-C08	PLFY-P08NCMU-E	Clg. Recessed 2x2	8,000	9,000	350/280	38/29	41	8-3/16 x 22-7/16 x 22-7/16	1-1/4	Std.	0.29	15
HP-C12	PLFY-P12NCMU-E	Clg. Recessed 2x2	12,000	13,000	390/320	39/30	44	8-3/16 x 22-7/16 x 22-7/16	1-1/4	Std.	0.35	15
HP-C15	PLFY-P15NCMU-E	Clg. Recessed 2x2	15,000	17,000	390/320	40/31	44	8-3/16 x 22-7/16 x 22-7/16	1-1/4	Std.	0.35	15
<b>Narrow Ceiling Recessed – 1 Way Blow</b>												
HP-N06	PMFY-P06NBMU-E	Clg. Recessed 1-way	6,000	6,700	307/230	35/27	38	9-1/16 x 31-31/32 x 15-9/16	1-1/32	Std.	0.25	15
<b>Ceiling Concealed and Ducted – Average Static***</b>												
HP-A08	PEFY-P08NMAU-E	Clg. Concealed – Avg.***	8,000	9,000	300/212	29/26	51	9-13/16 x 27-9/16 x 28-7/8	1-1/4	Std.	1.05	15
HP-A18	PEFY-P18NMAU-E	Clg. Concealed – Avg.***	18,000	20,000	600/424	35/28	58	9-13/16 x 35-7/16 x 28-7/8	1-1/4	Std.	1.56	15
<b>Floor Standing – Recessed and Concealed</b>												
HP-R08	PFFY-P08NRMU-E	Floor – Recessed	8,000	9,000	229/194	41/36	41	25-3/16 x 34-29/32 x 8-11/16	1-3/32	x	0.32	15

Capacity Rating Conditions:

\*Cooling Mode Nominal Conditions: 80 F Db/67 F Wb Indoor; 95 F Db Outdoor

\*\*Heating Mode Nominal Conditions: 70 F Db Indoor; 47 F Db/43 F Wb Outdoor

Condensate Pumps:

Std. = Includes pump as factory standard.

Field = Factory supplied and field installed external “Aspen” pump, ONLY if plans show “WITH PUMP”.

x = No factory pump provided: Use external condensate pump if shown on plans.

Notes:

\*\*\*Provide FBM2 filter box.

## **VRF MULTIZONE HEAT PUMPS CONTROLS ACCESSORIES SCHEDULE BARRINGTON TOWN OFFICES**

### **Local Controllers (Thermostats):**

Simple MA remote controller, PAC series. Provide one controller for every indoor unit (multiple units serving a single zone will share a controller).

### **Central Controller / User Interface:**

Touch screen controller model AG-150—standard series, for up to 50 indoor units. Locate controller where shown on plans or in location approved by architect and owner. Surface mount controller on field provided control panel. Controller provides an interface for time scheduling for the VRF heat pumps and a local user interface.

### **Drain Pan Level Sensor:**

Provide a model DPLS-1 condensate drain pan level switch for every indoor heat pump unit. Switch shall be wired directly to heat pump unit to shut-off cooling operation and indicate a condensate alarm at local and central controller in the event of an alarm condition. If not factory-installed, switches shall be field installed and wired.

### **Owner's Training:**

VRF Projects: Owner training shall be provided by a VRF manufacturer's representative who is familiar with all aspects of the project. As part of the training the owner shall have the option of working with the trainer to set up all initial setpoints, schedules and operating parameters for every VRF control component for the project. The confirmation of owner's training on the following page must be completed and provided to the engineer with project closeout documents.

### **Initial Settings:**

The contractor shall configure the following adjustable settings as follows unless otherwise directed by the owner. The owner may request a change to any of these adjustable settings during the training session:

- All indoor units shall be set with the fans to "variable speed auto" in all modes.
  - Occupied Mode: Auto with "Low" as the minimum speed.
  - Unoccupied Mode: Auto with "Ultra Low" as the minimum speed.
- All indoor units shall be set to control to the thermistor installed in the wired local remote controller (not the thermistor installed in the return air stream).
- The initial setpoints shall be as follows:
  - Heating: Occupied 70° F. Unoccupied 70° F.
  - Cooling: Occupied 75° F. Unoccupied 75° F.

## **CONFIRMATION OF OWNER'S TRAINING AND ACCEPTANCE OF CONTROL SYSTEM**

**Project:** \_\_\_\_\_

Owner's representative affirms that:

he/she has read the "Owner's Training" paragraph near the end of the Control Systems Specifications Section, and the "OWNER'S TRAINING" paragraph above, and that

all work and training required to be provided by the Contractor by the time of control system acceptance has been provided, and has been fully satisfactory as far as can be determined at this time.

Training sessions took place at the following place, dates, and times:

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Total hours of training provided: \_\_\_\_\_

Owner's representative: \_\_\_\_\_

Signed \_\_\_\_\_

Date \_\_\_\_\_

Note that, as specified, additional training is required in approximately six months.

**END OF VRF CONTROL SCHEDULE**

# **SECTION 231832 - ELECTRIC DUCT HEATERS**

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## **Part 1 - GENERAL**

Provide the electric heater(s) in ductwork as shown on the drawings and as specified herein.

Heaters and panelboards (if required) shall meet the requirements of the National Electrical Code and shall be UL1996 Listed by Underwriters Laboratories for zero clearance to combustible surfaces and for use with heat pumps and air conditioning equipment.

### **Reference Standards:**

Underwriters Laboratory, Inc. (UL)  
National Electrical Code (NEC)

## **Part 2 - PRODUCTS**

**General:** Heating elements shall be open coil, 80% nickel, 20% chromium, Type A resistance wire, Type C alloys containing iron or other alloys are not acceptable. Coils shall be machine crimped into stainless steel terminals extending at least 1" into the air stream and all terminal hardware shall be stainless steel. Coils shall be supported by ceramic bushings staked into supporting brackets. Brackets are not to be spaced more than 4-1/2" apart.

**Heater Frames and Terminal Boxes:** Heater frames and terminal boxes shall be corrosion resistant steel. Unless otherwise indicated, the terminal box shall be NEMA 1 type construction and shall be provided with a hinged, latching cover and multiple concentric knockouts for field wiring.

**Controls and Options:** Open coil heaters shall be furnished with a disk type, automatic reset thermal cutout for primary overtemperature protection. Heaters shall also be furnished with disk type, load-carrying manual reset thermal cutouts, factory wired in series with heater stages for secondary protection. Heat limiters or other fusible overtemperature devices are not acceptable.

Heaters shall be rated for the voltage, phase and number of heating stages indicated in the schedule. All three-phase heaters shall have equal, balanced, three-phase stages. All internal wiring shall be stranded copper with 105°C minimum insulation and shall be terminated in crimped connectors or box lugs.

Power and control terminal blocks shall be provided and clearly marked for all field wiring and shall be sized for installation of 75°C copper wire rated in accordance with NEC Table 310-16, not more than three conductors in a conduit.

Heaters shall be furnished with built-in fuses per NEC. Heaters with loads greater than 48 amps will be furnished with built-in fusing. Heaters shall be sub-circuited into a maximum of 48 amps per circuit. Low resistance single element fuses will be mounted in phenolic fuse blocks fitted with extra tension springs to assure cool connections. Fuses shall be sized at least 125% of the load.



Heaters shall be furnished with one of the following Control Options as specified in the schedule:

*Electric* - Thermal cutouts, airflow switch, contactors, fuses (if over 48 amps), control circuit transformer, and built-in, snap-acting, door interlocked disconnect switch.

*SCR Proportional* - Thermal cutouts, airflow switch, safety contactors (where required), INDEECO Controls SCR's, (heater loads over 96Amps shall be SCR-VERNIER controlled), fuses (if over 48 amps), control circuit transformer, and built-in snap-acting, door interlocked disconnect switch.

When specified in the schedule, heaters will be supplied with the following special features:

*Slip-in heaters* - Slip-in heaters are to be designed so that the entire frame, except the terminal box, slips into the duct with 1/4" clearance all around.

*Flanged* - Flange heaters are to be designed so that the inside face dimensions exactly match the duct dimensions. The heater frame is to be attached to outward turned flange of the duct.

*Pressure Plate* - A 40% open pressure plate on the air inlet side to provide uniform airflow through the heater.

*Protective Screens* - Protective screens are to be provided to protect personnel from accidental contact with electrically hot open coil elements, and to avoid large airborne contamination from reaching the elements.

*SCR Proportional Controls* - SCR power controller is required for heaters drawing 96 amps or less for 3-phase or 192 amps for single-phase supply. One master SCR will be provided for full proportional output. SCR's are to have field switchable temperature inputs for: 4-20 mA, 0-10 VDC for building automation control, 135 or 2,200 OHMS or be controlled by a factory-furnished room or duct thermostat as specified in the schedule.

SCR power controller shall be furnished with the following:

- Failsafe circuitry for shorted or opened input
- LED status lights for: power on and system operation
- All SCR's are equipped with transient/surge absorbers
- SCR's are zero cross firing
- Snubber network protection against false firing
- Control circuit is to be optically isolated from the power circuit.
- SCR is to be suitable for indoor, dusty, and wet or outdoor applications as specified in the schedule.

*Step controller controls* - Electronic step controller, provides control of heater stages as noted in the schedule. Advanced micro processing operation and field switchable temperature inputs for: 4-20 mA, 0-10 VDC for building automation control, 135 or 2,200 ohms, or be controlled by a factory-furnished room or duct thermostat as specified in the schedule.

Step Controller shall be furnished with the following:

- Adjustable time delay between stages
- LIFO – Last in, first out stage sequencing
- LED status lights for: Power On, System Operation, and each Stage On

Self-diagnostic program with trouble-shooting LED to verify input settings, wiring, contactor and stage operation  
TRIAC outputs for each stage

Disconnecting Contactors - Disconnecting contactors, breaking all ungrounded conductors are required.

Fan Relay - A fan relay will be provided as *(an alternate to)* or *(in addition to)* airflow switch. Fan relay is to provide a positive electrical interlock between the fan motor and the heater.

Pilot Lights - Pilot lights to indicate low airflow, heater on, each stage on. Pilot lights are to be mounted through the side of the heater's terminal box, indicate functional operation:

Heater On - To indicate that power has been supplied to the heater.

Low Airflow - To indicate that there is either no airflow or insufficient airflow to prevent the heater from operating.

Each Stage On - To indicate when each heater stage has been energized.

Remote Panels - Remote panels to be either NEMA 1, 4, 12 type and 3R construction as noted in the schedule. Remote panels are to be provided with door interlocking disconnect switch, disconnecting contactors, power fusing, control circuit transformer, and controllers (as required) are to be mounted inside the control panel for easy access and servicing.

**Testing:** Coils shall be dielectrically tested at 1000 volts plus twice the rated voltage for one minute by the manufacturer.

**NEC and UL Requirements:** Heaters shall be constructed so that installation may be accomplished in accordance with the local authority and provisions of the National Electrical Code (NEC) for zero clearance. The complete unit shall be listed by Underwriters' Laboratories, Inc., bear the appropriate UL label, and comply with all applicable requirements of NEC.

**Capacity:** Heaters shall have KW, voltage ratings and staging as indicated in the schedule.

**Acceptable Manufacturers:** If it complies with these specifications, products manufactured by the following manufacturers will be acceptable: INDEECO, Qmark, Wattco.

## Part 3 - EXECUTION

**General:**The installation shall be in accordance with the manufacturer's Installation, Operating and Maintenance Instructions with regard to application, mechanical and electrical requirements. It shall be the responsibility of the contractor to carry out proper installation and guarantee operational status.

**Automatic temperature controls coordination:** The equipment provided for this project shall be in compliance with the automatic temperature control coordination requirements as described elsewhere in respective sections.

END OF SECTION 231832

## ELECTRIC DUCT HEATER SCHEDULE BARRINGTON TOWN OFFICES

TYPE NO.	EDH-1	EDH-2	EDH-3
ERV UNIT	1	2	3
HEATING CAPACITY (KW)	7.5	5	1.5
AIRFLOW (CFM)	1005	600	180
MAX APD (IN WC):	0.12	0.12	0.12
INSIDE DUCT DIMENSIONS (IN)	18x12	12x12	8x8
ARRANGEMENT	FLANGED DUCT COIL		
MANUFACTURER	INDEECO		
TYPE	QUZ		
STYLE	FLANGED		
ELECTRICAL (VOLTAGE/PHASE)	208/1		
CONTROL TYPE	SCR (MODULATING)		
CONTROL VOLTAGE	24		
STAGES	1		
ACCESSORIES	- DISCONNECT SWITCH, - MAGNETIC CONTACTOR, - MANUAL RESET THERMAL CUTOUT, - AIRFLOW SWITCH - SCR CONTROLLER (0-10 VDC INPUT) - FACTORY PROVIDED PROPORTIONAL CONTROL THERMOSTAT WITH REMOTE DUCT TEMPERATURE SENSOR.		

COORDINATE WITH SIZE OF DUCTWORK SHOWN ON PLANS AND CLEARANCES IN  
FIELD. CONFIRM THAT COIL WILL FIT BEFORE ORDERING.

## **SECTION 231835 - ELECTRIC RADIANT CEILING PANELS**

### **Part 1 – GENERAL**

#### **Reference Standards:**

National Electrical Code (NEC)  
Underwriters Laboratory, Inc. (UL)

### **Part 2 - PRODUCTS**

**Construction:** Radiant Panels shall be constructed of 22-gauge galvanized steel with a baked-on powder coat finish. Heating element shall be electrically insulated with a UL listed compound. Panel shall include two inches of mineral wool insulation and electrical junction box.

**Capacity:** Provide height, width, and capacity (wattage) as indicated in the schedule.

**Controls and Options:** Provide scheduled controls and accessories.

**NEC and UL Requirements:** The complete unit shall be listed by UL, bear the appropriate UL label, and comply with all applicable requirements of NEC.

**Warranty:** Provide minimum 1-year warranty.

**Acceptable Manufacturers:** Indeeco or equal.

### **Part 3 - EXECUTION**

**General:** The installation shall be in accordance with the manufacturer's Installation, Operating and Maintenance Instructions. It shall be the responsibility of the contractor to carry out proper installation and guarantee operational status.

**Automatic temperature controls coordination:** The equipment provided for this project shall be in compliance with the automatic temperature control requirements as described elsewhere.

**Electrical:** Single phase electrical as scheduled, direct wired connection, GFCI protection where installed near plumbing fixtures or otherwise required.

**END OF SECTION 231834** (Revised November 20, 2015)

**ELECTRIC RADIANT CEILING PANELS  
BARRINGTON TOWN OFFICES**

PLAN TYPE NO.	ERP-1
MANUFACTURER	INDEECO
MODEL	AS2424-375-208-TEGF-PT
CABINET	22-GAUGE GALVANIZED STEEL
HEIGHT	24"
WIDTH	24"
WEIGHT	15 LBS
ELECTRICAL RATING	
WATT	375
VOLTAGE	208V
AMPS	1.8

**REQUIRED OPTIONS**

FINELINE TEGULAR REVEAL EDGE FOR 9/16" GRID  
WHITE TEXTURED POWDER COAT FINISH

NOTE: MOUNT IN SUSPENDED CEILING.

## **SECTION 231846 - ENERGY RECOVERY UNITS - COMMERCIAL**

### **Part 1 - GENERAL**

**Submittals:** Submit product data on energy recovery units including operating efficiency at scheduled conditions, fan curves, motor efficiencies, sound data, coil selections, dimensioned drawings with all accessories, and actual weight.

**Electrical Requirements:** Confirm electrical characteristics, including voltage, phase, power requirements with Electrical Contractor before ordering equipment.

**Wiring:** Refer to Division-26 Sections for power supply wiring from power source to power connection on unit; not work of this section.

**ASHRAE Compliance:** Provide capacity ratings for energy recovery devices in accordance with ASHRAE 84 "Methods of Testing Air-to-Air Heat Exchangers." Design and construct, and install heat pipe heat exchangers in accordance with ASHRAE 15, "Safety Code for Mechanical Refrigeration".

**ARI Compliance:** Test and rate energy recovery units in accordance with ARI 1060 "Standard for Air-to-Air Heat Recovery Equipment".

**NRCA Compliance:** Provide roof curbs for roof mounted equipment constructed in accordance with recommendations of NRCA.

**NFPA Compliance:** Construct and install energy recovery units in accordance with NFPA 70 "National Electrical Code."

**C/UL Labels:** Construct units in accordance with CSA C22.2 and UL 1812. Provide C/UL label of approval.

### **Part 2 - PRODUCTS**

**General:** Provide as indicated, energy recovery units, factory-assembled and tested, of performance, electrical characteristics, and having accessories as scheduled. Include with basic unit: heat exchanger, supply and exhaust fans, high efficiency motors, adjustable drives, internal spring vibration isolation for fans, supply and return air filters, insulated housing, service access panels, condensate pan and drains, controls, electrical panel with starters and disconnects.

**Manufacturers:** As Scheduled. Units from manufacturers which are not specifically scheduled should be submitted for preliminary approval a minimum of 10 days before bids are due.

**Motor Starters and Disconnects:** Motor starters and disconnects are specified in Division 23 section, "Electrical Requirements for Mechanical Equipment."

## Part 3 - EXECUTION

**General:** Install energy recovery units where indicated, in accordance with equipment manufacturer's written instructions, and with recognized industry practices to ensure that units comply with requirements and serve intended purposes.

**Electrical Wiring:** Install electrical devices furnished by manufacturer but not specified to be factory-mounted. Furnish copy of manufacturer's wiring diagram submittal to Electrical Installer for power wiring. Verify that electrical wiring installation is in accordance with manufacturer's submittal and installation requirements. Do not proceed with equipment start-up until wiring installation is acceptable to equipment installer.

**Vibration Isolation (for units without internal spring isolators):** Install units with spring vibration isolators. Provide vibration isolators for all piping connections. Meet seismic requirements.

**Ductwork Connections:** Refer to Division-23 "Ductwork" sections. Provide flexible connections on inlet and outlet duct connections.

**Condensate:** Provide trapped condensate drain piping from unit to building drain system as indicated or required.

**Auxiliary Drain Pan:** Provide auxiliary drain pan with separate drain line under entire unit. Provide water detection device to alarm occupants in event of overflow from equipment drain pan into auxiliary drain pan.

**Service Access:** Provide 3'-0" minimum clearance from sides of unit for inspection and servicing.

**Electrical Clearances:** Provide required electrical clearances to unit electrical panel.

**Temporary Heat:** (When allowed.) Protect each return air grille with filtration media with a Minimum Efficiency Reporting Value (MERV) of 8 if energy recovery units must be used for temporary heating, ventilating or air conditioning during construction.

**Start-up:** Start-up energy recovery units, in accordance with manufacturer's start-up instructions. Test controls and demonstrate compliance with requirements. Replace damaged or malfunctioning controls and equipment. Provide services of manufacturer's technical representative for one-half day to instruct Owner's personnel in operation and maintenance of units. Schedule training with Owner; provide at least 7-day notice to Contractor and Engineer of training date.

Install new filters at completion of energy recovery unit work, and prior to testing, adjusting, and balancing work.

Vacuum clean units inside and out.

**Balancing:** Refer to Division-23 section "Testing, Adjusting, and Balancing" for balancing of energy recovery units; not work of this section. Provide pulleys, belts, and sheaves, as required for correct balance to balancing contractor at no additional cost to the Owner.

**Spare Parts:** Provide one complete extra set of filters for each filter bank in energy recovery units.  
Provide one spare set of belts for each belt driven fan in energy recovery unit.

**END OF SECTION 231846** (231846a)



# ENERGY RECOVERY UNIT SCHEDULE

## BARRINGTON TOWN HALL

PLAN NUMBER	ERV-1		ERV-2		ERV-3		ERV-4 (FUTURE)			
LOCATION	STORAGE 1		STORAGE 2		STORAGE 2		EXT. STORAGE			
AREA SERVED	OFFICES		TOWN MEETING		LOBBY AND TOILETS		EXTERIOR STORAGE			
MANUF.	RENEWAIRE		RENEWAIRE		RENEWAIRE		RENEWAIRE			
MODEL #	HE1.5XINV		HE1XINV		EV300		EV200			
SUPPLY										
CFM	1005		600		180		150			
ESP (IN W.C.)	0.75		0.75		0.5		0.5			
FILTER (MERV)	MERV-13		MERV-13		MERV-13		MERV-13			
EXHAUST										
CFM	1005		600		180		150			
ESP (IN W.C.)	0.5		0.5		0.5		0.5			
FILTER (MERV)	MERV-8		MERV-8		MERV-8		MERV-8			
PERF. DATA	WIN	SUM	WIN	SUM	WIN	SUM	WIN	SUM		
RETURN										
DB(F)	70.0	75.0	70.0	75.0	70.0	75.0	70.0	75.0		
RH (%)	35	50	35	50	35	50	35	50		
OUTSIDE AIR										
DB (F)	4	89	4	89	4	89	4	89		
RH (%)	44	45	44	45	44	45	44	45		
SUPPLY AIR										
DB(F)	51.1	79	52.3	78.8	55.1	78.2	56.3	77.9		
RH(%)	40	54	40	54	39	55	39	55		
SRE (%)	71	71	73	73	77	77	79	79		
LRE (%)	54	45	57	48	62	47	65	50		
TFE (%)	67	57	69	59	73	61	76	63		
ELECTRICAL										
V/P/H	208-230/60/1		208-230/60/1		120/60/1		120/60/1			
SUPPLY- HP	1.0 (W/ECM)		0.75 (W/ECM)		0.1		0.1			
SUPPLY - FLA	5.1-4.9		5.1-4.9		1.5		1.5			
EXHAUST - HP	1.0 (W/ECM)		0.75 (W/ECM)		0.1		0.1			
EXHAUST - FLA	5.1-4.9		5.1-4.9		1.5		1.5			
MCA (AMPS)	11.5		11.5							
MOPD (AMPS)	15		15							
UNIT										
L (IN)	33-5/8		20-5/8		23-7/8		23-7/8			
52	52		03/08/40		28-3/4		28-3/4			
H (IN)	46-1/4		49-1/8		20-1/8		20-1/8			
WT (LBS)	340		211		88		80			

FOR ALL: PROVIDE SINGLE POINT ELECTRICAL CONNECTION WITH DISCONNECT.

## **SECTION 231890 - METAL DUCTWORK AND ACCESSORIES**

### **Part 1 - GENERAL**

**General:** Ductwork shown on the drawings is schematic and shows the approximate location of ductwork and other equipment. The exact location will be governed by structural conditions, obstructions, and appearance. This is not to be construed so as to permit redesign of the ductwork system. No deviations from the layout will be made without approval from the Engineer. Do not order or fabricate ductwork prior to coordinating exact location with the structural conditions and all other trades. No request for extra compensation will be considered for hardships encountered which would have been disclosed or made evident by a reasonable coordination of this work.

#### **Submittals:**

**Ductwork:** Submit ductwork Fabrication Shop Standards Manual indicating gauges, reinforcing, and similar information for ductwork, fittings, accessories, etc., for the required sizes and static pressure classes to fully demonstrate compliance with SMACNA "HVAC Duct Construction Standards, Metal and Flexible". The Manual shall be shop specific and submitted for review well in advance of sheet metal installation.

**Ductwork Cleanliness:** Submit construction specifications for ductwork cleanliness, referring to SMACNA "Duct Cleanliness for New Construction Guidelines". Include specifications for removal (internal wipe-down) of oil film from ductwork.

**Adhesives and Sealants:** Submit product information for adhesives and sealants including MSDS and VOC limits and manufacturing location.

**Qualifications:** Firms regularly engaged in manufacture of metal ductwork, products and accessories of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

**NFPA Compliance:** Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems", NFPA 90B "Standard for the Installation of Warm Air Heating and Air Conditioning Systems", and NFPA 96 "Standard for Ventilation Control and Fire Protection of Commercial Cooking Operations".

**SMACNA Compliance:** Comply with SMACNA "HVAC Duct Construction Standards, Metal and Flexible". Comply with SMACNA "IAQ Guidelines for Occupied Buildings Under Construction." Comply with SMACNA "Duct Cleanliness for New Construction Guidelines".

**UL Compliance:** Construct, test, and label fire dampers in accordance with UL Standard 555 and 555S, "Fire Dampers and Ceiling Dampers", latest edition.

**IMC Compliance:** Comply with the currently enforced edition of the International Mechanical Code for fabrication of metal ductwork.

**AMCA Compliance:** Test and rate louvers in accordance with AMCA 500, "Test Method for Louvers, Dampers and Shutters".

**Delivery, Storage, And Handling:** Store ductwork and accessories inside, above grade, and enclose with waterproof wrapping.

## **Part 2 - PRODUCTS**

**Sheet Metal Materials, General:** Provide the following materials where indicated. Package and mark sheet metal materials as specified in ASTM A 700.

Galvanized Sheet Steel: Lock-forming quality, ASTM A 924, with G60 zinc coating for interior, dry duct and G90 zinc coating for exterior ducts and any ductwork susceptible to moisture, in accordance with ASTM A 653. Provide mill phosphatized finish for exposed surfaces of ducts exposed to view.

Provide suitable "paint-grip" coating for ductwork that will be painted.

Carbon Steel Sheets: ASTM A 366, cold-rolled sheets, commercial quality, with oiled, exposed matte finish.

Stainless Steel: ASTM A 480, Type 316, sheet form, with No. 4 finish on exposed surface for ducts exposed to view; Type 304, sheet form, with No. 1 finish for concealed ducts.

Aluminum: Alloy 3003-H14.

**Reinforcement Shapes and Plates:** Unless otherwise indicated, provide galvanized steel reinforcing where installed on galvanized sheet metal ducts. For aluminum and stainless steel ducts provide reinforcing of compatible materials.

**Tie Rods:** Galvanized steel, 1/4 inch minimum diameter for 36-inch length or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

**Joint and Seam Sealant and Flanged Joint Mastics:** Non-toxic, water based adhesive-sealant. Equal to United Duct Sealer (Water Based), United McGill Corp.; or Flex Grip, Hardcast. Provide duct sealant specifically designed for flanged duct connections of continuous butyl rubber extrusion, equal to Hardcast Flange Grip #1902-FR.

Total volatile organic compounds (VOCs) shall not exceed the limits of SCAQMD Rule #1168

**Fire-Stopping:** Refer to Division 23 Section "Basic Materials and Methods."

**Rectangular Duct and Fitting Fabrication:** Except as otherwise indicated, fabricate rectangular ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards" Conform to the requirements in the referenced standard for metal thickness, reinforcing types and intervals, tie rod applications, and joint types and intervals. **Minimum duct gage is 24.**

**Do not exceed 2:1 aspect ratio except in extraordinary conditions, this ratio may be extended to 2.5:1.**

Cross break or bead duct sides that are 11" and larger and are 20 gauge or less, with more than 4 sq. ft. of unbraced panel area, as indicated in SMACNA "HVAC Metal Duct Construction Standard", Figure 1-8, regardless if insulated.

Fabricate elbows, transitions, offsets, branch connections, and other duct construction in accordance with SMACNA "HVAC Metal Duct Construction Standard (2006)", Figures 4-1 through 4-9, with the following modifications:

Figure 4-2: Type RE1 – Square throat is not permitted. Types RE4, 6, 7, 8, 9, & 10 are not permitted.

Figure 4-3: Use single thickness vanes with 4-1/2" minimum trailing ends, SP=1-1/2".

Figure 4-7: Offset types 1 & 2 are not allowed. Minimum bell mouth radius shall be 1-1/2".

Figure 4-8: Figures A & C are not allowed.

Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.

Button punch snap lock (figure 2-2, type L-2) and internal standing seam joints are not allowed.

**Round Duct Fabrication:** Except as otherwise indicated, fabricate round ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards." Conform to the requirements in the referenced standard for metal thickness and joint types. Modify the tables and figures as follows:

Table 3-1: All elbows, regardless of duct velocity, shall be 1-1/2" radius to duct diameter.

Figure 3-2: Seam types RL-3, 6A, 6B, 7, are not allowed.

Figure 3-4: Adjustable elbows are not allowed.

Figure 3-5: Non lateral taps may be used only where spatial conditions do not allow lateral taps.

Figure 3-6: Replace the transition length formula listed ( $L_2=A-B$ ) with the following: Limit angular tapers to 30° for contracting tapers and 20° for expanding tapers.

**Minimum duct gauge is 24.** Fittings shall be one gauge heavier than the duct size requirement, 22 gage minimum.

**Aluminum Round Duct Fabrication:** Except as otherwise indicated, fabricate round ducts with galvanized sheet steel, in accordance with SMACNA "HVAC Duct Construction Standards." Conform to the requirements in the referenced standard for metal thickness and joint types. **Minimum duct gage is 032".**

**Spiral Round and Flat Oval Duct Fabrication:** "Basic Round Diameter" as used in this article is the diameter of the size of round duct that has a circumference equal to the perimeter of a given sized of flat oval duct. Except where interrupted by fittings, provide round and flat oval ducts in lengths not less than 12 feet.

**Spiral Round Ducts:** Where indicated on drawings fabricate round supply ducts with spiral lockseam construction, except where diameters exceed 72 inches with longitudinal butt-welded seams. Comply with SMACNA "HVAC Duct Construction Standards," Table 3-2 for galvanized steel gauges. **Minimum duct gage is 24.**

Flat Oval Ducts: Fabricate flat oval supply ducts with standard spiral lockseams (without intermediate ribs) or with butt-welded longitudinal seams in gauges listed in SMACNA "HVAC Duct Construction Standards," Table 3-4.

**Manufacturers:** United McGill Corp.; Lindab, Inc.; SEMCO, Inc.

**Kitchen Hood Exhaust Ducts:** Fabricate kitchen hood exhaust ducts with not less than 16-gauge, carbon steel sheets for concealed ducts and 18-gauge stainless steels for exposed ducts. Weld and flange seams and joints. Conform to NFPA Standard 96. Conform to local code requirements where more stringent.

**Dishwasher Hood Exhaust Ducts:** Fabricate dishwasher hood exhaust ducts with 18-gauge stainless steels. Weld and flange seams and joints.

**Flexible Ducts:** As scheduled.

**Acoustic Flexible Ducts:** As scheduled.

**Acoustic Flexible Ducts - Medical Grade:** As scheduled.

**Underground Ductwork and Fittings:** Equal to AQC Industries AKDuct "Blue Duct". Provide HDPE, food grade, closed cell plastic recycled material with no VOC, conforming to ASTM-D2412. Provide integrally insulated ductwork and fittings with R-10 insulating value without the use of external or internal insulation. Fiberglass or PVC coated galvanized steel is not acceptable.

Manufacturer: AQC Industries.

**Hangers and Supports:** Fabricate hangers and supports in accordance with SMACNA "HVAC Duct Construction Standards", Figure 4-4, modified as follows:

Wire is not allowed to be used as a hanger support. Provide hangers as detailed for exposed ductwork.

Use powder actuated fasteners only when specifically allowed. Do not use powder actuated concrete fasteners for lightweight aggregate concretes or for slabs less than 4 inches thick.

**Stainless Steel Ductwork:** For stainless steel ducts, provide stainless steel hanger and support materials.

**Hangers Installed In Corrosive Atmospheres:** Electro-galvanized, all-thread rod or hot-dipped-galvanized rods with threads painted after installation.

**Motor Dampers:** Provide motor dampers, of types and sizes indicated. In all cases damper actuators are furnished and installed by the ATC contractor. Provide galvanized steel control dampers with parallel blades for two position control, opposed blades for modulating control. Coordinate damper shaft with ATC Contractor. Provide position indicator (score on the exposed end of the damper shaft) for all dampers.

**Low Pressure Manual Balancing Dampers:** Provide balancing dampers of type and size as scheduled.

**Counterbalanced Relief and Backdraft Dampers:** Provide dampers of type and size indicated.

**Fire Dampers:** Provide fire dampers, of types and sizes indicated. Provide fusible link rated at 212°F unless otherwise indicated. Curtain must be completely out of the air stream when damper is open. All dampers must be dynamic rated for design class of the duct system and the air velocity.

**Smoke Dampers:** Provide smoke dampers of types and sizes indicated. Coordinate actuator voltage with Electrical Installer.

**Fire/Smoke Dampers:** Provide fire/smoke dampers in types and sizes indicated. Provide reuseable UL listed electric link/mechanical lock rated at 212°F unless otherwise indicated. Provide link activated by either a signal from the fire alarm system or excessive duct ambient temperature.

**Manufacturers of Fire, Smoke, and Fire/Smoke Dampers:** Prefco, Nailor, Greenheck.

**Smoke Vents:** Provide smoke vents with double-wall insulated construction, insulated curb, spring assembly with telescopic tubes, motor assembly, control switch, McCabe fusible link, and powder coat finish, complying with smoke vent schedule.

**Manufacturers:** Nystrom,

**Duct Access Doors:** Provide where indicated or required for servicing equipment. Provide insulated doors for insulated ductwork. Provide one size hinged, other side with latching devices per SMACNA "HVAC Metal Duct Construction Standard"; "Duct Access Doors and Panels".

Provide door size 2" less than duct size x 16" for duct size less than 20".

Provide door size 18" x 18" for duct size greater than 20".

**Manufacturers:** Air Balance; Duro Dyne; Register & Grille; Ruskin; Ventfabrics; or Zurn Industries.

**Flexible Connections:** Provide LEED certified flexible duct connections wherever ductwork connects to vibration isolated equipment. Construct flexible connections, serviceable from -40F to 250F, of recycled Polyester base materials, flameproof fabric, crimped into duct flanges for attachment to duct and equipment.

**Manufacturers:** American/Elgen; Duro Dyne; Flexaust; or Ventfabrics.

**Ceiling Diffusers, Registers and Grilles:** Provide ceiling air diffusers, registers, and grilles that have, as minimum, throw, drop, pressure, and noise criteria ratings for each size device as listed in manufacturer's current data. Provide border styles compatible with adjacent wall and ceiling systems.

**Manufacturers:** Metalaire, Titus, Krueger, Price.

**Louvers:** Provide louvers that have minimum free area, and maximum pressure drop for each type as listed in manufacturer's current data, complying with louver schedule.

Provide louvers with frame and sill styles that are compatible with adjacent substrate, and that are specifically manufactured to fit into construction openings with accurate fit and adequate support, for weatherproof installation. Refer to general construction drawings and specifications for types of substrate which will contain each type of louver.

Provide 1/2" square mesh anodized aluminum wire bird screens on inside face of exterior louvers.

**Manufacturers:** Greenheck.

## **Part 3 - EXECUTION**

**General:** Install ducts in accordance with the following criteria:

Install ducts with the fewest possible joints.

Use fabricated fittings for all changes in directions, changes in size and shape, and connections. Locate ducts, except as otherwise indicated, vertically and horizontally, parallel and perpendicular to building lines; avoid diagonal runs. Install duct systems in shortest route that does not obstruct useable space or block access for servicing building and its equipment. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

Install insulated ducts with 1-inch clearance outside of insulation.

Conceal ducts from view in finished and occupied spaces by locating in mechanical shafts, hollow wall construction, or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown.

**Electrical Equipment Spaces:** Route ductwork to avoid passing through transformer vaults and electrical equipment spaces and enclosures.

**Hanging and Supporting:** Install as indicated in SMACNA "HVAC Duct Construction Standards."

**Protection:** Protect as indicated in SMACNA "Duct Cleanliness for New Construction Guidelines", Intermediate Level, or as scheduled or noted otherwise. Protect ductwork during construction in accordance with SMACNA "IAQ Guidelines for Occupied Buildings Under Construction."

Seal ductwork during transport and storage.

Provide storage area that is clean, dry and minimize exposure to dust.

Provide working area that is clean, dry and protected from the elements.

Wipe down internal surfaces of ductwork immediately prior to installation.

Seal open ends of completed and in-progress ductwork.

**Duct System Pressure Class:** Construct and install each duct system for the specific duct pressure classification indicated; if not indicated use the 2 inch water gauge pressure classification.

Static Pressure Classifications:

Construct low pressure duct systems to the 2 inch water gauge pressure classifications (variable volume duct upstream of VAV boxes is 2 inches water gauge pressure class).

Construct medium pressure duct systems to the 5 inch water gauge pressure classifications.

**Leakage Class:** Where ducts are scheduled to be leak tested in specifications Section 231990, "Testing, Adjusting and Balancing", construct ductwork to ASHRAE Leakage Class 3 (3 cfm/100 ft<sup>2</sup>) standards.

**Seal Class:** Where ductwork is not scheduled to be leak tested, seal all ductwork to SMACNA Seal Class A (all transverse joints, longitudinal seams and duct wall penetrations), regardless of pressure class.

**Installation of Flexible Ducts:** For any duct run using flexible ductwork, do not exceed 6'-0" extended length. Install in accordance with SMACNA, "HVAC Duct Construction Standards". Install insulated type flexible ducts in all supply air ductwork with temperature differences to the surrounding areas >10°F, non-insulated or insulated type flexible ducts with temperature differences <10°F and in return air systems. Attach flexible duct to metal duct and end terminals with drawbands on both the inner sleeve and the outer jacket.

Flexible ductwork may be used to make corrections for minor misalignments of metal duct connections to diffusers. The angle of adjustment shall not exceed 30°. Flexible duct shall not be used to make sharp turns or any other configuration that compromises the net free area of the duct.

Support Flexible ducts at maximum 4 feet on center by 26 gage x 1-1/2" galvanized straps, unless otherwise required by manufacturer's field installation instructions.

**Kitchen Hood Exhaust Duct Installations:** Provide 18 in. minimum clearance from kitchen hood and exhaust ductwork to combustible material except where material is protected in a manner satisfactory to the authority having jurisdiction. Install without dips or traps that may collect residues, except where traps have continuous or automatic residue removal. Install access openings at each change in direction and at 12-foot intervals. Locate on sides of duct 1-1/2 inches minimum from bottom, and fit with grease-tight covers of same material as duct. Do not penetrate fire-rated assemblies.

Provide 18 in. minimum clearance to the interior surfaces of combustible chases and 6 in. minimum clearance to the interior surfaces of noncombustible or limited-combustible chases. Minimum clearances cannot be reduced.

Notify engineer before installation of kitchen exhaust ductwork where minimum clearances cannot be maintained and suitable protection has not been shown or specified.

**Dishwasher Exhaust Duct Installations:** Install dishwasher exhaust duct systems in accordance with SMACNA "HVAC Duct Construction Standards". Provide welded stainless steel ductwork, pitched back to hood to drain.



**Underground Ductwork Installation:** Install underground ductwork in accordance with manufacturer's instructions. Use manufacturer's sealant caulk. Provide bedding of sand or light aggregate, backfill with pea gravel, sand, or excavated material if equivalent. Allow 24 hours for sealants to cure, then pressure test ductwork according to manufacturer's instructions before final connections to equipment.

**Installation of Ductwork Accessories:** Install ductwork accessories in accordance with manufacturer's installation instructions, with applicable portions of details of construction as shown in SMACNA standards, and in accordance with recognized industry practices to ensure that products serve intended function.

**Balancing Dampers:** Install balancing dampers at every duct branch on both supply and return ductwork (whether or not specifically indicated on drawings) for all ductwork systems except high-velocity VAV.

**Control Dampers:** Install control dampers in ductwork as noted on drawings.

**Damper Shafts:** Score all damper shafts at end to indicate damper position. Applicable for all dampers in all equipment.

**Fire Dampers:** Install fusible links in fire dampers and adjust for proper action. Fire dampers require a wall opening clearance to allow for expansion of dampers during a fire, refer to manufacturers installation instructions for clearances required.

**Duct Smoke Detectors:** Mount duct smoke detectors furnished by fire alarm system supplier in main air ducts of air handling units and elsewhere as noted in fire alarm system specifications and drawings.

**The 2012 International Mechanical Code requires smoke detectors be located in the return air duct or plenum upstream of any filters for air systems with capacities greater than 2000 cfm; NFPA 90A (2009) requires the smoke detectors be located in the supply duct downstream of the air handler for capacities greater than 2000 cfm. Coordinate exact locations with the Authority having Jurisdiction.**

**Smoke Vents:** Coordinate with other trades for installation in roof where shown, and connection to fire alarm system, and control power.

**Access Doors:** Install access doors at all fire dampers, smoke dampers, motor dampers, humidifiers, both sides of coils, and other devices requiring access.

**Air Inlets and Outlets:** Install air outlets and inlets in accordance with manufacturer's written instructions and in accordance with recognized industry practices to ensure that products serve intended functions. Locate ceiling air diffusers, registers, and grilles, as indicated on general construction "Reflected Ceiling Plans" and "Interior Elevations". Unless otherwise indicated, locate units in center of acoustical ceiling modules. Paint portions of ductwork visible through air inlets and outlets flat black.

Where flexible duct run outs are perpendicular to the outlet of the diffuser, use either a rigid full radius elbow, diffuser box, or flexible duct with elbow support at the diffuser connection.

**Louver Installation:** Pitch bottom of duct toward louver to allow drainage. Seal duct watertight. Caulk perimeter of louver to building. Provide access as required to service or clean louver screens and dampers.

**Temporary Heat:** Protect all intake and return/exhaust openings with filtration media when used for temporary heating, ventilating, or air conditioning during construction (when allowed). Provide filtration media with a Minimum Efficiency Reporting Value (MERV) of at least 8 (as determined by ASHRAE 52.2-1999) at each return grille. Replace all filtration media immediately prior to occupancy.

**END OF SECTION 231890**

## **FLEXIBLE DUCT SCHEDULE BARRINGTON TOWN OFFICES**

TYPE	ACOUSTICAL INSULATED FLEXIBLE DUCT
MANUF.	FLEXMASTER USA
MODEL	TYPE 6M
LINER	SPUNBOND NYLON FABRIC
HELIX	GALVANIZED STEEL
INSULATION	FIBERGLASS
R-VALUE	R-5
JACKET	REINFORCED METALIZED VAPOR BARRIER

USE TITUS FLEXRIGHT OR THERMAFLEX FLEXFLOW ELBOWS FOR ALL  
90 DEGREE BENDS.

## SPIRAL DUCT SCHEDULE BARRINGTON TOWN OFFICES

LOCATION	EXPOSED	CONCEALED
MATERIAL	PAINT-GRIP	GALVANIZED
SHELL	SPIRAL LOCKSEAM WITH STANDING RIB	SPIRAL LOCKSEAM
WALL	SINGLE	SINGLE
NOTES	STANDARD GRADE	STANDARD GRADE

\*SEAL TO SEAL CLASS A REQUIREMENTS. USE WATER BASED SEALANT APPLIED TO RAMP COUPLED JOINTS ½ INCH FROM END. LINDAB GASKETS SEALS ARE ACCEPTABLE

## **MOTOR, BALANCING AND RELIEF DAMPER SCHEDULE BARRINGTON TOWN OFFICES**

### **MOTOR DAMPERS**

TYPE	INSULATED, ULTRA LOW LEAK, THERMALLY BROKEN BLADES
CLASS	1A
MANUF.	GREENHECK
MODEL	ICD-44
LEAKAGE	1.5 CFM/SF AT 1" W.G. (24x24 DAMPER)
OPTIONS	FLANGES, LOUVER/DAMPER SLEEVE, TRANSITIONS
NOTE:	MIN SIZE - 12x12 (INTERNAL MOUNT)
EQUALS:	RUSKIN CTDI-50, CTDI-50BF, TAMCO 9000BF

DAMPER SUBMITTAL SHALL SHOW LEAKAGE RATE FOR EACH DAMPER.

**DAMPER MOTOR BY ATC CONTRACTOR, COORDINATE SHAFT.**

**REFER TO CONTROL SPECIFICATION SECTIONS FOR MOTOR DAMPERS NOT SCHEDULED WITH EQUIPMENT.**

### **BALANCING DAMPERS**

RECTANGULAR	GREENHECK VCD-20 WITH BRONZE OR SS BEARINGS (6"x6" MINIMUM SIZE) DURO DYNE SPECLINE REGULATORS
ROUND	GREENHECK VCDR-50 WITH BRONZE OR SS BEARINGS (4" MINIMUM SIZE) DURO DYNE SPECLINE REGULATORS

RAPIT DAMPER REGULATORS AND JIFFY DAMPERS NOT ACCEPTABLE.

SCORE SHAFT TO INDICATE DAMPER POSITION.

DAMPERS PROVIDED WITH PREFABRICATED TAKE-OFFS MUST MEET ABOVE REQUIREMENTS

## **DYNAMIC FIRE DAMPER SCHEDULE BARRINGTON TOWN OFFICES**

RECTANGULAR	-	GREENHECK DFD-210 MULTI-BLADE
ROUND	-	GREENHECK DFDR-510

FUSIBLE LINK	-	212F
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ACCESSORIES	-	TRANSITIONS AS REQUIRED
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DUCT ACCESS DOOR-	PROVIDE ACCESS DOOR IN DUCT AT ALL FIRE DAMPERS. EXCEPT WHERE ACCESS IS AVAILABLE THROUGH GRILLES.
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FIRE DAMPERS REQUIRE A WALL OPENING CLEARANCE TO ALLOW FOR EXPANSION OF DAMPERS DURING A FIRE, REFER TO MANUFACTURERS INSTALLATION INSTRUCTIONS FOR CLEARANCES REQUIRED.

**NOTE: REFER TO SPECIFICATIONS SECTION, “BASIC MATERIALS AND METHODS” FOR ACCESS DOORS REQUIRED TO ACCESS DUCT ACCESS DOORS.**

# **DIFFUSER, REGISTER, AND GRILLE SCHEDULE BARRINGTON TOWN OFFICES**

PLAN NO.	S-1	S-2
MANUF.	PRICE	PRICE
MODEL	AMDE	620
FACE	SQ	D-D
DAMPER	O-B	O-B
MATERIAL	AL	AL
FINISH	W-PC	W-PC
NOTES	LAY-IN	LAY-IN

PLAN NO.	R-1	R-2	R-3
MANUF.	PRICE	PRICE	PRICE
MODEL	81	630 DAL	81
FACE	E-C	H	E-C
DAMPER	---	O-B	---
MATERIAL	AL	AL	AL
FINISH	W-PC	W-PC	W-PC
NOTES	LAY-IN	LAY-IN	CUT-IN

PLAN NO.	DG/FD	DG
MANUF.	A-J MANUFACTURING	PRICE
MODEL	1900	ATG 1
FACE	H	H
DAMPER	1.5 HR FIRE	NONE
MATERIAL	STL	AL
FINISH	DARK BRONZE	AL-PC
NOTES		

## DIFFUSER, REGISTER, AND GRILLE KEY

U/C	-	UNDERCUT (3/4")
DG	-	DOOR GRILLE
DG/FD	-	DOOR GRILLE W/ FIRE DAMPER
DG/LP	-	DOOR GRILLE (LIGHT PROOF)

NOTE: REFER TO DOOR SCHEDULE FOR COORDINATION OF UNDERCUTS AND DOOR GRILLES. **PROVIDE IF NOT PROVIDED WITH DOORS, COORDINATE WITH GC FOR CUTTING INTO EXISTING DOORS.**

### PLAN NO.:

S	-	SUPPLY DIFFUSER, REGISTER, GRILLE
R	-	RETURN (OR EXHAUST) DIFFUSER, REGISTER, GRILLE
T	-	TRANSFER GRILLE

### FACE:

SQ	-	SQUARE (OR RECTANGULAR)
H	-	HORIZONTAL FACE BARS
V	-	VERTICAL FACE BARS
PRF	-	PERFORATED
E-C	-	EGG CRATE
D-D	-	DOUBLE DEFLECTION
RND	-	ROUND

### DAMPER:

O-B	-	OPPOSED BLADE
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### MATERIAL:

AL	-	ALUMINUM
ST	-	STEEL
G-STL	-	GALVANIZED STEEL

### FINISH:

W-E	-	WHITE ENAMEL
W-PC	-	WHITE POWDER COAT
A-A	-	ANODIZED ALUMINUM
AL	-	ALUMINUM PAINT
G-STL	-	GALVANIZED STEEL



## LOUVER SCHEDULE BARRINGTON TOWN OFFICES

PLAN NO.	WL-1,2
MANUF. (ALL)	GREENHECK
MODEL NO.	EGH-501
TYPE	WIND DRIVEN RAIN RESISTANT
SIZE WxH	42x30
DEPTH (ALL)	5"
CFM	1785
FREE AREA (SF)	3.37
FA VEL - FPM	530
SP - - "H20	.04, .05
MATERIAL (ALL)	EXTRUDED ALUMINUM
DAMPER	ICD-44
FINISH(ALL)	FLUOROCARBON (KYNAR) FINISH STANDARD COLOR BY ARCHITECT
ACCESS.(ALL)	BIRD SCREEN FLANGE AS REQUIRED

PLAN NO.	WL-3,4
MANUF. (ALL)	GREENHECK
MODEL NO.	EGH-501
TYPE	WIND DRIVEN RAIN RESISTANT
SIZE WxH	36x8
DEPTH (ALL)	5"
CFM	150
FREE AREA (SF)	.2
FA VEL - FPM	646
SP - - "H20	0.06
MATERIAL (ALL)	EXTRUDED ALUMINUM
DAMPER	
FINISH(ALL)	FLUOROCARBON (KYNAR) FINISH STANDARD COLOR BY ARCHITECT
ACCESS.(ALL)	BIRD SCREEN FLANGE AS REQUIRED

CONFIRM EXACT SIZE, COLOR AND LOCATION WITH ARCHITECT BEFORE ORDERING.

DAMPER MOTOR BY ATC CONTRACTOR, COORDINATE SHAFT.

REFER TO DAMPER SCHEDULE 231910-S FOR LEAKAGE RATING.

## **SECTION 231920 - SOUND ATTENUATORS**

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### **Part 1 - GENERAL**

**Submittals:** Submit product data on sound attenuators including performance data, and dimensions.

**NFPA Compliance:** Construct sound attenuators using acoustical fill complying with NFPA 90A, "Air Conditioning and Ventilating Systems."

**ASTM Compliance:** Comply with applicable requirements of ASTM E477.

### **Part 2 - PRODUCTS**

**General:** Provide factory-fabricated and tested duct silencers as indicated, select with acoustic performance characteristics which match, or exceed those indicated on schedule. Select with static pressure loss equal to or less than that scheduled.

**Protection of Airstream:** No exposed (or coated) fiberglass allowed in airstream.

**Manufacturers:** Vibro Acoustics, Industrial Acoustics Company, Price

### **Part 3 - EXECUTION**

**General:** Install sound attenuators as indicated, and in accordance with manufacturer's installation instructions.

**Location:** Install each unit level and accurately in position indicated in relation to other work; and maintain sufficient clearance for normal service and maintenance, but in no case less than that recommended by manufacturer.

**Duct Connections:** Connect ductwork to sound attenuators in accordance with Division-23 ductwork sections.

**Testing:** Upon completion of installation and prior to initial operation, test and demonstrate that sound attenuators, and duct connections to sound attenuators, are leak tight. Repair or replace sound attenuators and duct connections as required to eliminate leaks, and retest to demonstrate compliance.

**END OF SECTION 231920**

## SOUND ATTENUATOR SCHEDULE BARRINGTON TOWN OFFICES

PLAN NO.	ST-1,2	
MANUFACTURER	PRICE	
MODEL NO.	RLT36/1D	
ACOUSTIC RATINGS - DB		
RATING VELOCITY - FPM	750	
	DIL	SN
1 62.5	3	44
2 125	6	24
3 250	14	29
4 500	26	35
5 1000	32	35
6 2000	28	33
7 4000	20	25
8 8000	15	18
CFM	1005, 600	
DIMENSIONS-"Wx"Hx"L	18x12x36, 12x12x36,	
FPM	670, 600	
S.P.-"W.G.	0.11, .09	
WT-LBS.	---	
CASING - GA	22	
FILL	FIBERGLASS	
LINING	TEDLAR	

# **SECTION 231972 - ELECTRIC CONTROL SYSTEM**

---

## **Part 1 - GENERAL**

### **Submittals, Change Orders, and Description of Work**

**Submittals:** Provide complete submittal information with detail sufficient for evaluation of compliance with the Contract Documents. Submit on all significant products including all applicable products listed in the Control System Schedule. Note additional specific submittal requirements throughout this Section. *Provide complete submittal package at one time, and review in person with Engineer, or remotely via an internet virtual meeting initiated by Engineer.*

**Description of Control System Work:** Provide an electric control system to accomplish all control sequences as specified. Actuation of the controller's associated devices such as dampers and control valves shall be accomplished electrically. All necessary controls and wiring for a complete operating system must be provided.

### **Standards**

**Electrical Standards:** Provide electrical products that have been tested, listed, and labeled by UL. Comply with NEMA standards pertaining to components and devices for electric control systems. Comply with FCC requirements.

**NFPA Compliance:** Comply with NFPA 90A "Standard for the Installation of Air Conditioning and Ventilating Systems" where applicable to controls and control sequences.

**Accessibility Guidelines:** Comply with the "Americans with Disabilities Act" (ADA) of 1990, and mount all controls designed for occupant use in accordance with the Act.

### **Electrical Requirements and Coordination With Electrical Contractor**

**General:** Install electrical components and use electrical products complying with the Electrical Division.

**Control Wiring:** Line and low voltage control wiring required for the Automatic Temperature Control (ATC) control system and/or any mechanical equipment, that is not shown on electrical drawings, shall be provided by the ATC Contractor. ATC Contractor is responsible for wiring any control devices, remote or otherwise, that may be furnished with any mechanical equipment but are not factory-installed. Coordinate these wiring requirements with the manufacturer supplying this equipment.

**Room Thermostat and Actuator Wiring:** Provide minimum 4-wire cable to each room sensor and to each actuator, even though all wires may not be currently used. Provide more than four wires if needed or specified elsewhere.

**Line Voltage Wiring:** All line voltage wiring, and low voltage wiring where required by local authority, shall be installed by a licensed electrician.

**ATC Power Wiring:** Power wiring and all required disconnects and transformers for all control panels, controls, and devices shall be by ATC Contractor. Power source for remotely-located control

transformers or devices shall originate from local control panels or from equipment being served, and is by ATC Contractor (Electrical Contractor provides circuit at power panel).

**EC Power Wiring:** Power wiring for all mechanical equipment will be provided by the Electrical Contractor (EC). Power panel circuits and circuit breakers shall be provided by the Electrical Contractor. Boiler room emergency (red) shut-off switch is provided by the Electrical Contractor.

## **Coordination With Mechanical Contractor:**

**Cooperation:** The Mechanical Contractor (MC) shall provide size coordination of valve and damper schedules furnished by the ATC Contractor; mechanical equipment submittal data as required by ATC Contractor; a copy of the Maintenance Chart; and receipt, storage, and handling of valves and dampers at the job site.

**ATC-Furnished Items:** Except as noted otherwise, the Mechanical Contractor (MC) shall install the following equipment furnished by the ATC Contractor:

- control valves,
- motor-operated dampers not scheduled in other Division 23 Sections,
- immersion wells,
- water flow switches.

**Piping:** The MC shall provide all pipe penetrations and provisions for installation of temperature sensors and pressure taps with isolation valves, for devices furnished by the ATC Contractor.

**Dampers:** The MC shall furnish and install all dampers that are scheduled in other Division 23 Sections. MC shall coordinate damper shaft with ATC Contractor. Motor-operated dampers shown on the Drawings but not scheduled shall be furnished by the ATC Contractor and installed by the MC. In all cases, damper actuators shall be furnished and installed by the ATC Contractor, except for two-position outside air damper actuators which may come with ERUs, FCUs or PTACs, and which are compatible with the ATC Contractor's controller.

**Duct Smoke Detectors:** Mechanical Contractor shall locate and install duct smoke detectors (furnished by Electrical Contractor) in main air ducts of air handling units and elsewhere as noted in mechanical or fire alarm system specifications and drawings.

**Speed Controls:** Speed controls furnished with mechanical equipment shall be mounted and wired by ATC Contractor.

**Variable Frequency Drives:** Supplied by MC, specified in Division 23 Section "Variable Frequency Drives." ATC Contractor provides control interfaces as specified elsewhere.

**Remote Buttons:** ATC Contractor shall install and wire remotely-located push buttons, switches, etc. required to operate MC-furnished devices such as solenoid-operated flush valves and gas valves, where such work is not shown on the Electrical Contract Documents. ATC Contractor shall provide all buttons, switches, wiring, transformers, solenoid actuators, etc. which are required but not indicated as being provided by MC or EC.

## Coordination With Owner

**Telephone Extension:** If required, the Owner will provide a telephone line to a single location for the modem/auto dialer. This line will be “analog” and will not be routed through a switchboard unless approved by ATC Contractor.

**Component Placement:** Coordinate with Owner the placement and protection of all user-accessible control components such as the Master Control Panel, room thermostats, modems, auto-dialers, manual reset controllers, and visual/audio alarms.

**Programming:** Provide initial programming/setting of all room temperature setpoints, time schedules, alarm points and messages, and auto-dialing parameters, as requested by Owner.

## Part 2 - PRODUCTS

**General:** Provide control products consisting of controllers, valves, dampers, sensors, thermostats, clocks, relays, and other components as required for complete installation. Except as otherwise indicated, provide manufacturer’s standard materials and components; designed and constructed as recommended by manufacturer, and as required for application indicated. Devices not specifically listed in this section, yet required by the Division 23 section “Sequence of Operation”, shall be provide as required, at no additional cost to Owner.

**Acceptable Manufacturers / Contractors:** Only the pre-qualified manufacturers / contractors listed in the Control System Schedule are acceptable for this project. See Division 23 Section “Basic Requirements,” paragraph “Manufacturers--Control Systems” for information on pre-qualification.

**Control Valves:** Provide valves selected for installation requirements, fluid (including glycol where specified), pressure class, and flow rate; and which mate and match material of connecting piping. *Valves shall have a fluid temperature rating of 212 °F.* Two-position valves shall be line size, or, with permission of Engineer, one size smaller than line size. Two-way valves shall have close-off pressure of at least 35 PSI. Select  $C_v$  for all modulating valves to produce a full-open pressure drop as close to 3 PSI as possible without exceeding 3.40 PSI, except do not go more than two pipe sizes smaller than line size. If available, set “software stops” to 2.0 PSI at “fully open” position. In submittal, list close-off and temperature ratings, GPM,  $C_v$  and PSI for all valves.

**Motor-Operated Dampers:** Provided by MC; see Division 23 Section “Metal Ductwork” or “Metal Ductwork and Accessories”. Coordinate damper shaft with MC to ensure compatibility with ATC contractor supplied damper actuator.

**Damper and Valve Actuators:** All actuators shall be designed for a minimum of 60,000 full torque cycles or five years’ operation, whichever is greater; and shall be electrically operated by a controller. Where specified, the “spring-return” function must be satisfied by an actual mechanical spring. Size each actuator to operate dampers or valves with sufficient reserve power to provide smooth operation. Provide modulating or two-position action as specified. Heat motor type actuators are not allowed. “Beer can” actuators are not allowed.

**Room Thermostats:** Provide tamper-proof thermostats or clear plastic locking guards with two keys for ALL locations except private residence rooms; coordinate with Owner. Where cooling is provided, provide separate heating and cooling setpoints with overlap prevented. Room thermostats shall not

contain mercury. Provide one sample of each room thermostat to Engineer if any alternate brands are proposed, prior to bid.

**Remote-Bulb Thermostats:** Provide remote-bulb thermostats of on-off or modulating type, as required by sequence of operation. Provide settings where applicable, which are clearly visible and adjustable from front of instrument. Unit shall not contain mercury.

**Low-Temperature Protection Thermostats:** Provide low-temperature protection thermostats of auto reset and adjustable setpoint type, with sensing elements 20 feet in length, which respond to the coldest one-foot length.

**Humidistats/Dehumidistats:** Capacitive type sensor, ASTM E104.85 calibration,  $\pm 3\%$  accuracy @ 0-90% RH, interchangeable and replaceable sensor element.

**Carbon Dioxide Sensors/Controllers For Room Air:** *Requirements: (1) range 0-2000 ppm; (2) infrared technology; (3) accuracy at 1000 ppm and 77 °F shall be  $\pm 100$  ppm or better, including air pressure dependence; (4) published recommended calibration interval of five years or more (which can rely on a "self-calibration" algorithm); (5) for wall mounting; (6) with no digital display of ppm visible with cover in place, (7) with contact closure SPST relay output with adjustable setpoint, if required by control system schedule or sequence of operation. If so, provide 950 ppm setpoint and  $\pm 50$  ppm differential. At Contractor's option, this same unit may include sensing of room temperature and/or room RH, if specified, but only if the unit is configured so that CO2 reading is NEVER displayed to the building occupants.*

*Type: Relay Output. Approved Models with SPST relay output: Honeywell C7232A1032 or equal approved by Engineer prior to bid.*

*Type: Analog Output. Approved Models WITHOUT SPST relay output: AirTest TR9000 series; Greystone CDD1A; Telsaire Ventostat® 8000 Series "Precision Grade" or "Commercial Grade" products; or equal approved by Engineer prior to bid.*

*Not acceptable: Digital Control Systems AirSense Model 310 (accuracy  $\pm 75$  ppm, five-year drift less than  $\pm 375$  ppm); and Vulcain 90DM3A-SM (uses the Telsaire Ventostat® "Commercial Grade" Model 6004 OEM detector without self-calibration).*

**Control Devices Mounted In Outside Air:** These devices shall not have exposed PVC.

**Time Switches:** Seven-day programmable electronic time switch. Time switch shall have: automatic daylight savings time adjustment, minimum 48-hour carryover in case of power failure, large LCD display, simple keypad, holiday programming, locking NEMA-1 enclosure at least 7x4x3 inches (*but not exceeding 4 inches in depth*), number of channels as indicated, and an integral function of allowing manual override for the current time period. Paragon, Tork, or equal; Grasslin not allowed.

**Push button Switches:** All switches shall be ADA compliant. Provide extended style for all applications, except mushroom style for emergency gas shut-off switches.

**Control Panels:** Provide master and local control panel enclosures of fully enclosed steel cubical type, with locking doors. Unless not required by the appropriate administrative authority, all enclosures containing two or more electrical devices are assemblies that require approval and labeling by an

approved independent third party testing company (such as UL). The Contractor shall be responsible for all costs associated with obtaining all required assembly approval and labeling.

**Transformers:** If possible, transformers shall be made in USA, such as many models available from Functional Devices.

## Part 3 - EXECUTION

### General

**Installers:** Installers shall be factory-trained and certified to install, commission and service the system supplied for this project. Qualified electricians can be used for the electrical installation portions of the work. See Part I for electrician licensing requirements.

**Controllers:** Mount controllers, time switches, and user-operated control devices at convenient and accessible locations and heights. Except for VAV box actuator/controller packages, mount all controllers inside an enclosure: either the HVAC unit enclosure or a separate enclosure. Do not locate controllers above suspended ceiling unless they are controlling an above-ceiling HVAC unit and are inside or attached to the unit; or unless specifically so indicated by Engineer. Provide remote control of manual reset controllers as required for user accessibility, and coordinate with Owner. Locate master control panel in mechanical room unless otherwise indicated.

**Thermostats:** Provide a room thermostat for every terminal unit, unless specifically indicated otherwise. Omission of a thermostat symbol on the plans is *not* indication to omit the thermostat.

To every battery-powered thermostat, run a “24 VAC common” wire and connect to thermostat’s C terminal, to provide continuous power to the thermostat and extend battery life.

Mount room thermostats, humidistats, etc. as required, in a location exposed to representative room air conditions. Do not locate thermostats between doorway and light switch, or behind door swing. Wherever possible, locate thermostats at least two feet away from doors and operable windows. Never locate thermostats where they will be in direct sunlight, or where exposed to any discharge airstream or local heat-producing devices such as boilers, soda machines and copy machines. Do not locate on exterior walls or where exposed to unconditioned air. Provide air-sealing and thermally-insulating backplate for all wall locations. Relocate thermostats that no longer comply with the above requirements because of Owner-placed furnishings or equipment.

Coordinate mounting heights with Architect and comply with ADA (see section 4.27): generally, max. 48 inches; or max. 46 inches above a 34 inches high by 24 inches deep cabinet/counter.

Set thermostats, and program programmable thermostats. Adjust differential to provide as close temperature control as possible without exceeding manufacturers recommended cycling rate for the actuated devices.

**Outside Air Thermostats:** Never locate thermostats where they will be in direct sunlight. Locate *bulb* on north side of building unless specifically approved otherwise by Engineer.

**Low-Temperature Protection Thermostats:** Support element properly to cover entire duct width. In addition to the hard-wired connection to fans/dampers, connect to a digital input of the appropriate



Unitary Controller. No manual reset thermostats shall be used; remove or disconnect all factory-mounted manual reset thermostats.

**Carbon Dioxide Sensors:** Mount on wall, generally adjacent to room temperature sensor, complying with ADA, and in all cases between 36 and 72 inches above finished floor.

**Variable Frequency Drives:** Locate pressure sensor or sensors according to Contractor's experience and in consultation with Engineer.

**Identification:** Provide permanent labels (no tape) for all user-interface controls.

## **Electrical Requirements**

**Control Wiring:** The term "control wiring" is defined to include providing of wire, conduit and miscellaneous materials as required for mounting and connecting electric control devices.

**Wiring System:** Install complete control wiring system for control systems. Conceal wiring, except install wiring in conduit in mechanical rooms and areas where other conduit and piping are exposed. It is not allowed to power any devices inside a control panel using a plug-in transformer at an outlet outside the panel, with unprotected cord going into the panel. Provide multi-conductor instrument harness (bundle) in place of single conductors where number of conductors can be run along common path. Fasten flexible conductors bridging cabinets and doors neatly along hinge side, and protect against abrasion. Tie and support conductors neatly. Number-code or color-code conductors appropriately for identification and servicing of control system.

**Wire:** Install circuits over 25-volt with color-coded THWN/THHN wire in EMT, or MC cable as whips to equipment connections. (Liquid-tight conduit in exterior or hazardous locations.) Install circuits under 25-volt with color-coded No. 18 wire with insulation on each conductor and plastic sheath over all. Provide air plenum cable above plenum rated ceilings.

**Protection:** Install low voltage circuits located in concrete slabs, masonry walls, or underground in electric conduit. In existing construction where control piping or wiring is surface mounted in occupied rooms and it is not possible to conceal wiring, run wiring in wiremold raceway (color by Architect).

**VRF System Wiring:** All control wiring must be exactly as specified by VRF system manufacturer. Data sheets for all control wiring for project must be submitted and approved prior to wiring installation. All control wiring shall be installed in compliance with local electrical codes. All wiring must be plenum rated or installed in electrical conduit. No exposed wiring is permitted in finished spaces. Wiring installed in exposed locations such as attics or mechanical spaces must be neatly installed and properly secured and supported. Install a sleeve at every location where wires penetrate any surface such as walls or ceilings.

## **Project Close-Out**

**Cleaning:** Clean factory-finished surfaces. Repair any marred or scratched surfaces with manufacturer's touch-up paint. Remove debris from inside room sensor cases. Remove paint from room thermostats and sensors. Coordinate with other contractors as required to accomplish the requirements of this paragraph.

**Testing and Adjusting:** Start-up, test and adjust control systems. Prior to Final Control System

Inspection, provide to Engineer a written list of all controllers and all initial setpoints. Explain any cases where conditions are not being maintained close to setpoint. Demonstrate compliance with requirements. Replace damaged or malfunctioning control equipment. Provide all support as and when needed by commissioning agent; and by balancing contractor. Resolve any problems uncovered by balancing contractor, and provide Engineer with a list of problems identified and resolved.

**Final Control System Inspection:** Contractor shall meet with Engineer to thoroughly review the control system. Contractor shall take corrective actions per Engineer's punch, and shall submit itemized confirmation that required actions have been completed.

**Owner's Training:** *Provide training services for four hours, or for not less than the number of hours as listed in the Control System Schedule, whichever is greater.* Provide on-site instruction to owner's personnel in operation and maintenance of the control system. *Schedule instruction with Owner and provide seven-day notice to General Contractor and Architect of training dates and times.* Provide up to two complete training material packages as requested by Owner. Return a signed "Confirmation of Owner's Training and Acceptance of Control System" form when initial training is complete.

**Commissioning Support:** See Specifications Section "HVAC Commissioning" or Commissioning Division, if a third-party commissioning agent is part of the project.

## **Warranties**

**Five-Year Hardware/Software Warranty:** The ATC Contractor shall provide a five-year parts and labor warranty, covering all control hardware and software. The warranty shall be unconditional for the first two years. For the following three years, the consequences of ordinary wear and tear, damage due to negligence or improper use caused by the Owner, or other causes beyond the control of the ATC Contractor may be excluded from warranty coverage.

**END OF SECTION 231972** (updated *October 22, 2015*)

# **CONTROL SYSTEM SCHEDULE BARRINGTON TOWN OFFICES**

## **ACTUATORS**

### **A-2: Two-Position, Spring-Return Actuators**

ERU OA Damper - Fail Closed

ERU Exhaust Damper - Fail Closed

## **THERMOSTATS**

**VRF Heat Pump Thermostats:** by Heat Pump Manufacturer.

## **TIME SWITCHES**

**TS-1: Single Channel Time Switch:** Kele Intermatic ET90115C, Paragon, Tork, or approved equal, with voltage rating as required. Provide initial settings as directed by Owner. Provide laminated nameplate: "FRESH AIR VENTILATION TIMER."

**TS-5: Single Channel Bypass Time Switch:** Watt Stopper TS-400 or approved equal; provide 120/230/277 VAC or 24 VAC/VDC version as applicable and as selected by Contractor; ADA push button operation; electroluminescent LCD digital display shows timer's countdown; easy time adjustment from 5 minutes to 12 hours; zero crossing SPDT isolated relay; five-year warranty; color by Architect—coordinate color and submit pre-approved color. Provide laminated nameplate: "PUSH FOR FRESH AIR VENTILATION NOW".

**TS-6: Single Channel Bypass Time Switch:** Watt Stopper TS-400 or approved equal; provide 277 VAC version; ADA push button operation; electroluminescent LCD digital display shows timer's countdown; easy time adjustment from 5 minutes to 12 hours; zero crossing SPDT isolated relay; five-year warranty; color by Architect—coordinate color and submit pre-approved color. Provide laminated nameplate: "PUSH FOR HEAT".

## **CARBON DIOXIDE SENSOR/CONTROLLERS**

**Type:** Relay Output.

## **OWNER'S TRAINING**

**OT-1: Two Hours Total** (Excluding VRF system training which is by VRF factory representative, and ERV units training which is by ERV factory representative.)

## **CONFIRMATION OF OWNER'S TRAINING AND ACCEPTANCE OF CONTROL SYSTEM**

**Project:** \_\_\_\_\_

Owner's representative affirms that:

he/she has read the "Owner's Training" paragraph near the end of the Control Systems Specifications Section, and the "OWNER'S TRAINING" paragraph above, and that

all work and training required to be provided by the Contractor by the time of control system acceptance has been provided, and has been fully satisfactory as far as can be determined at this time.

Training sessions took place at the following place, dates, and times:

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Total hours of training provided: \_\_\_\_\_

Owner's representative: \_\_\_\_\_

Signed \_\_\_\_\_

Date \_\_\_\_\_

Note that, as specified, additional training is required in approximately six months.

**END OF CONTROL SYSTEM SCHEDULE**

## SECTION 231985 - SEQUENCE OF OPERATIONS

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**Scope of Work:** All equipment described in the Contract Documents shall be controlled, including items whose sequences may be inadvertently omitted. For omitted sequences, Contractors shall refer to the “Sequence of Operation Schedule - Kohler & Lewis Master List,” of which each prequalified temperature control contractor has a copy. Prior to and during project Close-Out, ATC Contractor shall make minor revisions to sequences and screens, as directed by Engineer, at no additional cost.

**Factory Sequences:** *Where certain units come with factory-provided DDC controls, these will come with factory-provided sequences of operation. Where these sequences are to be customized, see the appropriate equipment specifications sections. Include a copy of the factory sequences in the ATC submittal, and pull up these factory sequences as well as ATC sequences as part of the DDC help function.*

**Numbering Note:** The part of the sequence number before the hyphen indicates the principal relevant Division 23 or 26 specifications section or section series. However, each sequence applies to all applicable devices regardless of their specification section number.

**Submittals:** Submit shop drawings for each system automatically controlled. Include all systems, including HVAC unit manufacturer control systems, using and integrating information provided by HVAC unit manufacturer.

1. Shop drawings shall be easily readable, **WITH ALL LETTERING AT LEAST THIS BIG**, yet be no larger than 11 x 17 inches.
2. Pages printed back-to-back shall not relate to the same equipment.
3. Include schematic flow diagram of system showing fans, pumps, coils, dampers, valves, wiring, piping, and control devices.
4. Submit separate drawing(s) or list of all zones in which one controller controls more than one HVAC unit. (See “Network Architecture” paragraph in Section 231971.)
5. Include written description of sequences of operation as they will be installed, that is, as they will be given to the programmers, and explicitly note any proposed deviations from the Specifications. List sequences in the same general order as specified and with the sequence numbers. ***It is not acceptable to rewrite or reword the specified sequences UNLESS the submitted sequences are accompanied by a copy of the specified sequences in which all words of the specified sequences are crossed out, indicating that they have been transferred to the rewritten submitted sequences, or indicating through a series of explanatory notes that certain words have not been incorporated, and stating the reasons.***
6. It is acceptable to submit a verbatim copy the specified sequences and note any proposed modifications, *if so doing complies with the above numbered paragraph*; contact Engineer for electronic copy of the project specifications and include all relevant addenda. If a verbatim copy is submitted, then Contractor is required to at the same time submit a complete cross reference between equipment and sequences. For example:

BLR-1, 2.	550-AL: Boiler Failure Alarm.
	550-BR: Boiler Return Water and Lead-Lag Control.
	550-BT: Boiler Trim.
	971-DE: Equipment Diagnostics.
	971-DT: Temperature Diagnostics.

FTR-1, 2.      830-RC: Radiation and Convector.  
                   971-BV: Valve Balancing.  
                   971-MU: Multiple Units.  
                   971-RI: Room Sensor Indicator Light.  
                   971-RO: Override Button on Room Sensors.  
                   971-RS: Room Setpoints.  
                   971-TM: Occupancy Modes.  
                   971-TS: DDC Time Scheduling.

7. Include cut sheets for all significant products: Reference equipment mark numbers, and include a complete and accurate table of contents of all cut sheets.
8. Submit color graphic screens – first, three typical screens; then, one of each unique screen type. (These submittals are usually made later in the project.) Do no work on screen graphics until the first three screens are approved.
9. Submittals shall comply with the requirements of Division 23 Section “Basic Requirements” and shall be included in the MC’s 3-ring submittal binder or shall be in a separate hard-sided 3-ring binder.
10. If there is an energy consultant or a third-party commissioning agent as part of the project, all control submittals shall go to these people first, and Engineer will review the submittals and hold the submittal meeting only after receiving their written review comments.
11. *Revise sequences to conform with actual programming, as part of the O&M Manual submission.*

**Work by Electrical Contractor** may include, but is not limited to the following sequences if shown in the Schedule: “DHW Recirculation Pump,” “Gas Solenoid Valve,” “Kitchen Hood and Monitoring,” “Exhaust Fan - Continuous,” “Exhaust Fan - Light Switch,” and “Smoke Dampers.”

**Abbreviations:**

adj.	adjustable via User Interface	HX	Heat Exchanger
AHU	Air Handling Unit	LAT	Leaving Air Temperature
DAT	Discharge Air Temperature	LWT	Leaving Water Temperature
DHW	Domestic Hot Water	MAT	Mixed Air Temperature
ERU	Energy Recovery Unit	OARH	Outside Air Relative Humidity
EAT	Entering Air Temperature	OAT	Outside Air Temperature
EWT	Entering Water Temperature	RAT	Return Air Temperature
HWR	Hot Water Return	RH	Relative Humidity
HWS	Hot Water Supply	RTU	Rooftop Unit

**END OF SECTION 231985** (updated August 22, 2011)

# SEQUENCE OF OPERATION SCHEDULE

## BARRINGTON TOWN OFFICES

### Mechanical Equipment

**675-VS: VRF Multizone Air Source Heat Pumps – Stand-Alone.** See VRF heat pump specifications section for VRF system control sequences provided by VRF manufacturer/installer. Mount and wire all factory controls as required, including but not limited to central controller, outdoor HP units, indoor HP units, DI/DO boards, local controllers, remote temperature sensors and drain pan condensate switches.

**832-EH: Electric Duct Heater Coil.** Mount and wire factory airflow switch to prove airflow before enabling heater. Mount and wire factory duct temperature sensor and factory temperature controller and set to maintain DAT of 60°F (adj.).

**835-EP: Electric Radiant Ceiling Panel Panel.** Wire to line voltage timer. Set timer to 15 minutes or as directed by Owner.

**846-CV: CO<sub>2</sub> Controlled Ventilation.** Control ventilation unit so as to maintain a CO<sub>2</sub> setpoint of nine hundred fifty (950) ppm (adj.). Provide throttling range no greater than plus or minus fifty ppm. Where there are multiple sensors for one HVAC unit, the sensor with the highest call for ventilation will control the unit. If ventilation unit is currently off when the CO<sub>2</sub> setpoint is exceeded, put unit into On mode.

**846-FC: Energy Recovery Unit—Factory Controls.** Install manufacturer's controls as required. Control associated duct motor dampers per specified sequence. Provide switches to control ERV units as shown on the plans. Set TS-5 to 3 hours (factory default) or as directed by Owner. Wire ERV-1 such that it runs per TS-1 or TS-5. Wire ERV-3 such that it runs per TS-5 or either CO<sub>2</sub> controller. Provide electric controls to operate ERV-3 whenever either ERV-1 or ERV-2 or BOTH are operating, and so that ERV-3 is off when both ERV-1 and ERV-2 are off. Wire into remote start/stop terminals at ERV unit, per factory wiring diagram.

At Contractor's option, this sequence can be satisfied via the Mitsubishi control system including their DIDO board(s). In this case, the TS-1 would be deleted and its function assumed by the heat pump central controller; the TS-5 units would continue to be used as inputs to the DIDO boards. (We suggest bidding based on electric controls and exploring the DIDO control option just prior to submittals.)

**910-EC: Motor Damper--Equipment Control.** For ERV Units. Control by the same method that controls the associated ERV fan. Open damper and prove full open damper position before starting fan, and close damper fully when all fans are off.

**971-RV: Room Setpoints.** Provide initial adjustable setpoints, per 231675-S4. Provide 5 °F (adj.) dead band between the two setpoints, with a nonadjustable minimum of 3 °F. Provide ability from Operator's Station to override and limit setpoints set at each sensor. For all Sensors, provide (adj.) global high and low limits for the room setpoints: 50 to 72 °F for heating, and 73 to 90 °F for cooling.

### END OF SEQUENCE OF OPERATION SCHEDULE

## **SECTION 231990 - TESTING, ADJUSTING, AND BALANCING**

### **Part 1 - GENERAL**

**Description of Work:** Test, adjust, and balance all air and hydronic mechanical systems as applicable.

**HVAC System Cleanliness:** Verify that the HVAC systems including ductwork, air handling equipment, and air distribution terminals are visibly clean.

Do not balance HVAC systems until they are visibly clean of dust and debris. Inform Engineer immediately of dirty condition.

**Noise and Vibration:** Identify systems with potential noise and vibration problems.

**Leakage Testing:** Provide leakage testing for scheduled ductwork in compliance with SMACNA, "HVAC Air Duct Leakage Test Manual" (1985).

**Energy Recovery Unit Testing:** Upon completion of installation of energy recovery units, and after balancing has been completed, test units to ascertain percent effectiveness of heat transfer device. Furnish test report, similar to SMACNA Form ER-1-78.

**Preliminary Balance Report:** Prepare preliminary balancing report and submit to Engineer.

Include recommendations for correcting any balancing, leakage, noise or vibration problems.

Note all deviations from specified control system sequences of operation.

**Final Balance Report:** Following engineering review of preliminary balance report and DDC system information, make adjustments and supplementary measurements as required. Recheck control system sequences of operation until all sequences have been verified as operating properly. Submit final report.

**Submittals:** Submit preliminary and final balancing reports. Preliminary balance report is required prior to Engineer's final inspection.

**Engineer and Technicians Data:** Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified.

**Certified Reports:** Submit testing, adjusting, and balancing reports bearing the signature of the Test and Balance Technician. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards.

**Report Contents:** Provide the following minimum information, forms and data:

General Information and Summary: Identify testing, adjusting, and balancing agency, Contractor, Owner, Architect, Engineer, and Project. Include addresses, and contact names and telephone numbers. Include a certification sheet containing the name address, telephone number, and signature of the Test and Balance Technician.



The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC or NEBB for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form.

Provide pressure differential profiles for air handling equipment, rooftop units, and other units in diagrammatic form.

Control System Sequence of Operation Verification: Note all deviations from specified sequences of operation.

**Independent Balancing Agency:** Employ the services of an independent testing, adjusting, and balancing agency to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.

**Agency Qualifications:** NEBB or AABC certified, or a Professional Engineer registered in the state in which the services are to be performed, or at least three (3) years of successful testing and balancing experience on projects with testing and balancing requirements similar to those required for this project.

**Codes and Standards:** Comply with the following codes and standards.

AABC: "National Standards For Total System Balance."

NEBB: "Procedural Standards for Testing, Adjusting and Balancing of Environmental Systems."

ASHRAE: ASHRAE Handbook, latest HVAC Applications Volume, Testing, Adjusting, and Balancing Chapter.

## **Part 3 - EXECUTION**

**Systems Operation:** Systems shall be fully operational prior to beginning procedures. Test, adjust, and balance the air systems before hydronic systems.

**Air Systems:** Before operating perform these steps:

Check filters for cleanliness.

Check dampers (both volume and fire) for correct and locked position, and temperature control for completeness of installation before starting fans.

Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a crosscheck with required fan volumes.

Place outlet dampers in the full open position.

Prepare schematic diagrams of system "as-built" ductwork layouts to facilitate reporting.

Lubricate all motors and bearings.

Check fan belt tension.

Check fan rotation.

**Hydronic Systems:** Before operating perform these steps:

Open valves to full open position.

Remove and clean all strainers.

Blow-down strainers on self balance valves.

Check pump rotation.

Clean and set automatic fill valves or glycol fill tanks for required system pressure.

Check that the system is completely full of water or glycol.

Check air vents at high points of systems and determine if all are installed and operating freely (automatic type) or to bleed air completely (manual type).

Set temperature controls so all coils are calling for full flow.

Lubricate all motors and bearings.

**Testing, Adjusting and Balancing:** Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.

Balance air systems to within 10% of indicated air flow.

Balance hydronic systems to within 10% of indicated flow. If self balance valves are employed, measure pressure drop across each valve.

Balance air systems with dampers fully open whenever possible, then slow the fan to meet design conditions.

Test and adjust mechanical systems for sound and vibration in accordance with the detailed instructions of the referenced standards.

Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

Patch insulation, ductwork, and housings, using materials identical to those removed.

Seal ducts and piping, and test for and repair leaks.

Seal insulation to re-establish integrity of the vapor barrier.

Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

Score all damper shafts at end to indicate damper position. Applicable for all dampers in all equipment.

**Pulleys, Belts and Sheaves:** Make any changes in the pulleys, belts and sheaves as required for correct balance as part of this Contract, and at no additional cost to the Owner.

**Retesting:** Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

**Field Adjustment of Flow Rates:** The hydronic and air flow rates noted in the construction documents are design goals. The balancing contractor should attempt to balance the systems to achieve these flow rates where possible. If not possible, the balancing contractor should consult with the Design Engineer to determine appropriate adjustments to the system flow rates.

**END OF SECTION 231990** (12/11/15)

# **BALANCING SCHEDULE BARRINGTON TOWN OFFICES**

## **SCOPE OF WORK**

ALLOW FOR PRELIMINARY AND FINAL BALANCE REPORTS.

SUBMIT COMPLETE PRELIMINARY BALANCE REPORT PRIOR TO ENGINEER'S FINAL INSPECTION.

REBALANCE AND SUBMIT FINAL BALANCE REPORT AFTER CORRECTIVE MEASURES HAVE BEEN TAKEN.

BALANCE ALL AIR SYSTEMS.

ADJUST VANES AT ALL DIFFUSERS AND GRILLES AS INDICATED OR AS REQUIRED FOR PROPER AIR DISTRIBUTION AND TO AVOID DIRECT BLOW ON OCCUPANTS.

VERIFY HVAC SYSTEM CLEANLINESS.

## **DAMPER TESTING**

CHECK EACH DAMPER TO CONFIRM THAT IT OPENS AND CLOSES AND SEALS TIGHTLY AS INTENDED AND MEETS MANUFACTURERS LISTED LEAKAGE RATE.

LIST EACH DAMPER LOCATION, SIZE AND OPERATIONAL AND SEALING STATUS IN BALANCING REPORT.

## SECTION 26 05 00

### GENERAL REQUIREMENTS FOR ELECTRICAL WORK

#### PART 1 - GENERAL

##### 1.1 GENERAL REQUIREMENTS

###### A. DEFINITION OF WORK

Conditions of the Contract, Specifications, Change Orders, Addenda and Drawings apply to work of this section.

###### B. PROVISIONS

As used in this section, "provide" means "furnish and install", "furnish" means "to purchase and deliver to the project site complete with every necessary appurtenance and support and to store in a secure area in accordance with manufacturers instructions", and "install" means "to unload at the delivery point at the site or retrieve from storage, move to point of installation and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project".

##### 1.2 APPLICABLE CODES AND STANDARDS

###### A. WORK

All work shall be in accordance with the laws, rules, codes, and regulations set forth by Local, State, and Federal authorities having jurisdiction. All products and materials shall be manufactured, installed and tested as specified, but not limited to the latest accepted edition of the following codes, standards and regulations:

NFPA	National Fire Protection Association
OSHA	Occupational Safety and Health Act
NEC	National Electrical Code (NFPA 70)
UL	Underwriters Laboratory
NESC	National Electrical Safety Code
FM	Factory Mutual Association
BOCA	Boca National Building Code
Local AHJ	Local and State building, electrical, fire and health department and public safety codes agencies.

###### B. CODE CONFLICTS

When requirements cited in this paragraph conflict with each other or with Contract Documents, the most stringent requirements shall govern conduct of work. The Engineer may relax this requirement when such relaxation does not violate the ruling of authorities that have jurisdiction. Approval for such relaxation shall be obtained in writing. Should the Electrical Subcontractor perform any work that does not comply with the requirements of the applicable building codes, state laws, and industry standards, he shall bear all costs arising in correcting these deficiencies.

##### 1.3 CONTRACT DOCUMENTS

###### A. WORK TO BE PROVIDED

Work to be provided under this division is shown on the electrical drawings listed in Division 1, General Requirements and in these Contract Specifications.

## B. COORDINATION OF WORK

The listing of electrical drawings does not limit the responsibility of determining the full extent of work that is required by these contract documents. The Electrical Subcontractor shall refer to the drawings and other specification sections included in the complete Contract Package, that indicate types of construction with which work of this section must be coordinated. The General Contractor shall coordinate the work of all trades including that of the electrical contractor, with all other subcontractors to determine whether there will be any interference with the electrical work. If the Electrical Subcontractor fails to check with the General Contractor and the electrical work is later found to interfere with the work of other subcontractors, then he shall make necessary changes, without additional cost to the Owner, to eliminate such interference.

## C. INTENT OF DESIGN

Drawings are diagrammatic and indicate the general arrangement of systems and work to be included in the Contract. Information and components shown on riser diagrams or called for in the specifications but not shown on plans, and vice versa, shall apply and shall be provided as though required expressly by both. The contract documents are not intended to indicate and specify each component required, but do require that the components and materials be provided for a complete and operational installation.

## D. DISCREPANCIES IN DOCUMENTS

Each bidder shall be responsible for examining the drawings and specifications carefully before submitting his bid, with particular attention to errors, omissions, conflicts with provisions of laws and codes imposed by authorities having jurisdiction, conflicts between portions of drawings, or between drawings and specifications, and ambiguous definition of the extent of coverage in the contract. Any such discrepancy discovered shall be brought to the immediate attention of the Engineer for correction. Should any of the aforementioned errors, omissions, conflicts or ambiguities exist in either or both the drawings and specifications, the Electrical Subcontractor shall have the same explained and adjusted in writing before signing the contract or proceeding with work. Failure to notify the Engineer in writing of such irregularities prior to signing the Contract will cause the Engineer's interpretation of the Contract Documents to be final. No additional compensation will be approved because of discrepancies thus resolved.

## E. CONFLICTS WITH CODES AND REGULATIONS

The drawings and these specifications are intended to comply with all the above mentioned Codes, Rules and Regulations. If discrepancies occur, the Electrical Subcontractor shall immediately notify the Engineer in writing of said discrepancies and apply for an interpretation and, unless and interpretation is offered in writing by the Engineer prior to the execution of the contract, the applicable rules and regulations shall be complied with as a part of the contract.

# PART 2 - SCOPE OF WORK

## 2.1 GENERAL REQUIREMENTS

### A. General Scope

The work to be accomplished under these specifications includes providing all labor, materials, equipment, consumable items, supervision, administrative tasks, tests and documentation required to install complete and fully operational electrical systems as described herein and shown on the Drawings.

### B. Administrative Responsibilities

The Electrical Subcontractor shall file plans, obtain permits and licenses, pay fees and obtain necessary inspections and approvals from authorities that have jurisdiction, as required to perform work in accordance with all legal requirements.

### C. Coordination with Local Utility Companies

1. The Electrical Subcontractor shall coordinate with the local Power, Telephone, and Cable System Utilities. The Electrical Subcontractor shall be responsible for paying any Utility charges and excess costs. The Electrical Subcontractor shall perform all work in accordance with utility company requirements and is subject to Utility Company inspection and approval prior to backfill of the duct bank.
2. The Electrical Utility for this project is Eversource. The contractor shall include in their bid an allowance of \$10,000 for the electrical service.
3. The Telephone Utility for this project is Fairpoint Communications.
4. The Cable Utility for this project is Time Warner Cable.

## 2.2 WORK TO BE PROVIDED UNDER THIS DIVISION

### A. General Scope

The Work shall be complete from point of service to each outlet or device with all accessory construction and materials required to make each item of equipment or system complete and ready for operation. The work shall include but not be limited to the following. The Electrical Subcontractor shall provide:

1. Service Entrance: Provide service conduits from the Electric Utility Pole located at the street to the metering equipment as required by the Utility companies. The Electrical Contractor shall be responsible for the secondary service entrance conductors.
2. Utility Metering: Provide meter enclosures and instrument cabinets for utility company revenue metering.
3. Grounding System: Provide a complete grounding system and all equipment and interconnection wiring.
4. Temporary Power: All charges for having temporary service provided to the facility, and all equipment, wiring and lighting as required and defined later in this specification section.
5. Service Entrances for Other Utilities: Provide empty conduits from existing underground service conduits to the building for telephone and CATV.
6. Power Distribution Systems: Provide power and lighting distribution systems including service disconnect, metering switchboard, distribution panels, dry type transformers, panelboards, overcurrent devices, raceway, cable and wire.
7. Generator and Automatic Transfer Switches: As an Add Alternate furnish a propane generator, concrete pad and other accessories as specified to be located as shown on the site plan. As part of base bid, furnish conduits for power, controls and circuits for auxiliary devices and the automatic transfer switch.
8. Feeder and Branch Circuit Wiring: Provide feeder and branch circuits and devices for power to equipment and convenience receptacles. This includes branch wiring to system control panels furnished under other sections.
9. Motor Circuit Wiring: Provide all motor wiring, safety disconnects, and motor starters unless integral with equipment.

10. Interior Lighting Systems: Provide complete interior lighting system including normal and emergency fixtures, exit signs, lamps, trim and accessories. The lighting control system shall be furnished as outlined in the drawings and include occupancy sensors, dimming controls and manual controls.
11. Exterior Lighting Systems: Provide complete exterior lighting system including building and site lighting fixtures, poles, controls, lamps and accessories.
12. Fire Alarm Systems: Provide complete fire alarm and detection system including pull stations, heat detectors, area smoke detectors, duct smoke detectors, indicating appliances, remote annunciation devices, water flow and tamper switch wiring, auxiliary contacts for equipment interlocking, magnetic door holders and other devices shown on the drawings. The fire alarm system shall be integrated with the elevator system as required by Code.
13. Telephone and Data Systems: Provide complete voice/data system conduits and cable trays, and wiring. All terminations shall be furnished by Owner.
14. Cable Television Systems: Provide conduit and wiring for CATV system outlets.
15. Control Wiring: Provide control wiring not provided by Division 25000.
16. Supports and Fittings: Provide all support material and hardware for raceway, cable tray and electrical equipment.
17. Terminations: Provide terminations of all cable and wire unless otherwise noted.
18. Penetrations: Provide all building wall, floor and roof penetrations for raceway and cable tray where not provided by the General Contractor.
19. Other Items Furnished By Others: Install the following equipment furnished by others:
  1. Motors
  2. Control Panels

## 2.3 WORK NOT INCLUDED UNDER THIS DIVISION

### A. Related Work Included in Other Sections

The following work is not included in this Section and shall be performed under other sections:

1. Excavation and backfill.
2. Concrete work, including concrete housekeeping pads and other pads and blocks for vibrating and rotating equipment.
3. Cutting and patching of masonry, concrete, tile, and other parts of structure, with the exception of drilling for hangers and providing holes and openings in metal decks. The Electrical Subcontractor shall identify locations of penetrations, excavations, structural supports, etc. required for the completion of the Work of this Section to the General Contractor in a timely manner.
4. Installation of access panels in ceilings and wall construction.
5. Painting, except as specified herein.



6. Temporary water, heat, gas and sanitary facilities for use during construction and testing.
7. Outdoor air intake or exhaust louvers.
8. Control wiring specifically indicated as part of Division 25.

## 2.4 GENERAL EQUIPMENT AND MATERIALS REQUIREMENTS

### A. General Requirements

All equipment and materials shall be new and of the quality specified. All materials shall be free from defects at the time of installation. Materials or equipment damaged in shipment or otherwise damaged during construction shall not be repaired at the jobsite, but shall be replaced with new materials.

### B. Representation of Equipment

All equipment installed on this project shall have local representation, local factory authorized service and a local stock of repair parts.

### C. Warranties

No equipment or material shall be installed in such a manner as to void a manufacturer's warranty. The Electrical Subcontractor shall notify the Engineer of any discrepancies between the Contract Documents and manufacturer's recommendations prior to execution of the work. Refer to Division 1, General Requirements for Warranty Requirements.

## 2.5 SHOP DRAWINGS

### A. General Requirements

After the Contract is awarded, but prior to proceeding with the Work, the Electrical Subcontractor shall obtain complete shop drawings, product data and samples from manufacturers, suppliers, vendors, and Subcontractors for all materials and equipment specified herein, and submit data and details of such materials and equipment for review by the Engineer. Submission of such items shall follow the guidelines set in the General Section of the Specification Document. Prior to submission of the shop drawings, product data and samples to the Engineer, the Electrical Subcontractor shall review and certify that the shop drawings, product data and samples are in compliance with the Contract Documents. Further, the Electrical Subcontractor shall check all materials and equipment after their arrival on the jobsite and verify their compliance with the Contract Documents. A minimum period of ten working days, exclusive of transmittal time will be required in the Engineer's office each time shop drawings, product data and/or samples are submitted or resubmitted for review. This time period shall be considered by the Electrical Subcontractor when scheduling his Work.

### B. Information to be included in Submittal

The shop drawing submittal shall include all data necessary for interpretation as well as manufacturer's name and catalog number. Sizes, capacities, colors, etc., specified on the drawings shall be specifically noted or marked on the shop drawings.

### C. Information Not to be included in Submittal

Submittals shall contain only information specific to systems, equipment and materials required by Contract Documents for this Project. Do not submit catalogs that describe products, models, options or accessories, other than those required, unless irrelevant information is marked out or unless relevant information is highlighted clearly. Marks on submittals, whether by Contractor, Subcontractor, manufacturer, etc., shall not be made in red ink. Red is reserved for review process.

D. Responsibility of Submitted Equipment

The Engineer's review of such drawings shall not relieve the Subcontractor of responsibility for deviations from the Contract, Drawings or Specifications, unless he has in writing called the attention of the Engineer to such deviations at the time of the submission. The Engineer's review shall not relieve the Electrical Subcontractor from responsibility for errors or omissions in such drawings.

E. Proposal of Other Equipment

If the Electrical Subcontractor proposes an item of equipment other than that specified or detailed on the drawings which requires any redesign of the wiring or any other part of the mechanical, electrical or architectural layout, the required changes shall be made at the expense of the trade furnishing the changed equipment at no cost to the Owner.

F. Substitution of Equipment of Equal Quality

Manufacturer's names are listed herein and on the drawings to establish a standard for quality and design. Where one manufacturer's name is mentioned, products of other manufacturers will be acceptable if, in the opinion of the Engineer the substitute material is of quality equal to or better than that of the material specified. Where two or more manufacturer's names are specified, material shall be by one of the named manufacturers only.

2.6 EQUIPMENT MANUALS

A. General Requirements

The Electrical Subcontractor shall provide three copies of operations and maintenance manuals for all items. These manuals shall be packaged with additional information including equipment cur sheets and as-built wiring diagrams. Manuals shall contain names and addresses of manufacturers and local representatives who stock or furnish repair parts for items or equipment.

B. Schedule

Deliver manuals no less than 30 days prior to acceptance of equipment to permit Owner's personnel to become familiar with equipment and operation prior to acceptance.

C. Instruction of Owner's Operating Personnel

Upon completion of installation or when Owner accepts portions of building and equipment for operational use, instruct the Owner's operating personnel in any and all parts of various systems. Such instructions shall cover period of control such as will take mechanical equipment through complete cycle. Make adjustments under actual operating conditions.

2.7 RECORD DRAWINGS

A. General Requirements

As work progresses, and for duration of the Contract, the Electrical Subcontractor shall maintain a complete and separate set of prints of Contract Drawings at job site at all times and record work completed and all changes from original Contract. Drawings shall clearly and accurately include work installed as a modification or added to the original design. At completion of work and prior to final request for payment, the Electrical Subcontractor shall submit a complete set of reproducible record drawings showing all systems as actually installed.

PART 3 - EXECUTION

3.1 WIRING METHOD

#### A. Requirements

Unless otherwise noted all wiring shall be installed in raceway as follows:

1. Service Entrance Conductors: All service conductors shall be installed in rigid steel, rigid aluminum or intermediate metal conduit except when installed underground. Wiring installed underground shall be installed in rigid non-metallic, PVC conduit and as per the Contract Drawings.
2. Power Distribution Outdoors: All conduits installed outdoors, all risers between floors and conduit exposed to physical damage shall be rigid steel, rigid aluminum or intermediate metal conduit. Wiring installed underground shall be installed in rigid non-metallic, PVC conduit and as per the Contract Drawings.
3. Power Distribution Indoors: Unless otherwise noted, all other power distribution wiring including feeders and branch circuits shall be installed in electrical metallic tubing (EMT) when installed exposed. Where exposed to potential physical damage, conduits shall be rigid steel, rigid aluminum or intermediate metal conduit. MC cable may be used above ceilings and in walls. Type NM cable (Romex) shall not be allowed.
4. Telephone & Data: Shall be installed in EMT where exposed and filled as not to exceed fill ratio requirements. In finished spaces furnish EMT, 3/4" (minimum) in walls from the box to the accessible ceiling space.
5. Cable Television (CATV): Shall be installed in EMT where exposed. In all common areas and offices, furnish EMT, 3/4" (minimum) in walls from the box to the accessible ceiling space.
6. Fire Alarm System: Fire alarm system wiring shall be installed in EMT where exposed or MC cable listed for use as fire alarm cable and designated for such by red finish where installed above ceilings and in walls.
7. Control Wiring: Shall be installed in EMT where exposed and on J-hooks above acoustic ceilings.
8. Under-slab Conduits: Conduit installed under floor slabs shall be rigid nonmetallic conduit with rigid steel stub-ups.
9. Corrosive Areas: All conduits in corrosive areas shall be PVC coated rigid steel.

### 3.2 EQUIPMENT ARRANGEMENT AND ACCESS

#### A. Location of Equipment

Locate all equipment which must be serviced, operated or maintained in fully accessible positions. Minor deviations from the drawings may be made to allow for better accessibility at no additional cost to the Owner, but changes shall not be made without review by the Engineer. Minimum clearances in front of or around equipment shall conform to the latest applicable code requirements.

#### B. Arrangement of Equipment

The size of equipment shown on the drawings is based on the dimensions of a particular manufacturer. Where other manufacturers are acceptable, it is the responsibility of the Electrical Subcontractor to determine if the equipment he proposed to furnish will fit the space available. Layout drawings shall be prepared by the Subcontractor when required by the Engineer or Owner to indicate a suitable arrangement.

### 3.4 EQUIPMENT LABELING

#### A. Panelboards and Transformers

All panelboards, cabinets and other specified equipment shall be labeled with engraved laminated plastic plates, minimum 3/4" high with 3/8" engraved letters. Punch tapes with mastic backings are not acceptable.

#### B. Starters and Disconnect Switches

All starters, disconnect switches and other specified equipment shall be marked with engraved laminated plastic plates, minimum 1/2" high with 1/4" engraved letters. Where individual switches or circuit breakers in power or distribution panelboards do not have cardholders, they shall be marked with 1/2" high labels.

#### C. Empty Conduits

All empty conduits shall have labels tied to the pull string at each end of each empty conduit, marked as to identification of each end. Junction boxes with circuits provided for future use shall be labeled with appropriate circuit designation.

#### D. Panelboard Directories

Cardholders for panelboards shall be filled out with typewritten identification of each circuit, except that the word "spare" shall be written in soft pencil to identify all circuit breakers installed that are not used.

END OF SECTION 26 05 00

## SECTION 26 05 19

### LOW VOLTAGE WIRE

#### PART ONE - GENERAL

##### 1.1 GENERAL REQUIREMENTS

###### A. Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section.

##### 1.2 APPLICABLE CODES AND STANDARDS

###### A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

ASTM B-3	Soft or Annealed Copper Wire
ASTM B-8	Concentric Lay Stranded Copper Conductors
NEMA WC-5	Thermoplastic Insulated Wire and Cable for the Transmission and Distribution of Electrical Energy.
NEMA WC-7	Cross-Linked Thermosetting Polyethylene Insulated Wire for the Transmission and Distribution of Electrical Energy
UL 44	Rubber Insulated Wires and Cables
UL 62	Flexible Cord and Fixture Wire
UL 83	Thermoplastic Insulated Wires and Cables

##### 1.3 SUBMITTALS REQUIRED

###### A. Manufacturer's product data sheets.

##### 1.4 MANUFACTURERS

###### A. Subject to compliance with the Specification Requirements:

- Anixter
- General Cable
- Rome Cable
- Approved Equal

#### PART TWO: PRODUCTS

##### 2.1 GENERAL

###### A. Conductors

All conductors shall be annealed copper in accordance with ASTM B-3.

###### B. Jacket

The jacket of all wire shall be printed with the following information:

- Manufacturer
- Size
- Insulation type
- Maximum voltage
- UL label

C. Insulation

All insulation shall be 600 volt rated.

## 2.2 POWER WIRING

A. Service Lateral/Service Entrance Conductors

Service lateral and service entrance conductors shall be type XHHW in raceway. The electrical contractor may substitute conductors comprised of compact stranded aluminum alloy that is listed by UL Standard 486B, labeled "AL9CU" for 90°C rated circuits. Cable shall be as manufactured by Alcan Cable, Stabiloy Compact Stranded type. Cable sizes shall be adjusted to meet the same Ampacity levels as designed for copper cables. All aluminum connections shall be made using a listed Oxide Inhibiting compound as recommended by the cable manufacturer.

B. Feeders and Motor Branch Circuits

Feeders and motor branch circuits shall be type XHHW or THHN/THWN in raceway or MC cable assembly.

C. Description

All power wiring shall be stranded, Class B strand in accordance with ASTM B-8, minimum size #12 AWG.

## 2.3 LIGHTING AND RECEPTACLE BRANCH CIRCUITS

A. Description

All lighting and convenience receptacle branch circuit wiring shall be type THHN/THWN, solid or stranded conductor, minimum size #12 AWG.

## 2.4 CONTROL WIRING

A. Description

Wiring for control circuits shall be THHN/THWN stranded, with Class B strand in accordance with ASTM B-8, minimum size #12 AWG unless otherwise noted on drawings.

## PART THREE: EXECUTION

### 3.1 GENERAL

A. Installation

All wire shall be installed in accordance with manufacturer's instructions.

### 3.2 TESTING

#### A. Control and Instrument Wiring

Control and instrument field wiring shall be visually inspected and tested for continuity to insure that all field wiring is installed in accordance with Contract Drawings and/or equipment manufacturers drawings. Verify all field conductors are properly identified with wire numbers.

#### B. Low Voltage Power Wiring

All 208V power wiring shall be subjected to one minute 1000V megger test. Minimum insulation resistance shall be 50 megohms. Megger tests shall be performed between each phase (A-B, B-C, and C-A) and three phases tie together to ground.

END OF SECTION 26 05 19

## SECTION 26 05 26

### GROUNDING EQUIPMENT

#### PART ONE: GENERAL

##### 1.1 GENERAL REQUIREMENTS

###### A. Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section.

###### B. Installation Compliance

The Contractor shall provide a complete grounding system including grounding electrodes, electrode conductors, bonding jumpers, equipment grounding conductors, connections and other materials as may be required for a complete installation. The completed system provided shall meet the requirements of the National Electrical Code and the interpretation of the Local Authority Having Jurisdiction.

##### 1.2 APPLICABLE CODES AND STANDARDS

###### A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NFPA 70	National Electrical Code
UL 467	Grounding and Bonding Equipment

##### 1.3 SUBMITTALS REQUIRED

###### A. Equipment Data Sheets

Data sheets for chemical grounding systems, exothermal connection methods, and associated wiring.

##### 1.4 MANUFACTURERS

A. Products shall be of firms regularly engaged in manufacture of grounding equipment.

#### PART TWO: PRODUCTS

##### 2.1 GENERAL

###### A. Requirements

Provide all equipment, components and parts required to for a complete and operable system.

##### 2.2 GROUND RODS

###### A. Requirements

Ground rods shall be ¾-inch copper clad steel construction furnished in 10 foot lengths.



## 2.3 CONDUCTORS

### A. Bare Grounding Conductors

Bare grounding conductors shall be soft drawn stranded copper, sized in accordance with NEC Article 250 unless otherwise noted on the Drawings.

### B. Insulated Grounding Conductors

Insulated grounding conductors shall be stranded copper with Type TW, THW or THHN/THWN insulation. Grounding conductor shall be provided with green insulation for identification purposes.

## 2.4 CONNECTIONS

### A. Welded Connections

Welded connections shall be exothermic reaction type, as manufactured by Cadweld, or approved equal. The contractor shall provide all molds, crucibles, weld metal, and any necessary materials or equipment required to make connections using this process.

### B. Compression Connections

Compression lugs shall be short barrel, one-hole compression type for conductors #2/0 AWG and smaller and long barrel, two-hole compression type for conductors #3/0 AWG and larger.

## 2.5 GROUNDING BAR

### A. Requirements

Provide a wall-mounted copper grounding bar, mounted 6 inches above finished floor in the main electrical room and all telecommunications and IDF rooms. Grounding bar shall be connected directly to the grounding grid.

## PART THREE: EXECUTION

## 3.1 GROUNDING ELECTRODE SYSTEM

### A. Requirements

Grounding electrodes of the types shown on the Contract Drawings and as required by NEC shall be provided. Additional electrodes shall be provided if required by the local Authority Having Jurisdiction. All electrodes shall be bonded together to form the grounding electrode system.

### B. Installation of Ground Rods

Ground rods shall be driven vertically with the upper end of the rod not less than 2-1/2 feet below finished grade. When conditions require, ground rods may be driven at an angle not to exceed 45 degrees from vertical, with the driven end facing outside of the grounding ring.

### C. Installation of Grounding Ring Conductors

Grounding ring conductors shall be bare copper, sized as shown on the Contract Drawings and installed at a minimum depth of 2-1/2 feet below finished grade. Conductors encased in concrete footings, in or under floor slabs, and in duct banks shall be bare copper, sized as shown on the Contract Drawings. All connections made below grade or encased in concrete shall be exothermic weld type.

D. Connection to Structural Steel

Grounding grid conductors shall be connected to building structural steel as required by the NEC this shall include a connection to reinforcing steel in a minimum of one concrete footing. All connections to building steel shall be exothermic weld type.

E. Grounding Electrode Conductors

The electrical service and all separately derived systems shall be grounded in accordance with NEC Article 250. The grounding electrode conductor shall be copper, sized in accordance with Article 250 of the NEC or as shown on the Drawings.

### 3.2 EQUIPMENT GROUNDING SYSTEMS

A. Requirements

A separate, insulated copper conductor, with green colored insulation, shall be provided in all raceways and with every feeder, branch and control circuit, in addition to the grounded metallic conduit system. The equipment grounding conductor shall be grounded at both ends.

B. Connection of Equipment Grounding Conductors

Connections to equipment grounding busses shall use compression type termination lugs bolted to a clean, dry surface on the bus, free from any contaminants which may hinder the electrical continuity of the connection. The contractor shall provide any additional hardware and all drilling and tapping that may be required for this connection.

### 3.3 ADDITIONAL BONDING REQUIREMENTS

A. Grounding of Raceway Systems

All metallic raceways shall be electrically continuous and bonded to the grounding system.

B. Bonding of Other Systems

Interior metal water, gas and sprinkler piping shall be bonded as required by Article 250 of the NEC. The points of attachment of these bonding conductors shall be located in readily accessible locations.

END OF SECTION 26 05 26

## SECTION 26 05 33

### RACEWAY AND FITTINGS

#### PART ONE: GENERAL

##### 1.1 GENERAL REQUIREMENTS

###### A. Provisions

Provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this Section.

##### 1.2 APPLICABLE CODES AND STANDARDS

###### A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

ANSI C80.1	Standard for Rigid Steel Conduit
ANSI C80.3	Standard for Electrical Metallic Tubing
ANSI C80.6	Standard for Intermediate Metal Conduit
NEMA RN-1	Polyvinyl-chloride Externally Coated Galvanized Rigid Steel Conduit and Electrical Metallic Tubing
NEMA TC-2	Electrical Plastic Tubing and Conduit
NEMA TC-3	PVC Fittings for use with Rigid PVC Conduit and Tubing
UL 1	Flexible Metal Conduit
UL 6	Rigid Metal Conduit
UL 360	Liquid Tight Flexible Steel Conduit
UL 514B	Fittings for Conduit and Outlet Boxes
UL651	Schedule 40 and 80 Rigid PVC Conduit
UL797	Electrical Metallic Tubing
UL870	Wireways, Auxilliary Gutters and Associated Fittings
UL1242	Intermediate Metal Conduit

##### 1.3 SUBMITTALS REQUIRED

###### A. Manufacturers' product data sheets

##### 1.4 MANUFACTURERS

###### A. In compliance with the Specification Requirements:

- Allied Tube and Conduit (Conduit)
- Wheatland (Conduit)
- Thomas and Betts (Fittings)
- Appleton (Fittings)
- Crouse Hinds/Cooper (Fittings)
- OZ Gedney (Fittings)
- Killark (Fittings)
- Carlon (PVC)
- National Pipe and Plastics (PVC)

- AFC Cable Systems (MC/LFMC)
- Southwire (MC/LFMC)
- Other manufacturers listed in the specification descriptions
- Approved equals

## PART TWO: PRODUCTS

### 2.1 CONDUIT

#### A. Galvanized Rigid Steel Conduit (GRS)

Rigid steel conduit shall be manufactured from mild steel tube with a uniform protective coating of hot dipped zinc galvanizing inside and outside, including all threads. The conduit shall be furnished in nominal 10-foot lengths, with both ends threaded and furnished with a galvanized coupling on one end and a plastic thread protector on the other end.

#### B. Rigid Aluminium Conduit

Rigid aluminum conduit, couplings and elbows shall be manufactured of a suitable copper-free aluminum alloy. Conduit lengths shall be seamless throughout and shall have hard, smooth and gum-free interior coatings to facilitate the pulling-in of conductors. It shall be furnished in nominal 10-foot lengths, with both ends threaded and a coupling applied to one end of each length. Threads on the coupling end shall be coated with a special lubricant so that the coupling may be removed without difficulty. Threads on the end opposite the coupling shall be protected from damaged by a plastic cap.

#### C. Intermediate Metal Conduit (IMC)

Intermediate metal conduit shall be of steel piping with a uniform protective coating of hot dipped zinc galvanizing on the outside of the conduit, including all threads. The conduit shall be furnished in nominal 10-foot lengths, both ends threaded furnished with a galvanized coupling on one end and a plastic thread protector on the other end.

#### D. Rigid Nonmetallic Conduit (PVC)

Rigid nonmetallic conduit shall be polyvinyl chloride, rated for use with 90°C conductors and furnished in 10-20-, or 30-foot lengths.

#### E. Electrical Metallic Tubing (EMT)

Electrical metallic tubing shall be constructed of zinc coated steel with an interior coating of lacquer or enamel to permit easier wire pulling.

#### F. Liquid Tight Flexible Metal Conduit (LFMC)

Liquid tight flexible conduit shall be constructed with a flexible core of galvanized steel and an oil and sunlight resistant PVC jacket to form a liquid tight raceway. The overall jacket shall be wrinklefree and suitable for use in temperatures from -25°C to +80°C.

#### G. Flexible Metal Conduit (MC)

Flexible metal conduit shall have an outer armor constructed of be hot dipped galvanized interlocked strip steel.

### 2.2 CONDUIT FITTINGS

## A. Bushings

### 1. Insulated Bushings

Insulated bushings for conduit sizes 1-1/4 inches and larger shall have metal bodies and threads, with molded-on high impact phenolic thermosetting insulation to prevent conductor insulation damage. Bushings shall be Type "IBC" insulated bushings as manufactured by OZ Gedney or an approved equal. Insulated bushings for conduit sizes 1 inch and smaller may be of plastic, OZ Gedney Type "A", or an approved equal.

### 2. Insulated Grounding Bushings

Insulated grounding bushings shall be similar to the insulated bushings described above, except they shall have set screws to lock the bushings on the conduits and shall have mechanical type lugs attached. The lugs shall be sized to accept the ground wire sizes as set forth in the latest edition of the National Electrical Code, but in no case smaller than No. 8 AWG wire. Grounding bushings shall be Type "BLG" as manufactured by OZ Gedney or an approved equal.

### 3. Male Bushings

Male bushings shall be Thomas and Betts Corporation insulated throat chase nipples, or a product of equal construction. Bushings used only to pass conductors through metal partitions, etc. shall be OZ Gedney, Type "ABB".

### 4. Male Bushings

Bushings for use with EMT shall be OZ Gedney type "SBT" or approved equals.

## B. Conduit Bodies

Conduit bodies for use with aluminum conduit shall be of copper free aluminum alloy. Those for use with steel conduit may be of galvanized, or cadmium plated cast iron, or of copper free aluminum alloy. All conduit fittings shall be provided with neoprene gaskets and sheet metal covers, except that cast covers shall be used for sized 1-1/2 inches and larger. Rigid conduit connections shall be threaded and EMT connections shall be set screw type. Cover screws shall be captive. All conduit fittings shall be as manufactured by Crouse Hinds, Appleton, Killark or approved equal.

## C. Hubs

Water-tight conduit connections are required on all NEMA 3R, 4, and 4X enclosures and all electrical equipment located outdoors or in damp or wet areas. Where hubs or water-tight threaded connections are not provided as part of the enclosure, water-tight hubs shall be Myers "Scrutite", or approved equal. All other terminations shall be double locknut and bushing.

## D. Fittings

Fittings for use with liquid-tight flexible conduit shall be zinc plated malleable iron Crouse Hinds type "CGB" or approved equal.

E. Locknuts

Locknuts shall be hot dipped galvanized steel or malleable iron. Standard locknuts shall be used for connections to NEMA 1 enclosures. Sealing locknuts with integral gasket shall be used for connections to NEMA 12 enclosures.

2.3 JUNCTION BOXES

A. Pull and Junction Boxes

Pull and junction boxes shall be of code gauge metal with continuously welded joints or of cast metal if called for on the Drawings. All junction boxes shall have gasketed screw covers. Boxes for use with aluminum conduits shall be of aluminum. Sheet steel boxes shall be galvanized after fabrications. Screws for galvanized steel box covers shall be made of brass. Screws for aluminum box cover shall be stainless steel.

B. Boxes Installed in Concrete

Boxes installed in concrete shall be cast iron alloy or copper free aluminum.

C. Rating of Boxes

Unless otherwise shown on drawings, all boxes installed indoors shall be rated NEMA 1 and all boxes installed outdoors shall be rated NEMA 3R. Boxes located in fire walls, exterior walls, and at the ceiling of the top floor shall be sealed with UL approved fire sealant material to maintain the rating of the separation as well as providing air sealing to maintain the buildings thermal envelope. Boxes located on opposing sides of rated walls i.e. unit separations, must be at least 24" apart or treated with putty pads per IBC.

2.4 OUTLET BOXES

A. Outlet Boxes for Concealed Work

Outlet boxes for concealed work shall be pressed steel boxes, galvanized and not less than #12 gauge. Each ceiling outlet designated for a lighting fixture shall have a fixture support secured in place with bolts and nuts. Ceiling boxes shall be octagonal with lugs and screws for back plates.

B. Outlet Boxes Installed Outdoors

Outlet boxes installed outdoors, in concrete or exposed, shall be cast iron alloy or copper free aluminum with gasketed covers.

C. Outlet Box Accessories

Provide outlet box accessories as required for each installation, including box supports, mounting ears and brackets, wallboard hangers, box extension rings, fixture studs, cable clamps and metal straps for supporting outlet boxes, which are compatible with outlet boxes being used and to fulfill installation requirements for individual wiring situations.

2.5 WIREWAY

A. Wireway

Wireway shall be lay-in type, code gauge steel with dark gray epoxy paint finish inside and out.

B. Covers

Covers shall be hinged with captive screw fasteners for NEMA 1 & NEMA 3R wireway and gasketed quick release latch covers for NEMA 12 wireway.

2.6 SUPPORTS

A. Sizing

The Electrical Subcontractor shall size and provide all supports necessary for the installation of all raceway.

B. Channel Framing

Channel framing shall be manufactured by Unistrut, Kindert, B-Line or approved equal.

C. Indoor Locations

In dry, non-corrosive areas, channel framing and angle shall be galvanized steel or aluminum and all nuts, bolts and hardware shall be carbon steel, cadmium plated or hot dipped galvanized. Beam clamps shall be galvanized steel or malleable iron.

D. Outdoor, Wet or Damp Locations

In outdoor, wet or damp areas channel framing and angle shall be aluminum or 304 stainless steel and nuts, bolts and hardware shall be 304 stainless steel. Beam clamps shall be hot dipped galvanized steel or malleable iron.

E. Corrosive Locations

In corrosive areas, channel framing shall be 316 stainless steel, PVC coated steel or PVC coated aluminum. Nuts, bolts and hardware shall be 316 stainless steel. Beam clamps shall be PVC coated.

F. Supports

Supports shall be sized with a minimum safety factor of four or 200 lbs. whichever is greater.

PART THREE: EXECUTION

3.1 GENERAL

A. Requirements

See Specification Section 26.05.00 Subsection 3.1 for Wiring Methods.

3.2 INSTALLATION

A. Conduit, EMT, Boxes and Enclosures

Conduit, EMT, boxes & enclosures shall be installed so that they are mechanically secure, electrically continuous and neat in appearance.

**B. Exposed Runs**

Exposed runs shall be installed to conform to the shape of the surface over which they are run. Where they are run over a plane surface, they shall be straight and true. All exposed conduits shall be run parallel and perpendicular to building column lines and walls. Diagonal runs will not be permitted. Conduit runs in groups shall be supported by means of common members made of channel framing. Group mounting is not required where the group consists of only two conduits. Machine bolts with expansion shields shall be used when fastening to solid masonry or concrete. Toggle bolts shall be used to fasten to hollow masonry.

**C. Spacing**

Unless otherwise approved, spacing between conduit supports shall not exceed ten feet. Conduits shall not be supported from structural members marked "Removable" on the structural drawings. Conduit hangers and supports shall be fastened to buildings and structural members only and not to any equipment or piping. Separate conduits a minimum of 6" from flues, steam and hot water lines. Install conduit above mechanical piping wherever possible.

**D. Conduit Supports**

All conduit supports other than structural members shall be galvanized. The use of perforated strap or plumber straps will not be permitted.

Conduit up to 1-1/2 inches may be supported by one-hole malleable iron straps with clamp backs. Conduit 2 inches and larger shall be supported by two-hole straps.

**E. Conduit Run Lengths**

Conduit runs shall not exceed 100 feet between boxes, fittings or devices.

PVC conduits run above grade shall be sufficiently supported to prevent sagging.

MC cables shall be neatly bundled and tie wrapped and sufficiently supported.

**F. Use of Expansion Joints**

All conduit crossing building or structure expansion joints shall be provided with approved expansion fittings.

**3.3 BENDS**

**A. Field Bends**

Field bends shall be made with approved bending tools. All field-formed bends shall be of maximum radius permitted by the design and construction conditions.

**B. Exposed Conduit Changing Direction**

Where a group of exposed conduits change direction, the bends shall have a common center in order to maintain the uniformity and neat appearance of the group, having regard for the minimum bending radius of the largest conduit in the group.

**C. General**

Bends shall be uniform radius and free from cracks, crimps or other damage to the conduit or its coating and shall not unduly flatten the conduit section.



### 3.4 JOINTS AND TERMINATIONS

#### A. Joints in Rigid Conduit

All joints in rigid conduit shall be threaded, using standard couplings. The use of running threads, threadless or split couplings is prohibited. When reaming out of conduit ends to remove burrs and rough edges, care shall be exercised to avoid excessive reaming which results in the weakening of the conduit wall at the end.

#### B. Tightening of Joints

All joints shall be made up wrench tight and with a minimum of wrench work in order to avoid wrench cuts.

#### C. Cut Threads

All cut threads shall be thoroughly painted with a coating of a rust inhibiting primer.

#### D. EMT Couplings and Fittings

EMT couplings and fittings shall be compression type on conduits up to 1-1/4 inch and double set screw type for conduits 1-1/2 inch and larger.

#### E. Conduit Terminations

All conduit terminations in panels, enclosures, outlet boxes and equipment shall be provided with bushings.

### 3.5 FLEXIBLE CONDUIT

#### A. Terminations

Flexible conduit shall be use to terminate all, lighting, motors, unit lanterns, transformers, pilot devices and vibrating equipment.

#### B. Liquitite Flexible Conduit

Liquitite flexible conduit and fitting shall be used outdoors and in all damp or wet areas, or where exposed to grease or oil.

#### C. Connections to Lighting Fixtures

Connections to lighting fixtures (lighting whips) shall be maximum length of 6 feet. All other flexible connections shall be maximum 24 inches.

### 3.6 PENETRATIONS

#### A. Penetrations through Slabs, Walls, Roofs

All penetrations through concrete slabs, masonry walls or roofs shall be provided with sleeves.

#### B. Sleeves

All sleeves shall be sealed to maintain the integrity of the structure. Fire resistant walls and floors shall be sealed with approved material, and shall maintain the original fire rating. All seals below grade shall be watertight, O.Z./Gedney type WSK or approved equal.

END OF SECTION 26 05 33

## SECTION 26 24 16

### PANELBOARDS

#### PART ONE: GENERAL

##### 1.1 GENERAL REQUIREMENTS

###### A. Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section.

##### 1.2 APPLICABLE CODES AND STANDARDS

###### A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA 250	Enclosures for Electrical Equipment
NEMA AB-1	Molded Case Circuit Breakers
NEMA KS-1	Enclosed Switches
NEMA PB-1	Panelboards
UL 50	Enclosures for Electrical Equipment
UL 67	Panelboards
UL 98	Enclosed and Deadfront Switches
UL 489	Molded Case Circuit Breakers and Circuit Breaker Enclosures
UL 943	Ground Fault Circuit Interrupters

##### 1.3 SUBMITTALS REQUIRED

###### A. Manufacturer's product data sheets.

###### B. Circuit breaker schedules.

##### 1.4 MANUFACTURERS

###### A. Subject to compliance with the specification requirements:

- Square D
- Cutler Hammer
- General Electric

#### PART TWO: PRODUCTS

##### 2.1 GENERAL

###### A. Panelboards

Panelboards, including lighting and appliance panelboards and power distribution panelboards, shall be of the sizes, rating and arrangement shown on the drawings.

###### B. Overcurrent Devices

Panelboards shall be provided complete with all overcurrent devices, accessories and trim.

C. Safety Barriers

All panelboards shall be provided with safety barriers for dead front construction.

D. Short Circuit Ratings

The required short circuit ratings of assembled panelboards are shown on the Drawings. The short circuit rating of every overcurrent device in the panel shall meet or exceed the panel rating. Unless otherwise noted on the Drawings, series rated combinations will not be permitted.

## 2.2 CABINETS

A. Boxes

Boxes shall be code gauge galvanized sheet steel.

B. Trim

Trim shall be code gauge steel, ANSI-61 gray finish with stainless steel flush type lock/latch handle. All locks shall be keyed alike.

C. Surface Mounted Panels

Trim for surface mounted panels shall be door-in-door construction such that the gutter space may be exposed by a hinged door.

D. Frames

Directory frames shall be metal frame with plastic covers.

## 2.3 BUS

A. Bus Work

All bus work shall be 750 amp/sq.in. aluminum.

B. Neutral Buses

Unless otherwise noted on the drawings, neutral busses shall be 100% rated with adequate connections for all outgoing neutral conductors.

C. Panelboards

Panelboards shall be provided with aluminum ground busses.

D. Connection

Bus shall be designed for sequence phase connection to allow the installation of one, two or three pole branch circuit breakers in any position.

## 2.4 OVERCURRENT DEVICES

A. Device Type

Overcurrent devices shall be trip-free molded case, bolt-on, thermal magnetic circuit breakers.

B. Main Circuit Breakers

Main circuit breakers shall be individually mounted and bolted to bus assembly. Back-fed branch mounted circuit breakers are prohibited.

C. Circuit Breakers Frontfaces

Front faces of all circuit breakers shall be flush. Trip indication shall be clearly shown by the handle position between the ON and OFF positions.

D. Ground Fault Circuit Breakers

Ground fault circuit breakers shall be provided as required on the Contract Drawings and shall require no more panel space than standard breakers.

E. Switching Lighting Circuit Breakers

Where circuit breakers are used for switching of lighting, circuits type "SWD" circuit breakers shall be provided.

F. Arc Fault Circuit Breakers

Arc fault circuit breakers shall be provided as required on the Contract Drawings and shall require no more space than standard circuit breakers.

G. Connections

All connections shall be rated for 75°C copper conductors.

## PART THREE: EXECUTION

### 3.1 GENERAL

A. Installation

Panelboards shall be installed in accordance with Manufacturer's Instructions. Panelboard mounting heights shall be mounted so the highest breaker switch device does not exceed 48" of the finished floor.

END OF SECTION 26 24 16

**SECTION 26 28 16**  
**SAFETY SWITCHES**

**PART ONE: GENERAL**

**1.1 GENERAL REQUIREMENTS**

**A. Provisions**

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section.

**1.2 APPLICABLE CODES AND STANDARDS**

**A. Products**

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA KS-1	Enclosed Switches
UL 98	Enclosed and Deadfront Switches

**1.3 SUBMITTALS REQUIRED**

**A. Manufacturer's product data sheets.**

**1.4 MANUFACTURERS**

**A. Subject to compliance with the specification requirements:**

- General Electric
- Square D
- Siemens
- Cutler Hammer

**PART TWO: PRODUCTS**

**2.1 GENERAL**

**A. Description**

Safety switches shall be 240 VAC or 480VAC (dependant on the voltage of the circuit used in) NEMA heavy duty, horsepower rated visible blade type. Switches shall be non-fused or fused as indicated on the drawings. Lugs shall be front removable and UL listed for copper conductors. All current carrying parts shall be plated to resist corrosion.

**B. Switch Operating Mechanism**

The switch operating mechanism shall be spring activated quick make - quick break, such that during the normal operation of the switch, the operation of the contacts shall not be capable of being restrained by the operating handle after the closing or opening operation of the contacts has been started.

C. External Operating Handle

The external operating handle shall be an integral part of the box and not the cover. The operating handle shall also indicate the switch position, ON in the up position, OFF in the down position and be capable of being padlocked in the OFF position. An interlock shall be provided to prevent opening the cover when the switch is ON and prevent closing the switch contacts when the cover is opened. This interlock mechanism shall be provided with an externally operated override.

D. Arc Suppressors and Line Terminal Shields

Switches shall be provided with arc suppressors and line terminal shields. Arc suppressors shall be removable if necessary to facilitate access to line side lugs.

E. Number of Switched Poles

Single speed motors shall be provided with three pole switches. Two speed motors shall be provided with six pole switches.

F. Ground Kit

Switches shall be provided with a factory supplied ground kit.

G. Fused Switches

Fused switches shall be provided with class H or K fuses.

H. Short Circuit Rating

The UL Listed short circuit current rating of the switches shall be 10KAIC when used with Class H or K fuses.

I. Enclosures

Safety switches installed indoors shall be provided with NEMA 1 enclosures. Safety switches installed outdoors or in wet areas shall be provided with NEMA 3R enclosures.

J. Service Entrance Equipment

Switches identified for use as Service Entrance Equipment shall be rated and labeled for this application.

## PART THREE: EXECUTION

### 3.1 GENERAL

A. Installation

Safety Switches shall be installed in accordance with Manufacturer's Instructions.

END OF SECTION 26 28 16

## SECTION 26 29 13

### MOTOR CONTROLLERS

#### PART ONE: GENERAL

##### 1.1 GENERAL REQUIREMENTS

###### A. Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section.

###### B. The work of this section includes locally installed, enclosed combination magnetic motor starters and manual motor starters.

##### 1.2 APPLICABLE CODES AND STANDARDS

###### A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NEMA ICS-2	Industrial Control Devices, Controllers and Assemblies.
NEMA ICS-6	Enclosures for Industrial Controls and Systems
UL 508	Industrial Control Equipment.

##### 1.3 SUBMITTALS REQUIRED

###### A. Manufacturer's product data sheets.

###### B. Dimensioned Outline Drawings.

###### C. Control wiring diagrams.

##### 1.4 MANUFACTURERS

###### A. Subject to compliance with the specification requirements:

- Square D
- Cutler Hammer
- General Electric
- Siemens

#### PART TWO: PRODUCTS

##### 2.1 MAGNETIC MOTOR STARTERS

###### A. Full Voltage Type Non-Reversing Type (FVNR)

Unless otherwise noted, magnetic motor starters shall be NEMA rated full voltage non-reversing type. Minimum starter size shall be NEMA 1.

B. Full Voltage Reversing Type (FVR)

Provide FVR starters as required by the Contract Drawings. FVR starters shall be provided with electrical interlock and integral time delay transition between forward and reverse rotation. Starters shall be electrically and mechanically interlocked to prevent both starters being energized simultaneously. Minimum starter size shall be NEMA 1.

C. Two-Speed Starters (2S)

Provide 2S starters as required by the Contract Drawings. 2S starters shall be provided with integral time delay transition between fast and slow speeds. Starters shall be electrically and mechanically interlocked to prevent both starters being energized simultaneously. Minimum starter size shall be NEMA 1.

## 2.2 ITEMS COMMON TO ALL MOTOR STARTERS

A. Enclosure

All components including the disconnecting means shall be installed in a single enclosure rated NEMA 1 for indoor locations and NEMA 3R for wet, damp and outdoor locations.

B. Disconnecting Means

The disconnecting means shall be circuit breaker type, non-fused or fused as shown on the Contract Drawings and provided with an external operating handle which is interlocked to prevent opening the door when the handle is in the ON position and prevent closing the disconnect when the door is opened. The interlock shall be provided with an external mechanism capable of overriding the interlock. The handle shall be capable of being padlocked in the OFF position.

C. Circuit Breakers

Circuit breakers shall be adjustable magnetic trip, motor circuit protector type.

D. Short Circuit Rating

The short circuit rating of the assembly shall be as shown on the Contract Drawings, but not less than the rating of the upstream breaker.

E. Transformer

Each motor starter shall be provided with a control power transformer to provide 120 VAC control power. The transformer shall be provided with two primary fuses and one secondary fuse. The transformer shall be provided with a minimum of 100VA of spare capacity.

F. Overload Relays

Overload relays shall be three-pole, trip free, manually reset Class 20, bimetallic, ambient compensated type with an external reset mechanism.

G. Contactor Coils

Contactor coils shall be provided with surge suppressors.

H. Auxiliary Contacts

Sufficient auxiliary contacts shall be provided for all interlocks. A minimum of one normally open and one normally closed spare contacts shall be provided.



I. Door-Mounted Pilot Devices

A HAND-OFF-AUTO maintained contact selector switch, red RUN and green READY pilot lights shall be provided on each enclosure. All door mounted pilot devices shall be heavy-duty, oil tight type. Pilot lights shall be transformer type.

J. Control Wiring

All control wiring shall be brought to terminal blocks for connection of field cabling. Minimum wire size shall be #12 AWG.

K. Connections

Connections for motor leads shall be suitable for copper conductors applied at their 75°C rating.

## 2.3 MANUAL MOTOR STARTERS

A. Single Phase Fractional HP Manual Motor Starters

Single phase fractional HP manual motor starters shall be toggle operated, enclosed, one or two pole switches as required by the installation.

B. Enclosure

The enclosure shall be NEMA 1 for indoor locations and NEMA 3R for outdoor, wet and damp locations. A handle guard shall be provided to allow the toggle operator to be padlocked in the OFF position.

C. Overloads

Starters shall be provided with trip free melting alloy thermal overloads.

## PART THREE: EXECUTION

### 3.1 GENERAL

A. Installation: Equipment shall be installed in accordance with manufacturer's instructions.

B. Overload Heater Elements

The Contractor shall verify motor nameplate amperes and motor service factors and shall provide all overload heater elements and fuses. Overload heater elements shall be sized in accordance with motor nameplate characteristics.

C. Auxiliary Contacts

The Contractor shall verify and provide the proper number of auxiliary contacts required by equipment provided by others, for control and interlocking of equipment specified in other Divisions of this Specification. Coordinate these requirements with Division 25 Controls Contractor.

END OF SECTION 26 29 13

## SECTION 26 31 00

### FIRE ALARM SYSTEM

#### PART ONE: GENERAL

##### 1.1 GENERAL REQUIREMENTS

###### A. Definition of Work :

This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.

##### 1.2 APPLICABLE CODES AND STANDARDS

###### A. Compliance:

All work shall be in accordance with the laws, rules, codes, and regulations set forth by Local, State, and Federal authorities having jurisdiction. All products and materials shall be manufactured, installed and tested as specified, but not limited to the latest accepted edition of the following codes, standards and regulations:

NFPA 13	Sprinkler Systems
NFPA 70	National Electrical Code
NFPA 72	National Fire Alarm Code
NFPA 101	Life Safety Code
UL 38	Manually Actuated Signaling Boxes
UL 268	Smoke Detectors for Fire Protective Signaling Systems
UL 346	Water-flow Indicators for Fire Protective Signaling Systems
UL 464	Audible Signaling Appliances
UL 521	Heat Detectors for Fire Protective Signaling Systems
UL 864	Control Units for Fire Protective Signaling Systems
UL 1971	Visual Notification Appliances

###### B. Electrically Supervised System

The fire alarm system shall comply with requirements of NFPA Standard 72 for Protected Premises Signaling Systems except as modified and supplemented by this specification. The system shall be electrically supervised and monitor the integrity of all conductors.

###### C. UL Listing

The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.

###### D. Authority Having Jurisdiction

1. The system and its components shall meet all requirements of the Local Authority Having Jurisdiction.
2. The Fire Chief and/or his designee shall approve the design and installation of all fire alarm

systems, key box locations and connection of fire alarm systems to the receiving station.

### 1.3 SUBMITTALS REQUIRED

#### A. Shop Drawings

Shop Drawings shall include but not be limited to the following:

- Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
- Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
- Show annunciator layout, configurations, and terminations.

#### B. Manuals

Manuals shall be submitted simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.

#### C. Wiring Diagrams

Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.

#### D. Sequence of Operation

Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

#### E. Battery Calculation

Provide a complete battery calculation showing that the battery system provided meets the operational requirements as defined by NFPA.

### 1.4 MANUFACTURERS

#### A. Subject to compliance with the requirements of this specification, provide alternate products by one of the following:

- Notifier
- SimplexGrinnell
- Gamewell
- Approved Equal

## PART TWO: PRODUCTS

### 2.1 SYSTEM REQUIREMENTS

#### A. General

A new intelligent reporting, microprocessor controlled fire detection system shall be installed in accordance to the project specifications and drawings.

#### B. Basic System Performance

Basic System performance shall meet the following:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 4 (Class B) Signaling Line Circuits (SLC).
2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
4. On Style 6 or 7 (Class A) configurations a single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
5. Alarm signals arriving at the FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.

#### C. Basic System Functional Operation

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

1. The system alarm LED on the system display shall flash.
2. A local piezo-electric signal in the control panel shall sound.
3. A backlit LCD display shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
4. Printing and history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (notification appliances and/or relays) shall be activated.

### 2.2 SYSTEM CONDUITS, WIRING AND GROUNDING

#### A. Conduits

Conduits shall be in accordance with other sections of this specification and The National Electrical Code (NEC), local and state requirements.

#### B. Wiring

Wiring shall be UL listed and in accordance with local, state and national codes and as

recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG for Notification Appliance Circuits. Wire and cable not installed in conduit shall have a fire resistance rating suitable for the installation as indicated in NFPA 70 (e.g., FPLR).

C. Terminal Boxes, Junction Boxes and Cabinets

All boxes and cabinets shall be UL listed for their use and purpose.

D. Arrangement of Circuit Wiring

Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.

E. Grounding of Fire Alarm Control Panel

The control panel cabinet shall be grounded securely to either a cold water pipe or grounding rod.

## 2.3 FIRE ALARM CONTROL PANEL (FACP)

Main FACP or network node shall contain a microprocessor based Central Processing Unit (CPU) and power supply in an economical space saving single board design. The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal heat detectors, addressable modules, printer, annunciators, and other system controlled devices.

A. Operator Controls

1. Acknowledge Switch: Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel audible signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the LCD display to the next alarm or trouble condition. Depression of the Acknowledge switch shall also silence all remote annunciator audible signals.
2. Alarm Silence Switch: Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenced by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.
3. Alarm Activate (Drill) Switch: The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.
4. System Reset Switch: Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
5. Lamp Test: The Lamp Test switch shall activate all local system LEDs, light each segment of the liquid crystal display and display the panel software revision for service personal.

## B. FACP System Capacity and General Operation

1. The control panel or each network node shall provide, or be capable of expansion to a minimum of 600 intelligent/addressable devices.
2. The control panel or each network node shall include Form-C alarm, trouble, supervisory, and security relays rated at a minimum of 2.0 amps @ 30 VDC. It shall also include four Class B (NFPA Style Y) or Class A (NFPA Style Z) programmable Notification Appliance Circuits.
3. The control panel or each network node shall support up to 8 additional output modules (signal, speaker, telephone, or relay), each with 8 circuits for an additional 64 circuits. These circuits shall be either Class A (NFPA Style Z) or Class B (NFPA Style Y) per the project drawings.
4. The system shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color coded system status LEDs, and an alphanumeric keypad with easy touch rubber keys for the field programming and control of the fire alarm system.
5. The system shall be programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.
6. The system shall allow the programming of any input to activate any output or group of outputs.
7. The system shall be provided with Drift Compensation to extend detector accuracy and filter out transient noise signals.
8. The system shall be provided with Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
9. The system shall be able to display or print system reports.
10. The system shall be provided with periodic detector test, conducted automatically by the software.
11. The system shall be provided with self optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.
12. The system shall be provided with cross-zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
13. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.
15. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 5 to 30 seconds and each detector shall be

able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.

16. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.
17. Point Read: The system shall be able to display or print the following point status diagnostic functions:
  - Device status
  - Device type
  - Custom device label
  - View analog detector values
  - Device zone assignments
  - All program parameters
18. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 800 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose. Systems that do not have dedicated alarm storage, where events are overridden by non-alarm type events, are not suitable substitutes. Each of these activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety. The history buffer shall use non-volatile memory.
19. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
20. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.
21. Software Zones: The FACP shall provide 100 software zones, 10 additional special function zones, 10 releasing zones, and 20 logic zones.
22. Waterflow Detection: An alarm from a waterflow detection device shall activate the appropriate alarm message on the main panel display; turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.
23. Supervisory Operation: An alarm from a supervisory device shall cause the appropriate indication on the system display, light a common supervisory LED, but will not cause the system to enter the trouble mode.
24. Signal Silence Operation: The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch.

25. Non-Alarm Input Operation: Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.
26. Combo Zone: A special type code shall be available to allow waterflow and supervisory devices to share a common addressable module. Waterflow devices shall be wired in parallel, supervisory devices in series.

C. Central Microprocessor

The microprocessor will communicate with, monitor and control all external interfaces. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall not be lost even if system primary and secondary power failure occurs. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.

D. System Display

The display shall annunciate status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.

E. Signaling Line Circuits (SLC)

Each SLC interface shall provide power to and communicate with the intelligent detectors (ionization, photoelectric or thermal) and modules (monitor or control). Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring. The CPU shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, prealarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.

F. Serial Interfaces

The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Information Technology Equipment (ITE) peripherals. The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays. The EIA-485 interface may be used for network connection to a proprietary-receiving unit.

G. Notification Appliance Circuit (NAC)

1. The Notification Appliance Circuit module shall provide four fully supervised Class A or B (NFPA Style Z or Y) notification circuits. An expansion circuit board shall allow expansion to eight circuits per module.
2. The notification circuit capacity shall be 3.0 amperes maximum per circuit and 6.0 amperes maximum per module.
3. The module shall not affect other module circuits in any way during a short circuit condition.
4. The module shall provide eight green ON/OFF LEDs and eight yellow trouble LEDs.



5. The module shall also provide a momentary switch per circuit that may be used to manually turn the particular circuit on or off or to disable the circuit.
6. Each notification circuit shall include a custom label inserted to identify each circuit's location. Labels shall be created using a standard typewriter or word processor.
7. The notification circuit module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL listed for use with up to 12 AWG wire.
8. Each circuit shall be capable of, through system programming, deactivating upon depression of the signal silence switch.
9. Electrical Contractor shall be responsible for furnishing a system smoke detector at the location of any field located NAC modules not shown on the drawings in compliance with NFPA.

#### H. Control Relay Module

1. The control relay module shall provide four Form-C auxiliary relay circuits rated at 5 amperes, 28 VDC. An expansion circuit board shall allow expansion to eight Form-C relays per module.
2. Each relay circuit shall be capable of being activated (change in state) by any initiating device or from any combination of initiating devices.
3. The relay module shall provide 8 green ON/OFF LEDs and 8 yellow LEDs to indicate disabled status of the relay.
4. The module shall provide a momentary switch per relay circuit that may be used to manually turn the relay ON/OFF or to disable the relay.
5. Each relay circuit shall include a custom label inserted to identify its location. Labels shall be created using a standard typewriter or word processor.
6. The control relay module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal blocks shall be UL listed for use with up to 12 AWG wire.

#### I. Enclosure

The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top. The door shall be provided with a key lock and shall include a glass or other transparent opening for viewing of all indicators.

#### J. Power Supply

1. A high tech off-line switching power supply shall be available for the fire alarm control panel or network node and provide 6.0 amps of available power for the control panel and peripheral devices.

2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger for use with batteries up to 60 AH or may be used with an external battery and charger system. Battery arrangement may be configured in the field.
4. The power supply shall continuously monitor all field wires for earth ground conditions, and shall have the following LED indicators:
  - Ground Fault LED
  - AC Power Fail LED
  - NAC on LED (4)
5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
6. The main power supply shall provide a battery charger using dual-rate charging techniques for fast battery recharge and be capable of charging batteries up to 60 AH.
7. All circuits shall be power-limited, per UL864 requirements.
8. The batteries are to be completely maintenance free and shall have sufficient capacity to power the fire alarm system for not less than twenty-four hours plus 5 minutes of alarm upon a normal AC power failure.

K. Surge Protection

All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.

L. Universal Digital Alarm Communicator Transmitter (UDACT)

1. The UDACT is an interface for communicating digital information between a fire alarm control panel and an UL-Listed central station and shall be mounted in a standard module position of the fire alarm control cabinet. The wire connections between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status.
2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.
3. The UDACT shall be completely field programmable from a built-in keypad and 4 character red, seven segment display.
4. The UDACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.
5. Communication shall include vital system status such as:
  - Independent Zone (Alarm, trouble, non-alarm, supervisory)
  - Independent Addressable Device Status

- AC (Mains) Power Loss
- Low Battery and Earth Fault
- System Off Normal
- 12 and 24 Hour Test Signal
- Abnormal Test Signal (per UL requirements)
- EIA-485 Communications Failure
- Phone Line Failure

6. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.

## 2.4 VISUAL STROBE NOTIFICATION DEVICES

Notification strobes shall be 24V xenon type, meet the requirements of the ADA, UL Standard 1971, and be fully synchronized. Minimum intensity is 15/75cd unless otherwise shown on the Drawings.

## 2.5 COMBINATION HORN/STROBE NOTIFICATION DEVICES

Electronic horns shall be 24V, field programmable without the use of special tools, at a sound level of at least 90dBA measured at 10 feet from the device. Strobes shall meet the requirements for Visual Strobe Notification Devices.

## 2.6 MANUAL PULL STATIONS

Manual fire alarm stations shall be analog addressable type, non-breakglass type, equipped with key lock so that they may be tested without operating the handle. Stations must be designed such that after an actual activation, they cannot be restored to normal except by key reset. An operated station shall be visually detected as operated at a minimum distance of 100 feet front or side. Manual stations shall be constructed of high impact Lexan, with operating instructions provided on the cover. The word FIRE shall appear on the manual station in letters 1/2-inch in size or larger.

## 2.7 PHOTOELECTRIC AREA SMOKE DETECTORS

Photoelectric smoke detectors shall be a 24 VDC, two wire, analog addressable type, ceiling-mounted, light scattering type using an LED light source. Each detector shall contain a remote LED output and a built-in test switch. Detector shall be provided on a twist-lock base. It shall be possible to perform a calibrated sensitivity and performance test on the detector without the need for the generation of smoke. The test method shall test all detector circuits. A visual indication of an alarm shall be provided by dual latching Light Emitting Diodes (LEDs), on the detector, which may be seen from ground level over 360 degrees. These LEDs shall flash at least every 10 seconds, indicating that power is applied to the detector. The detector shall not go into alarm when exposed to air velocities of up to 3000 feet (914.4 m) per minute. The detector screen and cover assembly shall be easily removable for field cleaning of the detector chamber. All field wire connections shall be made to the base through the use of a clamping plate and screw.

## 2.8 DUCT SMOKE DETECTORS

Duct smoke detectors shall be a 24 VDC, analog addressable type with integral communications and device identification, and provided with a remote test indicator. Each detector shall be furnished and wired by the electrical contractor and installed by the mechanical contractor in the

supply/return air ducts as shown on the Drawings. Duct smoke detectors shall be provided with properly sized air sampling tubes.

A. Operation of Duct Smoke Detectors

Duct smoke detectors shall be provided with 120V rated, form C contacts that open/close upon sensing of smoke or detector failure. Contacts will be used to shut down the associated air handler when detectors are installed in the supply ducts of the air handler.

## 2.9 HEAT DETECTORS

Automatic heat detectors shall be analog addressable type, and be of combination rate of rise and fixed temperature construction, rated at 135 degrees Fahrenheit for areas where ambient temperatures do not exceed 100 degrees, and 200 degrees for other areas. Heat detectors shall be low profile, ceiling mount type with positive indication of activation, and have smooth ceiling rating of 2500 square feet.

A. Rate of Rise Element

The rate of rise element shall consist of an air chamber, a flexible metal diaphragm, and a factory calibrated, moisture-proof, trouble free vent, and shall operate when the rate of temperature rise exceeds 15 degrees F (9.4 degrees C) per minute.

B. Fixed Temperature Element

The fixed temperature element shall consist of a fusible alloy retainer and actuator shaft.

## 2.10 WATERFLOW INDICATORS

Waterflow Switches shall be an integral, mechanical, non-coded, non-accumulative retard type, with alarm transmission delay time adjustable from 0 to 60 seconds. Initial settings shall be 30-45 seconds.

A. Installation Requirements

Waterflow switches shall be provided and connected under this section but installed by the mechanical contractor. Where possible, locate waterflow switches a minimum of one (1) foot from a fitting which changes the direction of the flow and a minimum of three (3) feet from a valve.

## 2.11 SPRINKLER AND STANDPIPE VALVE SUPERVISORY SWITCHES

A. Where Used

Each sprinkler system water supply control valve riser, zone control valve, and standpipe system riser control valve shall be equipped with a supervisory switch. Standpipe hose valves, and test and drain valves shall not be equipped with supervisory switches.

B. Post Indicator Valve (PIV) Switch

PIV (post indicator valve) or main gate valves shall be equipped with a supervisory switch. The switch shall be mounted so as not to interfere with the normal operation of the valve and adjusted to operate within two revolutions toward the closed position of the valve control, or when the stem has moved no more than one-fifth of the distance from its normal position. The supervisory switch shall be contained in a weatherproof aluminum housing, which shall provide a 3/4 inch (19 mm) conduit entrance and incorporate the necessary facilities for attachment to the valves. The switch housing shall be finished in red baked enamel. The entire installed assembly shall be tamper proof and arranged to cause a switch operation if the housing cover is removed, or if the unit is removed from its mounting.

### C. Valve Supervisory Switches

Valve supervisory switches shall be provided and connected under this section and installed by mechanical contractor. This unit shall provide for each zone: alarm indications using red LED for alarm and yellow LED for trouble and control switches for the control of fire alarm control panel functions. The annunciator will also have an ON-LINE LED, local electric alarm signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.

## 2.12 ELEVATOR CONTROL MODULE

## PART THREE: EXECUTION

### 3.01 INSTALLATION

#### A. Installation Requirements

1. Installation shall be in accordance with the NEC, NFPA 72, local and state codes, as shown on the drawings, and as recommended by the major equipment manufacturer.
2. Prior to installation, the fire alarm contractor shall complete an Application for Installation of Fire Protection Systems. No work shall be performed until approved by the Hooksett fire Department.
3. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
4. All conduit, junction boxes, conduit supports and hangers shall be concealed in finished areas and may be exposed in unfinished areas.
5. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.
5. Smoke detectors shall be provided with dust covers to remain in place during construction to protect smoke detectors from contamination and physical damage. Dust covers shall be removed prior to final acceptance.
6. All fire detection and alarm system devices, control panels and remote annunciators shall be flush mounted when located in finished areas and may be surface mounted when located in unfinished areas.
7. Manual fire alarm boxes shall be suitable for surface mounting or semi-flush mounting as shown on the plans, and shall be installed not less than 42 inches (1067 mm), nor more than 48 inches (122 mm) above the finished floor.

### 3.02 TESTING

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of

the adjustments and tests for the system.

#### A. Testing Requirements

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.
3. Verify activation of all waterflow switches.
4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open and short signaling line circuits and verify that the trouble signal actuates.
6. Open and short notification appliance circuits and verify that trouble signal actuates.
7. Ground all circuits and verify response of trouble signals.
8. Check presence and audibility of tone at all alarm notification devices and verify intelligibility and content of voice messages.
9. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
11. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

### 3.03 FINAL INSPECTION AND CERTIFICATION

At the final inspection, a factory-trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect. Upon completion of testing submit a certification from the major equipment manufacturer indicating that the supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

### 3.04 INSTRUCTION

Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation."

### 3.05 GUARANTEE

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance.

The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

END OF SECTION 26 31 00

## SECTION 26 31 13

### LIGHTING FIXTURES

#### PART ONE: GENERAL

##### 1.1 GENERAL REQUIREMENTS

###### A. Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work, and section 26 05 33, Raceway and Fittings, apply to the work of this section.

##### 1.2 APPLICABLE CODES AND STANDARDS

###### A. Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

CBM Labels	Certified Ballast Manufacturers Assoc.
NEC Art. 410	National Electrical Code
FCC, Part 18	RFI and EMI
ANSI C62.41	Line Transient Protection
UL 1570	Fluorescent Lighting Fixtures
UL 1572	HID Lighting Fixtures
UL 1571	Incandescent Lighting Fixtures
UL 924	Emergency Lighting and Power Equipment
UL 1088	Temporary Lighting

##### 1.3 SUBMITTALS REQUIRED

###### A. Data Sheets, Photometrics and Installation Instructions

Submit manufacturer's product data, photometrics, and installation instructions for each type of light fixture specified. Fixture submittals will be in booklet form with separate sheet for each fixture assembled in "luminaire type" alphabetical order, with proposed fixture and accessories clearly indicated on each sheet.

###### B. Ballast Requirements

Submit on a separate sheet for each HID and fluorescent fixture type specified, the ballast manufacturer, type and technical data for that ballast.

###### C. Lamp Requirements

Submit on a separate sheet for each light fixture specified, the proposed lamp and manufacturer's data for that lamp.

##### 1.4 MANUFACTURERS

###### A. General

The fixture types, manufacturers and model numbers are shown on the lighting schedule in the Contract Drawings. These fixtures and manufacturers are listed to establish a baseline type, style and quality of fixture to be provided. Although one manufacturer may be listed on this lighting schedule, other manufacturers' representatives may submit fixtures for consideration as "equal" fixtures to facilitate the "packaging" of the lighting fixtures within the representative's product



lines. The architect and engineer however reserve the right to require certain individual fixtures be provided of the model and manufacturer specified in order to meet specific design intent by the architect or engineer.

**B. Exterior Fixtures**

The Architect and Engineer reserve the right to require that the specified model and manufacturer of some or all of the exterior lighting fixtures be furnished by this contractor, due to approvals of local authorities required prior to Issue of Project Documents. No additional compensation will be furnished to the contractor for “assumptions” that alternate fixtures could be substituted for those specified.

**PART TWO: PRODUCTS**

**2.1 GENERAL**

**A. Light Fixtures**

Light fixtures shall be provided with housings, trims, ballasts, lamp holders, sockets, reflectors, wiring and other components required, as a factory-assembled unit for a complete installation.

**B. Electrical Wiring**

Provide electrical wiring within light fixtures suitable for connecting to branch circuit wiring in accordance with N.E.C. Article 410, Paragraph 25.

**C. Packaging**

Deliver interior lighting fixtures shall be delivered in factory fabricated containers and wrapping, in order to properly protect fixtures from damage.

**D. Storage**

Interior lighting fixtures shall be stored in original packaging. Store inside well-ventilated area protected from weather, moisture, soiling, humidity, extreme temperatures, laid flat and on skids to keep off floors and ground.

**E. Ceiling Fixtures**

Fixtures installed in ceilings, suspended from ceilings or on walls shall be installed with a plastic film covering protecting the lens, louver and lamps from dust, dirt and debris during construction. Plastic film shall be removed upon the completion of construction.

**2.2 FLOURESCENT FIXTURES**

**A. General**

Provide fluorescent fixtures of sizes, types and ratings indicated and specified in the Lighting Fixture Schedule on the Contract Drawings. All lamp/ballast combinations shall be listed by the CEE as energy efficient and accepted by Efficiency Maine for rebate purposes. Fixture efficiencies shall also meet those specified for Efficiency Maine rebates.

**B. Fluorescent-Lamp Ballasts**

Provide low-energy solid state fluorescent lamp ballasts, capable of operating lamp types indicated, with a minimum power factor of 0.90 and Class A sound rating. Ballasts shall have lamp current crest factor of 1.7 or less and total harmonic distortion less than 20%. Ballast factor shall be

0.88-1.0. Ballast shall be program start for maximum efficiency and parallel wired such that if one lamp fails the remaining lamps stay lit.

1. Manufacturers

Subject to compliance with the requirements, provide ballasts by one of the following:

- Osram Sylvania
- General Electric
- Phillips

C. Compact Fluorescent Ballasts

Provide solid-state electronic ballasts capable of operating lamp types specified. Ballasts shall have a total harmonic distortion not to exceed 20%. Ballasts shall have an end of lamp life sensing circuit capable of shutting the lamp down to prevent lamp glass from cracking and preventing lamp base and sockets from melting. Ballasts shall have a ballast factor of 0.90-1.00.

1. Manufacturers

Subject to compliance with requirements provide dimming ballasts by one of the following:

- Osram Sylvania
- General Electric
- Advance

2.3 LED FIXTURES

A. LED Fixture Requirements

Provide LED lighting fixtures of the wattages, initial lumen outputs and color temperatures specified in the fixture schedule. LED fixtures shall be furnished with 0-10V dimmable driver. Fixtures shall be DLC listed and/or approvable by PSNH/Eversource for a full rebate.

2.4 HIGH INTENSITY DISCHARGE FIXTURES

A. High Intensity Discharge Fixture Requirements

Provide HID lamp ballasts, of ratings, types and makes as recommended by lamp manufacturer, which properly mates and matches lamps to electrical supply by providing appropriate voltages and impedances for which lamps are designed. Design ballast to operate lamp within the lamp's power trapezoid requirements..

2.5 LAMPS

A. Lamp Requirements

Provide HID, fluorescent and incandescent lamps of types as indicated on the contract drawings. Acceptable lamp manufacturers are Osram Sylvania, Inc. and Philips Lighting Co.

2.6 INTERIOR LIGHTING CONTROLS – STAND-ALONE SYSTEMS

A. OCCUPANCY SENSORS

Occupancy sensors of the type and model specified on the drawings shall be provided, installed and wired into the local lighting circuit in the area that the sensors are installed. The engineer

will consider equipment of another equal manufacturer, where suitable coverage can be documented.

1. Passive Infrared Wall-Mount Fixtures

Wall mounted occupancy sensors shall be furnished with a pushbutton operator, with specified range of operation, and suitable for single or dual circuit operation as required by the application as outlined on the contract drawings.

2. Ultrasonic/Infrared Ceiling-Mounted Sensors

Ceiling mounted occupancy sensors shall be self-calibrating type, or the type and specified range of operation as specified on the contract drawings.

3. Power Packs

Power packs shall be provided as required for each room provided with occupancy sensors as needed.

4. Slave Relay Packs

Slave relay packs shall be provided in rooms with more than one lighting circuit controlled by the occupancy sensor.

5. Additional Installation Requirements

Provide all miscellaneous equipment and wiring for a complete installation.

## 2.7 EXTERIOR LIGHTING CONTROLS

### A. General

Operation of exterior lighting is to be provided with a combination of photocell (ON), time clock (ON or OFF), and automatic control override switch (ON) through a UL listed lighting contactor. These controls shall be provided with all components required for a fully-operable system.

### B. Lighting Contactors

Lighting contactors shall be provided in a NEMA 1 enclosure sufficiently sized to also house the time clock. Lighting contactors shall be listed for operation with the voltages shown on the Contract Drawings. Lighting contactors shall be multi-pole type sized sufficiently for the number of circuits shown on the contract drawings and a minimum of one spare circuit. Contactors shall be mechanically held with Normally Open (N.O.) contacts which are convertible to Normally Closed (N.C.) type.

### C. Photocells

Photocells shall be provided as shown on the Contract Drawings. Mounting location and height shall be as shown on the Drawings and further coordinated with the architect and engineer prior to installation for exact location of box. Photocell shall be provided with NEMA 4 enclosure to be mounted on standard 2"x4" exterior junction box.

### D. Time Clocks

Time clocks shall be 24-hour type with mechanical rotary dial operator.

## PART THREE: EXECUTION

### 3.1 GENERAL

#### A. Prior Examination

Examine all areas and conditions under which lighting fixtures are to be installed and structure which will support lighting fixtures. Notify the Contractor in writing of any conditions detrimental to proper installation and completion of the work. Do not proceed with work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

#### B. Coordinate Installation

Coordinate light fixture installations with other trades. Fluorescent light fixtures should be installed at least two feet away from smoke detectors. Coordinate all lighting fixtures with mechanical piping and ductwork to allow for proper clearance.

### 3.2 INSTALLATION

#### A. Locations and Heights

Install all lighting fixtures at locations and heights indicated, in accordance with the architectural reflected ceiling plans.

#### B. Recessed Lighting Fixtures

All recessed lighting fixtures installed in ceiling which require a fire resistance rating shall be installed in accordance with the 1996 BOCA National Building Code Section 713.

#### C. Fastening and Supporting Fixtures

Provide fixtures and/or fixture outlet boxes with hangers, channel or other method of fastening and supporting fixtures required for proper installation.

#### D. Pendant Mounted Fixtures

All pendant mounted fixtures shall be installed plumb and level or as detailed on the Contract Drawings. Pendant mounted fixtures longer than 18" shall have twin hangers of type specified.

#### E. Tightening Values

Tighten connectors and terminals, including screws and bolts in accordance with equipment manufacturer's published torque tightening values for equipment connectors. All screws and bolts shall have washers.

### 3.3 SPLICES AND TERMINATIONS

#### A. General

Twist on wire connectors shall be installed which utilize square-wire spring grips and thermo plastic shells. Install connectors to meet the manufacturer's torquing requirements. Install wire connectors of size required as not to exceed the manufacturers UL-listed CSA recognized wire combinations

### 3.4 FIELD QUALITY CONTROL

#### A. Replacement of Lamps

At date of substantial completion, all lamps that are not functioning, have color deficiencies, or are noticeably dimmed shall be replaced with new lamps as determined by the Engineer.

B. Temporary Lighting Replacement

All lamps used for temporary lighting in new light fixtures shall be replaced with new lamps.

C. Cleaning Light Fixtures

All light fixtures shall be cleaned of dirt and debris upon completion of construction. All finger prints and smudges shall be cleaned.

D. Protection During Construction

All installed fixtures during remainder of construction shall be protected in accordance with section 2.1.5 of this specification section.

E. Grounded

All light fixtures shall be grounded in accordance with article 250 and 410 of the NEC. Tighten connections to comply with tightening torques specified in UL 486A to assure permanent and effective grounds.

F. Damaged Light Fixtures

All light fixtures damaged in shipping or during installation shall be replaced with new fixtures at no cost to the owner.

G. Stock or Replacement Lamps

Furnish stock or replacement lamps amounting to 10%, but no less than six lamps, of each type and size lamp used in each type of lighting fixture. Deliver replacement stock as directed to Owner's storage space.

END OF SECTION 26 31 13

## SECTION 26 43 13

### TRANSIENT VOLTAGE SURGE SUPPRESSION

#### PART ONE: GENERAL

##### 1.1 GENERAL REQUIREMENTS

###### 1.1.1 Provisions

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section.

###### 1.1.2 Equipment

This section describes the materials and installation requirements for surge protection devices for the protection of AC electrical circuits from the effects of lightning induced currents, substation switching transients and internally generated transients resulting from inductive and/or capacitive load switching.

##### 1.2 APPLICABLE CODES AND STANDARDS

###### 1.2.1 Products

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

NFPA 70	National Electrical Code
NFPA 780	Standard for the Installation of Lightning Protection Systems
UL 1283	Standard for Electromagnetic Interference Filters
UL 1449	Transient Voltage Surge Suppression
ANSI/IEEE C62.41	8x20 Single Impulse Current Test

##### 1.3 SUBMITTALS REQUIRED

###### 1.3.1 Data Sheets and Drawings

Manufacturer's product data sheets, shop drawings and system layout drawings shall be submitted for approval prior to installation. Layout drawings shall include locations of all devices and required connections. Product data shall include manufacturer's written recommendations for installation.

##### 1.4 MANUFACTURERS

Subject to compliance with the specification requirements:

- Square D
- Cutler Hammer
- General Electric
- Siemens
- Erico/Critec
- Mersen

## PART TWO: PRODUCTS

### 2.1 GENERAL

#### 2.1.1 Mounted Assembly

TVSS modules may be provided remote mounted or integral to the panelboard the device is directly protecting. However, if the manufacturer, supplier or contractor decides to provide this as a remote mounted assembly, all components including but not limited to breakers, wiring, and conduit required by this installation shall be provided by the contractor at no additional cost to the owner. Remote mounted assembly shall be provided in a NEMA 1 enclosure or as indicated by the drawings.

#### 2.1.2 UL Listed

TVSS system shall be UL Listed.

#### 2.1.3 Service Entrance

Service entrance TVSS system shall be suitable for use in service entrance locations.

#### 2.1.4 Materials of Construction

TVSS shall be Metal Oxide Varistor (MOV) based, however, silicon avalanche diode (SAD) and combination MOV and SAD systems will be considered if submitted.

#### 2.1.5 Protection

TVSS protection shall be for all modes of protection, Line-to-Line/Line-to-Neutral, Line-to-Ground, and Ground-to-Neutral. The maximum surge current capability shall be at least 160kA for the (5) service entrance TVSS units and 120kA for the panel mounted TVSS unit feeding the communications equipment. Maximum surge capability shall be measured as the sum of the Line-to-Neutral value plus the Line-to-Ground value.

#### 2.1.6 Suppression Voltage Ratings

The UL component suppression voltage ratings shall not exceed the following:

Voltage	Line-to-Neutral	Line-to-Ground	Neutral-to-Ground	Line-to-Line
208Y/120V	400V	400V	400V	700V

#### 2.1.7 Let Through Voltages

The ANSI/IEEE C62.41 (1991) Category C3 let through voltages shall not exceed the following:

Voltage	Line-to-Neutral	Line-to-Ground	Neutral-to-Ground
208Y/120V	520V	520V	520V

#### 2.1.8 Protection

Unit shall be capable of protecting against and surviving 5000 ANSI/IEEE C62.41 Category C transients without failure.

### 2.1.9 Operating Voltage

Each TVSS shall be designed to withstand a maximum continuous operating voltage (MCOV) of not less than 115% of nominal RMS voltage.

### 2.1.10 Monitoring

TVSS shall be provided with onboard visual and audible diagnostic monitoring. Indicator lights/LED's shall provide fulltime visual diagnostic monitoring of the operational status of each phase of the surge current diversion module and shall differentiate full operation, reduced system operation and system failure. An audible alarm shall be provided to indicate a fault condition.

## PART THREE: EXECUTION

### 3.1 GENERAL

#### 3.1.1 Installation

Equipment shall be installed in accordance with manufacturer's instructions.

#### 3.1.2 Mounting

Remote mounted TVSS units shall be mounted as close to the electrical panel they are fed from as possible and shall use short, straight wiring runs with minimum slack, no extra turns and no loops to minimize circuit inductance and shall not exceed manufacturer's recommended maximum distance of installation.

#### 3.1.3 Warranty

TVSS shall be provided with a five-year warranty.

END OF SECTION 26 43 13



## **SECTION 26 70 00**

### **TELEPHONE AND DATA SYSTEMS**

#### **PART ONE: GENERAL**

##### **1.1 GENERAL REQUIREMENTS**

###### **A. Provisions**

The provisions of Section 26 05 00, General Requirements for Electrical Work apply to the work of this section. The intent of this document is to provide a standard specification that will be used for providing voice and data drops within the new addition to the building, including wiring, conduits and boxes only. It is intended that all devices and equipment will be furnished by the Owner.

###### **B. Project Conditions**

Jack locations, number of data connections to each jack locations are shown on the Contract Drawings.

#### **PART TWO: PRODUCTS**

##### **2.1 CONDUITS**

See Section 26 05 33, Electrical Raceways for conduit and raceway requirements.

##### **2.2 CABLING**

A. Data Cabling: Shall be Category 6.

#### **PART THREE: EXECUTION**

##### **3.1 GENERAL**

A. See Section 26 05 00, General Requirements for Electrical Work for wiring installation requirements.

B. Install plenum cable exclusively on this project, except that cables installed in or under slab shall be rated for wet environments.

C. When not in conduit or cable tray install in J-Hooks designed explicitly for communications cabling. Bridle rings, cable ties, mechanical, and structural steel are not acceptable means of supporting communications cables.

D. Wiring Method: Conceal conductors and cables in accessible ceilings, walls, and floors where possible.

- E. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.
- F. Comply with TIA/EIA-569-B for pull-box sizing and length of conduit and number of bends between pull points.
- G. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems" for installation of conduits and wireways.
- H. Install manufactured conduit sweeps and long-radius elbows whenever possible.

### 3.2 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
  - 1. Comply with TIA/EIA-568-C.1.
  - 2. Cables may not be spliced. Secure and support cables at intervals not exceeding 48 inches (1220 mm) and not more than 6 inches (150 mm) from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 3. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
  - 4. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
  - 5. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  - 6. Cold-Weather Installation: Bring cable to room temperature before dereeling. Heat lamps shall not be used for heating.
  - 7. In the communications equipment room, install a 10-foot- (3-m-) long service loop, at the remote termination install a 3-foot (1-m) long service loop.
  - 8. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
  - 1. Comply with TIA/EIA-568-C.2.
  - 2. Do not untwist UTP cables more than 1/2 inch (12 mm) from the point of termination to maintain cable geometry.
- D. Open-Cable Installation:
  - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  - 2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches (200 mm) above ceilings by cable supports not more than 48 inches (1220 mm) apart.
  - 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.

- E. Group connecting hardware for cables into separate logical fields.
  - 1. All VOICE cables shall terminate in Patch panels designated for VOICE.
  - 2. All DATA cables shall terminate on Patch panels designated for DATA.

### 3.3 IDENTIFICATION

#### A. Cable and Wire Identification:

- 1. Label each cable within 4 inches (100 mm) of each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated.
- 2. Each wire connected to building-mounted devices is not required to be numbered at device if color of wire is consistent with associated wire connected and numbered within panel or cabinet.
- 3. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.

### 1.2 FIELD QUALITY CONTROL

#### A. Perform tests and inspections.

#### B. Tests and Inspections:

- 1. Visually inspect UTP jacket materials for NRTL certification markings.
- 2. Visually inspect cable placement, grounding and bonding, equipment and patch cords, and labeling of all components.

END OF SECTION 26 70 00

## SECTION 26 60 00

### PROPANE GENERATOR (ADD ALTERNATE) AND AUTOMATIC TRANSFER SWITCH (BASE BID)

#### **PART ONE – GENERAL**

##### 1.01 GENERAL REQUIREMENTS

- A. The Work of this section includes all labor, materials, tools, equipment and incidentals necessary to provide, put in operation and field test one propane fueled engine driven generator unit of the size and rating specified with all associated equipment and devices as specified herein.
- B. The requirements of SECTION 16000, GENERAL REQUIREMENTS FOR ELECTRICAL WORK are a part of the Work of this section.

##### 1.02 APPLICABLE CODES AND STANDARDS

###### A. PRODUCTS

Products shall comply with the following codes and standards and shall be UL-listed and labeled:

UL 1008	Emergency Systems
NEMA MG1	Motors and Generators
NFPA 110	Emergency and Standby Power Systems

##### 1.03 SUBMITTALS REQUIRED

###### A. DATA SHEETS

Manufacturers data and catalog cuts on the engine, generator set, silencer, vibration isolators, static battery charger, starting batteries, generator main breaker, and engine governor.

###### B. OUTLINE DRAWINGS

Dimensioned outline drawings indicating weights, components, accessories, and field connections.

###### C. SCHEMATIC DRAWINGS

Electrical drawings including schematic and connection diagrams showing terminal block identification and arrangement, field and unit wiring. Include generator reactance and short circuit data.

###### D. TEST REPORTS

- Summary test reports for prototype tests and certified reports for production tests
- Generator Capability Curves
- Exhaust Chemistry
- Sound Level reports
- Manufacturer's computer generated sizing verifying generator sizing. Onan was basis of design see attached calculations for sizing assumptions.

E. DELIVERY SCHEDULE AND STATEMENT OF WARRANTY

Furnish delivery schedule and Statement of Warranty.

F. OPERATION MANUALS

Prior to final acceptance, operators and spare parts manuals shall be provided for all system equipment. The manuals shall include outline, interconnection, wiring, and control drawings accurately describing the equipment provided. Provide ladder logic for all programmable logic controllers in the system.

1.04 TESTING

Manufacturer's certified test record. The test record shall show the generator performance and frequency regulation to satisfy the requirements specified herein, and shall also show fuel consumption rates at 1/2 load, 3/4 load and full rated load.

1.05 MANUFACTURERS

Subject to compliance with the specification requirements:

- Onan/Cummins
- Caterpillar
- Kohler

**PART TWO – PRODUCTS**

2.01 SYSTEM DESCRIPTION

A. PROPANE ENGINE GENERATOR SET

Generator shall be a 4-cycle, 1800 RPM, propane engine generator set. Engine generator unit furnished shall be not less than 85kW, 106.25kW, 0.8 power factor capacity with 3-phase, 60 Hertz, 208/120Volts, 4-wire alternating current generator.

B. VOLTAGE REGULATION

Voltage regulation shall be plus or minus 1% for any constant load between no load and rated load. Random voltage variation with any steady load from no load to full load shall not exceed plus or minus 1%.

C. FREQUENCY REGULATION

Frequency regulation shall be isochronous from steady state no load to steady state rated load. Random frequency variation with any steady load from no load to full load shall not exceed plus or minus 0.25%.

2.02 ENGINE REQUIREMENTS

The engine shall be propane, 4 cycle, radiator and fan cooled. Minimum displacement shall be 412 cubic inches, with 10 cylinders. The horsepower rating of the engine at it's minimum tolerance level shall be sufficient to drive the alternator and all connected accessories. Two cycle engines are not acceptable. Engine accessories and features shall include:

- An electronic governor system shall provide automatic isochronous frequency regulation.
- Skid-mounted radiator and cooling system rated for full load operation in 122 degrees F (50 degrees C) ambient as measured at the generator air inlet. Radiator shall be provided with a duct adapter flange. The cooling system shall be filled with 50/50 ethylene glycol/water

mixture by the equipment supplier. Rotating parts shall be guarded against accidental contact per OSHA requirements.

- An electric starter(s) capable of three complete cranking cycles without overheating.
- Positive displacement, mechanical, full pressure, lubrication oil pump.
- Full flow lubrication oil filters with replaceable spin-on canister elements and dipstick oil level indicator.
- Replaceable dry element air cleaner with restriction indicator.
- Flexible supply and return fuel lines.
- Engine mounted battery charging alternator, 45 ampere minimum, and solid-state voltage regulator.

## 2.03 AC GENERATOR

- The AC generator shall be; synchronous, four pole, 2/3 pitch, revolving field, drip-proof construction, single pre-lubricated sealed bearing, air cooled by a direct drive centrifugal blower fan, and directly connected to the engine with flexible drive disc. All insulation system components shall meet NEMA MG1 temperature limits for Class H insulation system. Actual temperature rise measured by resistance method at full load shall not exceed 125°C.
- The generator shall be capable of delivering rated output (kVA) at rated frequency and power factor, at any voltage not more than 5 percent above or below rated voltage.
- A permanent magnet generator (PMG) shall be included to provide a reliable source of excitation power for optimum motor starting and short circuit performance. The PMG and controls shall be capable of sustaining and regulating current supplied to a single phase or three phase fault at approximately 300% of rated current for not more than 10 seconds

## 2.04 ENGINE GENERATOR CONTROLS

- The generator set shall be provided with a microprocessor-based control system which is designed to provide automatic starting, monitoring, and control functions for the generator set. The control system shall also be designed to allow local monitoring and control of the generator set, and remote monitoring and control as described in this specification.
- The control shall be mounted on the generator set. The control shall be vibration isolated and prototype tested to verify the durability of all components in the system under the vibration conditions encountered.
- The control shall be UL508 listed, CSA282-M1989 certified, and meet IEC8528 part 4. All switches, lamps and meters shall be oil-tight and dust-tight, and the enclosure door shall be gasketed. There shall be no exposed points in the control (with the door open) that operate in excess of 50 volts. The controls shall meet or exceed the requirements of Mil-Std 461C part 9, and IEC Std 801.2, 801.3., and 801.5 for susceptibility, conducted, and radiated electromagnetic emissions. The entire control shall be tested and meet the requirements of IEEE587 for voltage surge resistance.
- The generator set mounted control shall include the following features and functions:
  - Three position control switch labeled RUN/OFF/AUTO. In the RUN position the generator set shall automatically start, and accelerate to rated speed and voltage. In the OFF position the generator set shall immediately stop, bypassing all time delays. In the AUTO position the generator set shall be ready to accept a signal from a remote device to start and accelerate to rated speed and voltage.
  - Red "mushroom-head" push-button EMERGENCY STOP switch. Depressing the emergency stop switch shall cause the generator set to immediately shut down, and be locked out from automatic restarting.
  - Push-button RESET switch. The RESET switch shall be used to clear a fault and allow restarting the generator set after it has shut down for any fault condition.

- Push-button PANEL LAMP switch. Depressing the panel lamp switch shall cause the entire panel to be lighted with DC control power. The panel lamps shall automatically be switched off 10 minutes after the switch is depressed, or after the switch is depressed a second time.
- Generator Set AC Output Metering: The generator set shall be provided with a metering set including the following features and functions:
- 2.5-inch, 90 degree scale analog voltmeter, ammeter, frequency meter, and kilowatt (KW) meter. These meters shall be provided with a phase select switch and an indicating lamp for upper and lower scale on the meters. Ammeter and KW meter scales shall be color coded in the following fashion: readings from 0-90% of generator set standby rating: green; readings from 90-100% of standby rating: amber; readings in excess of 100%: red.
- Digital metering set, 0.5% accuracy, to indicate generator RMS voltage and current, frequency, output current, output KW, KW-hours, and power factor. Generator output voltage shall be available in line-to-line and line-to-neutral voltages, and shall display all three phase voltages (line to neutral or line to line) simultaneously.

## 2.05 GENERATOR SET ALARMS

### A. ALARM STATUS/DISPLAY

The generator set shall be provided with alarm and status indicating lamps to indicate non-automatic generator status, and existing alarm and shutdown conditions. The lamps shall be high-intensity LED type. The lamp condition shall be clearly apparent under bright room lighting conditions. The generator set control shall indicate the existence of the following alarm and shutdown conditions on a digital display panel:

- over speed (shutdown)
- low oil pressure (alarm)
- low oil pressure (shutdown)
- high coolant temperature (alarm)
- high coolant temperature (shutdown)
- low coolant temperature (alarm)
- low coolant level (alarm or shutdown--selectable)
- low DC voltage (alarm)
- high DC voltage (alarm)
- weak battery (alarm)
- fail to crank (shutdown)
- over crank (shutdown)
- high AC voltage (shutdown)
- low AC voltage (shutdown)
- under frequency (shutdown)
- over current (warning)
- over current (shutdown)
- over load (alarm)

### B. ENGINE STATUS MONITORING

- Engine oil pressure (psi or kappa)
- Engine coolant temperature (degrees F or C)
- Engine speed (rpm)
- Number of hours of operation (hours)
- Number of start attempts
- Battery voltage (DC volts)

## 2.06 GENERATOR BASE

The engine-generator set shall be mounted on a heavy duty, steel base to maintain alignment between components. The base shall incorporate a battery tray with hold-down clamps within the rails.

## 2.07 COOLANT HEATER

- Coolant heater shall be engine mounted, thermostatically controlled, coolant heater for each engine. Heater voltage shall be as shown on the project drawings.
- The coolant heater shall be installed on the engine with silicone hose connections. Steel tubing shall be used for connections into the engine coolant system where ever the length of pipe run exceeds 12 inches. The coolant heater installation shall be specifically designed to provide proper venting of the system. The coolant heaters shall be installed using quick disconnect couplers to isolate the heater for replacement of the heater element. The quick disconnect/automatic sealing couplers shall allow the heater element to be replaced without draining the engine cooling system or significant coolant loss.
- The coolant heater shall be provided with a 24VDC thermostat, installed at the engine thermostat housing. An AC power connection box shall be provided for a single AC power connection to the coolant heater system.
- The coolant heater(s) shall be sized as recommended by the engine manufacturer to warm the engine to a minimum of 100F (40C) in a 40F ambient, in compliance with NFPA110 requirements.

## 2.08 STARTING AND CONTROL BATTERIES

Starting battery bank, calcium/lead antimony type, 12 or 24 volt DC, sized as recommended by the generator set manufacturer, shall be supplied for each generator set with battery cables and connectors.

## 2.09 BATTERY CHARGER

Current limiting type designed to float at 2.17 volts/cell and equalize at 2.33 volts per cell. Include overload protection, full-wave rectifier, DC ammeter and voltmeter and 120V fused input. Provide wall-mounted NEMA 1 enclosure.

## 2.10 EXHAUST SILENCER

Exhaust muffler(s) shall be provided for each engine, size and type as recommended by the generator set manufacturer. The mufflers shall be critical grade. Exhaust system shall be installed according to the generator set manufacturers recommendations and applicable codes and standards.

## 2.11 OUTDOOR WEATHER PROTECTIVE HOUSING

Generator set housing shall be provided factory-assembled to generator set base and radiator cowling. Housing shall provide ample airflow for generator set operation at rated load in the ambient conditions previously specified. The housing shall have hinged side-access doors and rear control door. All doors shall be lockable. All sheet metal shall be primed for corrosion protection and finish painted with the manufacturer's standard color using a two step electro-coating paint process, or equal meeting the performance requirements specified below. All surfaces of all metal parts shall be primed and painted. Painting of hoses, clamps, wiring harnesses, and other non-metallic service parts shall not be acceptable. Fasteners used shall be corrosion resistant, and designed to minimize marring of the painted surface when removed for normal installation or service work.



## 2.12 AUTOMATIC TRANSFER SWITCH

- A. ATS system shall be 200A, 120/208-volt, 3-pole. Enclosure shall be rated NEMA 1.
- B. ATS shall be furnished with fully rated, silver plated copper ground and neutral bus.
- C. ATS shall be furnished with break-before-make action and mechanical interlocks to prevent simultaneous closing of normal and standby contacts.
- D. ATS shall be furnished with two (2) contacts rated at 5A continuous at 100VAC for customer use.
- E. An exerciser timer with momentary test pushbutton shall be incorporated within the microprocessor and shall be capable of starting the engine generator set and transferring the load (when selected) for exercise purposes on a daily, weekly or monthly basis. The exerciser shall contain a battery for memory retention during an outage.

## **PART THREE – EXECUTION**

### 3.01 INSTALLATION

#### A. GENERAL

Install propane engine-driven generator unit as indicated, in accordance with the equipment manufacturer's written instructions, and with recognized industry practices, to ensure that engine-generator units fulfill requirements. Comply with NFPA and NEMA standards pertaining to installation of engine-generator sets and accessories.

#### B. COORDINATION

Coordinate with other work, including raceways, electrical boxes and fittings, fuel tanks, piping and accessories, as necessary to interface installation of engine-generator equipment work with other work.

#### C. CONNECTION

Tighten connectors and terminals, including screws and bolts, in accordance with equipment manufacturer's published torque tightening values for equipment connectors. Where manufacturer's torquing requirements are not indicated, tighten connectors and terminals to comply with tightening torques specified in UL Std 486A, B and the National Electrical Code.

#### D. WIRING

Provide all interconnecting wiring and branch circuits for field mounted accessories.

#### E. COOLANT

Provide engine coolant with conditioner as recommend by the manufacturer.

### 3.02 STARTUP

Contractor shall engage local equipment manufacturer's representative to perform start-up and building load tests upon completion of installation. Provide certified test record.

### 3.03 WARRANTY

All products specified under this section shall be warranted by the manufacturer or a factory authorized dealer unconditionally for a period of one year from the date of acceptance by the owner. Warranty shall include total service 24 hours per day, 7 days per week, with a 4 hour response time. All costs incurred including labor, materials, travel, and other expenses are to be covered under this warranty.

**END OF SECTION 266000**



## Recommended Generator Report - 85GGHG

Project - Barrington Town Office

Comments -

### Project Requirements

Frequency, Hz	: 60.0	Generators Running in Parallel	: 1
Duty	: Standby	Site Altitude, ft(m)	: 361(152)
Voltage	: 120/208, Parallel Wye	Site Temperature, °C	: 25
Phase	: 3	Max. Altr Temp Rise, °C	: 125
Fuel	: Propane	Project Voltage Distortion Limit, %	: 10
Emissions	: EPA, stationary emergency application		

### Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 60.5	Max. Step kW	: 75.1 In Step 2	Cumulative Step kW	: 107.1
Running kVA	: 68.1	Max. Step kVA	: 178.9 In Step 2	Cumulative Step kVA	: 214.6
Running PF	: 0.89	Peak kW	: None	Cumulative Peak kW	: None
Running NLL kVA	: 2.1	Peak kVA	: None	Cumulative Peak kVA	: None
Alternator kW	: 61.52			Pct Rated Capacity	: 71.8

### Generator Set Configuration

Alternator	: UC3C	Engine	: WSG-1068A
BCode	: B413	Fuel	: Propane
Excitation	: PMG	Displacement, cu in. (Litre)	: 412.0(6.8)
Voltage Range	: UBR 208-240/416-480	Cylinders	: 10
Number of Leads	: 12	Altitude Knee, ft(m)	: 3600(1097)
Reconnectable	: Yes	Altitude Slope, % per 1000ft(304.8m)	: 4
Full Single Phase Output	: No	Temperature Knee, °F(°C)	: 104(40)
Increased Motor Starting	: No	Temperature Slope, % per 10°F(5.56°C)	: 1
Extended Stack	: No	Emissions	: *
		Cooling Package	:

\*Note: Consult your Cummins Power Generation Distributor for more information.

### Set Performance

### Load Requirements

Running At	: 71.8% Rated Capacity		
Max. Step Voltage Dip, %	: 26	Max. Allowed Step Voltage Dip	: 35 In Step 2
Max. Step Frequency Dip, %	: 10	Max. Allowed Step Frequency Dip	: 10 In Step 2
Peak Voltage Dip, %	:	Peak Voltage Dip Limit %	: 35.0
Peak Frequency Dip, %	:	Peak Frequency Dip Limit %	: 10
Site Rated Standby kW/kVA	: 85 / 106	Running kW	: 60.5
		Running kVA	: 68.1
Site Rated Max. SkW	: 101	Effective Step kW	: 86.8
Max. SkVA	: 368	Effective Step kVA	: 206.2
Temp Rise at Full Load, °C	: 150	Percent Non-Linear Load	: 3.0
Voltage Distortion	: 0.6	Voltage Distortion Limit	: 10
Site Rated Max Step kW Limit	:	Max Step kW	:

\*Note: Higher temperature rise at full rated load.

\*Note: All generator set power derates are based on open generator sets.



## Loads Summary Report

Project - Barrington Town Office

Comments -

### Project Requirements

<b>Frequency, Hz</b>	: 60.0	<b>Generators Running in Parallel</b>	: 1
<b>Duty</b>	: Standby	<b>Site Altitude, ft(m)</b>	: 361(152)
<b>Voltage</b>	: 120/208, Parallel Wye	<b>Site Temperature, °C</b>	: 25
<b>Phase</b>	: 3	<b>Max. Altr Temp Rise, °C</b>	: 125
<b>Fuel</b>	: Propane	<b>Project Voltage Distortion Limit, %</b>	: 10
<b>Emissions</b>	: EPA, stationary emergency application		

## Loads Summary List

**\*Note: Detailed Loads and Step Report available below**

Step No.	Load Name	Quantity	Running		Starting		Peak		Dip Limits, %		VTHD% Limit
			kW	kVA	kW	kVA	kW	kVA	Vdip	Fdip	
Step01	General Receptacle Load	1	5.0	5.56	5.0	5.56	None	None	35.0	10.0	0.0
Step01	Light Load 1	1	2.0	2.11	2.0	2.11	None	None	35.0	10.0	10.0
Step Summary			7.0	8.0	7.0	8.0	None	None	35.0	10.0	10.0
Step02	VRF-1	1	25.0	28.09	75.13	178.89	None	None	35.0	10.0	0.0
Step Summary			25.0	28.0	75.0	179.0	None	None	35.0	10.0	10.0
Step03	VRF-1	1	25.0	28.09	75.13	178.89	None	None	35.0	10.0	0.0
Step Summary			25.0	28.0	75.0	179.0	None	None	35.0	10.0	10.0
Step04	Well Pump	1	0.67	0.92	4.24	5.3	None	None	35.0	10.0	0.0
Step04	Heat Pumps	1	2.16	2.4	2.16	2.4	None	None	35.0	10.0	0.0
Step Summary			3.0	3.0	6.0	8.0	None	None	35.0	10.0	10.0
Step05	Sewage Pump	1	0.67	0.92	4.24	5.3	None	None	35.0	10.0	0.0
Step Summary			1.0	1.0	4.0	5.0	None	None	35.0	10.0	10.0
Project Summary			Running		Max Starting		Cumulative Step		Cumulative Peak		Project VTHD% Limit
			kW	kVA	kW	kVA	kW	kVA	kW	kVA	
			60.5	68.1	75.1	178.9	107.1	214.6	0.0	0.0	

**\*Note: Detailed Loads and Step Report available below**



## Loads and Steps Detail Report

Project - Barrington Town Office

Comments -

### Project Requirements

Frequency, Hz	: 60.0	Generators Running in Parallel	: 1
Duty	: Standby	Site Altitude, ft(m)	: 361(152)
Voltage	: 120/208, Parallel Wye	Site Temperature, °C	: 25
Phase	: 3	Max. Altr Temp Rise, °C	: 125
Fuel	: Propane	Project Voltage Distortion Limit, %	: 10
Emissions	: EPA, stationary emergency application		

### Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 60.5	Max. Step kW	: 75.1 In Step 2	Cumulative Step kW	: 107.1
Running kVA	: 68.1	Max. Step kVA	: 178.9 In Step 2	Cumulative Step kVA	: 214.6
Running PF	: 0.89	Peak kW	: None	Cumulative Peak kW	: None
Running NLL kVA	: 2.1	Peak kVA	: None	Cumulative Peak kVA	: None
Alternator kW	: 61.52				

### Step1

#### Calculated Individual Generator Set Step Load Requirements

Running kW	: 7.0	Starting kW	: 7.0	Cumulative Step kW	: 7.0
Running kVA	: 8.0	Starting kVA	: 8.0	Cumulative Step kVA	: 8.0
Running Amps	: 21.0	Starting Non-linear kVA	: 2.0		
Running Non-linear kVA	: 2.0				
Alternator kW	: 8.02				
Voltage Distortion Limit for step	: 10				

General Receptacle Load	Three Phase	Quantity	: 1 In this Step
Category	: General Receptacle		

Running kW	: 5.0	Starting kW	: 5.0	Peak kW	: None
Running kVA	: 5.56	Starting kVA	: 5.56	Peak kVA	: None
Running PF	: 0.9	Starting PF	: 0.9	Cyclic	: No
Running Amps	: 15.44	Max. % Voltage Dip	: 35.0	Max. % Frequency Dip	: 10.0
Alternator kW	: 5.0			Voltage	: 208

Light Load 1	Three Phase	Quantity	: 1 In this Step
Category	: Light - LED		

Running kW	: 2.0	Starting kW	: 2.0	Peak kW	: None
Running kVA	: 2.11	Starting kVA	: 2.11	Peak kVA	: None
Running PF	: 0.95	Starting PF	: 0.95	Cyclic	: No

Running Amps	: 5.85	Max. % Voltage Dip	: 35.0	Max. % Frequency Dip	: 10.0
Running NLL kVA	: 2.11				
Starting NLL kVA	: 2.11			Voltage	: 208
Alternator kW	: 3.02				

## Step2

### Calculated Individual Generator Set Step Load Requirements

Running kW	: 25.0	Starting kW	: 75.0	Cumulative Step kW	: 82.0
Running kVA	: 28.0	Starting kVA	: 179.0	Cumulative Step kVA	: 187.0
Running Amps	: 78.0	Starting Non-linear kVA	: 0.0		
Running Non-linear kVA	: 0.0				
Alternator kW	: 25.0				
Voltage Distortion Limit for step	: 10				

VRF-1		Three Phase	Quantity	: 1 In this Step
Category	: AC			

Running kW	: 25.0	Starting kW	: 75.13	Peak kW	: None
Running kVA	: 28.09	Starting kVA	: 178.89	Peak kVA	: None
Running PF	: 0.89	Starting PF	: 0.42	Cyclic	: No
Running Amps	: 78.06	Max. % Voltage Dip	: 35.0	Max. % Frequency Dip	: 10.0
Alternator kW	: 25.0			Voltage	: 208

AC Tons	: 25.0	Method	: Across the line
		Low Inertia	: No
EER per Ton	: 12.0	LRkVA Factor	: 5.9
Design	: Standard NEMA Design B,C or D	LRkVA Code	: G

## Step3

### Calculated Individual Generator Set Step Load Requirements

Running kW	: 25.0	Starting kW	: 75.0	Cumulative Step kW	: 107.0
Running kVA	: 28.0	Starting kVA	: 179.0	Cumulative Step kVA	: 215.0
Running Amps	: 78.0	Starting Non-linear kVA	: 0.0		
Running Non-linear kVA	: 0.0				
Alternator kW	: 25.0				
Voltage Distortion Limit for step	: 10				

VRF-1		Three Phase	Quantity	: 1 In this Step
Category	: AC			

Running kW	: 25.0	Starting kW	: 75.13	Peak kW	: None
Running kVA	: 28.09	Starting kVA	: 178.89	Peak kVA	: None
Running PF	: 0.89	Starting PF	: 0.42	Cyclic	: No
Running Amps	: 78.06	Max. % Voltage Dip	: 35.0	Max. % Frequency Dip	: 10.0
Alternator kW	: 25.0			Voltage	: 208

AC Tons	: 25.0	Method	: Across the line
		Low Inertia	: No
EER per Ton	: 12.0	LRkVA Factor	: 5.9
Design	: Standard NEMA Design B,C or D	LRkVA Code	: G

## Step4

### Calculated Individual Generator Set Step Load Requirements

Running kW	: 3.0	Starting kW	: 6.0	Cumulative Step kW	: 63.0
Running kVA	: 3.0	Starting kVA	: 8.0	Cumulative Step kVA	: 72.0
Running Amps	: 9.0	Starting Non-linear kVA	: 0.0		
Running Non-linear kVA	: 0.0				
Alternator kW	: 2.83				
Voltage Distortion Limit for step	: 10				

Well Pump		Single Phase	Quantity	: 1 In this Step
Category	: Motor			

Running kW	: 0.67	Starting kW	: 4.24	Peak kW	: None
Running kVA	: 0.92	Starting kVA	: 5.3	Peak kVA	: None
Running PF	: 0.73	Starting PF	: 0.8	Cyclic	: No
Running Amps	: 4.42	Max. % Voltage Dip	: 35.0	Max. % Frequency Dip	: 10.0
Alternator kW	: 0.67			Voltage	: 208
Shaft Hp	: 0.5	Method	: Capacitor Start, Induction Run		
Shaft kW	: 0.37				
Efficiency (%)	: 0.56	LRkVA Factor	: 10.6		
Design	: Capacitor Start, Induction Run	LRkVA Code	: M		
Load Factor	: 100.0				

Heat Pumps		Three Phase	Quantity	: 1 In this Step
Category	: General Receptacle			

Running kW	: 2.16	Starting kW	: 2.16	Peak kW	: None
Running kVA	: 2.4	Starting kVA	: 2.4	Peak kVA	: None
Running PF	: 0.9	Starting PF	: 0.9	Cyclic	: No
Running Amps	: 6.67	Max. % Voltage Dip	: 35.0	Max. % Frequency Dip	: 10.0
Alternator kW	: 2.16			Voltage	: 208

## Step5

### Calculated Individual Generator Set Step Load Requirements

Running kW	: 1.0	Starting kW	: 4.0	Cumulative Step kW	: 64.0
Running kVA	: 1.0	Starting kVA	: 5.0	Cumulative Step kVA	: 72.0
Running Amps	: 3.0	Starting Non-linear kVA	: 0.0		
Running Non-linear kVA	: 0.0				
Alternator kW	: 0.67				
Voltage Distortion Limit for step	: 10				

Sewage Pump		Single Phase	Quantity	: 1 In this Step
Category	: Motor			

Running kW	: 0.67	Starting kW	: 4.24	Peak kW	: None
Running kVA	: 0.92	Starting kVA	: 5.3	Peak kVA	: None
Running PF	: 0.73	Starting PF	: 0.8	Cyclic	: No
Running Amps	: 4.42	Max. % Voltage Dip	: 35.0	Max. % Frequency Dip	: 10.0

Alternator kW	: 0.67	Voltage	: 208
Shaft Hp	: 0.5	Method	: Capacitor Start, Induction Run
Shaft kW	: 0.37		
Efficiency (%)	: 0.56	LRkVA Factor	: 10.6
Design	: Capacitor Start, Induction Run	LRkVA Code	: M
Load Factor	: 100.0		





## Steps and Dips Details Report

Project - Barrington Town Office

### Project Requirements

Frequency, Hz	: 60.0	Generators Running in Parallel	: 1
Duty	: Standby	Site Altitude, ft(m)	: 361(152)
Voltage	: 120/208, Parallel Wye	Site Temperature, °C	: 25
Phase	: 3	Max. Altr Temp Rise, °C	: 125
Fuel	: Propane	Project Voltage Distortion Limit, %	: 10
Emissions	: EPA, stationary emergency application		

### Calculated Individual Generator Set Load Running and Peak Requirements

Running kW	: 60.5	Max. Step kW	: 75.1 In Step 2	Cumulative Step kW	: 107.1
Running kVA	: 68.1	Max. Step kVA	: 178.9 In Step 2	Cumulative Step kVA	: 214.6
Running PF	: 0.89	Peak kW	: None	Cumulative Peak kW	: None
Running NLL kVA	: 2.1	Peak kVA	: None	Cumulative Peak kVA	: None
Alternator kW	: 61.52				

### Generator Set Configuration

Model	: 85GGHG	Alternator	: UC3C
Engine Model	: WSG-1068A	Excitation	: PMG
Fuel	: Propane		

### Step Level Dips Summary

Step #	Voltage Dip Limit (%)	Expected Step Voltage Dip (%)	Voltage Recovery Time (s) **	Frequency Dip Limit (%)	Expected Frequency Dip (%)	Frequency recovery Time (s) **
1*	35	3	0.4	10	2	0.5
2	35	26	1.9	10	10	3.3
3	35	26	1.9	10	10	3.3
4	35	3	0.3	10	2	0.4
5	35	2	0.2	10	1	0.3

Note: Please refer to the model Spec. sheet for bandwidths used to report recovery times. For products manufactured in the United Kingdom it may be assumed that recovery times are based on ISO8528-5 G2 class bandwidths. Voltage and frequency recovery times are estimates. Typically, allow five to ten seconds between application of load steps when designing your system.

\*Caution: The starting PF for this step exceeds 0.8 lagging. The actual transient performance of the generator for these steps may vary compared to the results predicted by GenSize. Contact your Cummins Distributor for Guidance.

\*\*Please note that in some cases the voltage and frequency recovery time estimates are not shown in list. This is a result of "dummy" data points temporarily being used to fill data gaps in the GenSize database. Please disregard these blank results.

