

## PROJECT MANUAL

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# **Chaloner Middle School HVAC Replacement**

2100 Virginia Avenue  
Roanoke Rapids, North Carolina 27870

Roanoke Rapids Graded School District

SMITH SINNETT ARCHITECTURE

PROJECT NO. 2023020

DATE: 2 OCTOBER 2023

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### **Owner**

Roanoke Rapids Graded School District  
536 Hamilton Street  
Roanoke Rapids, North Carolina 27870

### **Architect**

Smith Sinnett Architecture, P.A.  
4600 Lake Boone Trail, Suite 205  
Raleigh, North Carolina 27607

### **Plumbing, Mechanical and Electrical Engineers**

Progressive Design Collaborative  
3101 Poplarwood Court, Suite 320  
Raleigh, North Carolina 27604

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**SECTION 00 00 05 – CERTIFICATIONS**

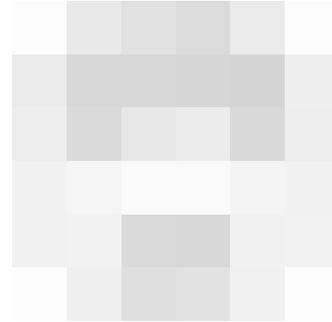
**Chaloner Middle School HVAC Replacement**

2100 Virginia Avenue  
Roanoke Rapids, North Carolina 27870

PROJECT NO.  
2023020

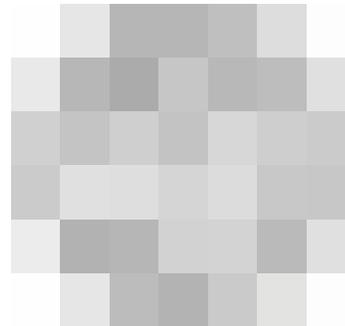
**ARCHITECTURE FIRM**

Smith Sinnett Architecture, P.A.  
4600 Lake Boone Trail, Suite 205  
Raleigh, North Carolina 27607



**ARCHITECT**

Smith Sinnett Architecture, P.A.  
4600 Lake Boone Trail, Suite 205  
Raleigh, North Carolina 27607



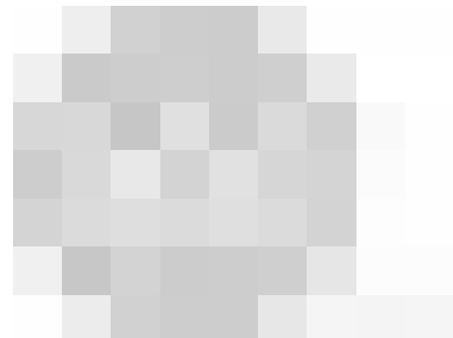
**MECHANICAL ENGINEER**

Progressive Design Collaborative  
3101 Poplarwood Court, Suite 320  
Raleigh, North Carolina 27604



**ELECTRICAL ENGINEER**

Progressive Design Collaborative  
3101 Poplarwood Court, Suite 320  
Raleigh, North Carolina 27604





**SECTION 00 01 00 – ADVERTISEMENT FOR BIDS**

Sealed proposals will be received until **2:00 pm on Tuesday October 31<sup>st</sup>, 2023**,  
at the Administrative Office Board Room of Roanoke Rapids Graded School District,  
536 Hamilton Street, Roanoke Rapids, NC 27870,  
for HVAC Replacement at  
**Chaloner Middle School**  
**Roanoke Rapids, North Carolina**  
at which time and place bids will be opened and read.

A **Mandatory Pre-Bid Meeting** will be held at **10:00 am on Tuesday, October 10<sup>th</sup>, 2023** at the existing  
**Chaloner Middle School**  
**2100 Virginia Avenue**  
**Roanoke Rapids, North Carolina 27870**

Complete plans and specifications for this project can be  
obtained by filling out the **‘Document Request Form’**  
from the Smith Sinnett Architecture website, [www.smithsinnett.com/documents](http://www.smithsinnett.com/documents),  
or by contacting Smith Sinnett Architecture, 4600 Lake Boone Trail,  
Suite 205, Raleigh, NC 27607 (919)781-8582  
during normal office hours after **October 2<sup>nd</sup>, 2023**

The Roanoke Rapids Graded School District Board of Education reserves the unqualified  
right to reject any and all proposals. No Bid may be withdrawn after the scheduled closing  
time for the receipt of bids for a period of 60 days.

**END OF SECTION 00 01 00**

**Chaloner Middle School HVAC Replacement**  
Roanoke Rapids, NC

Smith Sinnett / 2023020  
Roanoke Rapids Graded School District

**BSECTION 00 01 05 – NOTICE TO BIDDERS**

Sealed proposals will be received by the **Roanoke Rapids Graded School District in Roanoke Rapids, NC, at the Administrative Office Board Room of Roanoke Rapids Graded School District, 536 Hamilton Street, Roanoke Rapids, NC 27870 up to 2:00 pm Tuesday, October 31<sup>st</sup>, 2023** and immediately thereafter publicly opened and read for the furnishing of labor, material and equipment entering into the construction of

Roanoke Rapids High School  
800 Hamilton Street  
Roanoke Rapids, North Carolina 27870

This bid package consists of replacement of the existing air cooled chiller and associated pumps, replacement of the gas fire boilers and associated pump, replacement of the existing four-pipe air handlers and upgrade of the controls. Minor demolition of select ceilings and walls will be required to accomplish the work.

Bids will be received *for* Single Prime. All proposals shall be lump sum.

**Pre-Bid Meeting**

A **Mandatory Pre-Bid Meeting** will be held on **Tuesday, October 10<sup>th</sup>, 2023 at 2:00 pm at the Existing Chaloner Middle School: 2100 Virginia Avenue, Roanoke Rapids, North Carolina 27870**. The meeting will address project specific questions, issues, bidding procedures and bid forms. The meeting will continue on the project site where contractors will be permitted to walk the project site.

The meeting is also to identify preferred brand alternates and their performance standards that the owner will consider for approval on this project. In accordance with General Statute GS 133-3, Specifications may list one or more preferred brands as an alternate to the base bid in limited circumstances. Specifications containing a preferred brand alternate under this section must identify the performance standards that support the preference. Performance standards for the preference must be approved in advance by the owner in an open meeting. Any alternate approved by the owner shall be approved only where (i) the preferred alternate will provide cost savings, maintain or improve the functioning of any process or system affected by the preferred item or items, or both, and (ii) a justification identifying these criteria is made available in writing to the public. In accordance with GS133-3 procedures the following preferred brand items are being considered as Alternates by the owner for this project:

**Alternate No. 1: Owner Preferred Manufacturer– Vertical Packaged Outdoor Mounted Heat Pump (VPAC)**

1. Bard

**Alternate No. 2; Owner Preferred Manufacturer– Electric Stuff**

1. Siemens

Justification of any approvals will be made available to the public in writing no later than seven (7) days prior to bid date.

Plans and Specifications can be downloaded from Smith Sinnett Architecture by potential bidders, upon registration with Smith Sinnett by completing the Intent to Bid Form available at [www.smithsinnett.com](http://www.smithsinnett.com). The full hard copy of the plans and specifications can be purchased at the contractor's expense.

**NOTE:** The bidder shall include with the bid proposal the form *Identification of Minority Business Participation* identifying the minority business participation it will use on the project and shall include either *Affidavit A* or *Affidavit B* as applicable. Forms and instructions are included within the Proposal Form in the bid documents. Failure to complete these forms is grounds for rejection of the bid. (GS143-128.2c Effective 1/1/2002.)

All contractors are hereby notified that they must have proper license as required under the state laws governing their respective trades. General contractors are notified that Chapter 87, Article 1, General Statutes of North Carolina, will be observed in receiving and awarding general contracts. General contractors submitting bids on this project must have license classification for "Unlimited Building" or "Unclassified," required by the NC General Contractors Licensing Board under G.S. 87-1.)

NOTE: SINGLE PRIME CONTRACTS: Under GS 87-1, a contractor that superintends or manages construction of any building, highway, public utility, grading, structure or improvement shall be deemed a "general contractor" and shall be so licensed. Therefore a single prime project that involves other trades will require the single prime contractor to hold a proper General Contractors license. EXCEPT: On public buildings being bid single prime, where the total value of the general construction does not exceed 25% of the total construction value, contractors under GS87- Arts 2 and 4 (Plumbing, Mechanical & Electrical) may bid and contract directly with the Owner as the SINGLE PRIME CONTRACTOR and may subcontract to other properly licensed trades. GS87-1.1- Rules .0210

Each proposal shall be accompanied by a cash deposit or a certified check drawn on some bank or trust company, insured by the Federal Deposit Insurance Corporation, of an amount equal to not less than five percent (5%) of the proposal, or in lieu thereof a bidder may offer a bid bond of five percent (5%) of the bid executed by a surety company licensed under the laws of North Carolina to execute the contract in accordance with the bid bond. Said deposit shall be retained by the owner as liquidated damages in event of failure of the successful bidder to execute the contract **within ten days** after the award or to give satisfactory surety as required by law.

A performance bond and a payment bond will be required for one hundred percent (100%) of the contract price.

Payment will be made based on ninety-five percent (95%) of monthly estimates and final payment made upon completion and acceptance of work.

No bid may be withdrawn after the scheduled closing time for the receipt of bids for a period of **30** days.

The Owner reserves the right to reject any or all bids and to waive informalities.

Designer:  
Drew Wilgus, AIA, LEED AP  
Smith Sinnett Architecture, P.A.  
(Name)

4600 Lake Boone Trail, Suite 205  
Raleigh, North Carolina 27607  
(Address)

(919) 781-8582  
(Phone)

Owner:  
Robbie Clements, Director of Facilities and Operations  
Roanoke Rapids Graded School District  
(Agency/Institution)

536 Hamilton Street  
Roanoke Rapids, North Carolina 27870  
(Address)

(252) 519-7100  
(Phone)

**END OF SECTION 00 01 05**

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2100 Virginia Avenue  
Roanoke Rapids, North Carolina 27870

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# AIA<sup>®</sup> Document A701<sup>®</sup> – 2018

## **Instructions to Bidders**

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

Chaloner Middle School HVAC Replacement  
Chaloner Middle School  
2100 Virginia Avenue  
Roanoke Rapids, NC 27870  
Replacement of existing HVAC system with Wall Hung units.

**THE OWNER:**  
(Name, legal status, address, and other information)

The Roanoke Rapides Graded School District Board of Education  
536 Hamilton Street  
Roanoke Rapids, NC 27870

**THE ARCHITECT:**  
(Name, legal status, address, and other information)

Smith Sinnett Architecture  
4600 Lake Boone Trail Suite 205  
Raleigh, NC 27607  
(919) 781-8582

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

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

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

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

## ARTICLE 1 DEFINITIONS

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

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

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

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

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

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

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

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

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

## ARTICLE 2 BIDDER'S REPRESENTATIONS

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

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

## ARTICLE 3 BIDDING DOCUMENTS

### § 3.1 Distribution

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

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

Go to the Documents Tab at [smithsinnett.com](http://smithsinnett.com) and follow the instruction on the document request form.

§ 3.1.2 Any required deposit shall be refunded to Bidders who submit a bona fide Bid and return the paper Bidding Documents in good condition within ten days after receipt of Bids. The cost to replace missing or damaged paper documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the paper Bidding Documents, and the Bidder's deposit will be refunded.

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

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

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

### § 3.2 Modification or Interpretation of Bidding Documents

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

§ 3.2.2 Requests for clarification or interpretation of the Bidding Documents shall be submitted by the Bidder in writing and shall be received by the Architect at least seven days prior to the date for receipt of Bids.  
*(Indicate how, such as by email, website, host site/platform, paper copy, or other method Bidders shall submit requests for clarification and interpretation.)*

As directed by the plan request form located in the documents section of smithsinnett.com

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

### § 3.3 Substitutions

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

#### § 3.3.2 Substitution Process

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

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

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

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

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

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

**§ 3.4 Addenda**

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

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

Addenda will be posted to the documents page of smithsinnett.com

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

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

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

**ARTICLE 4 BIDDING PROCEDURES**

**§ 4.1 Preparation of Bids**

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

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

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

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

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

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

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

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

**§ 4.2 Bid Security**

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

*(Insert the form and amount of bid security.)*

Five percent (5%) of the full bid amount.

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

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

§ 4.2.4 The Owner will have the right to retain the bid security of Bidders to whom an award is being considered until (a) the Contract has been executed and bonds, if required, have been furnished; (b) the specified time has elapsed so that Bids may be withdrawn; or (c) all Bids have been rejected. However, if no Contract has been awarded or a Bidder has not been notified of the acceptance of its Bid, a Bidder may, beginning 60 days after the opening of Bids, withdraw its Bid and request the return of its bid security.

#### § 4.3 Submission of Bids

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

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

Refer to Project Manual Dated 10/2/2023

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

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

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

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

#### § 4.4 Modification or Withdrawal of Bid

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

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

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

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

Withdrawal Request due to clerical or math error only is 72 hours

### ARTICLE 5 CONSIDERATION OF BIDS

#### § 5.1 Opening of Bids

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

## **§ 5.2 Rejection of Bids**

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

## **§ 5.3 Acceptance of Bid (Award)**

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

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

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

### **§ 6.1 Contractor's Qualification Statement**

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

### **§ 6.2 Owner's Financial Capability**

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

### **§ 6.3 Submittals**

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

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

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

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

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

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

### **§ 7.1 Bond Requirements**

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

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

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

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

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

One Hundred (100%) of the contract sum.

#### § 7.2 Time of Delivery and Form of Bonds

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

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

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

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

### ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

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

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.  
*(Insert the complete AIA Document number, including year, and Document title.)*

Refer to the Project Manual dated 10/2/2023

- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.  
*(Insert the complete AIA Document number, including year, and Document title.)*

Refer to the Project Manual dated 10/2/2023

- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.  
*(Insert the complete AIA Document number, including year, and Document title.)*

Refer to the Project Manual dated 10/2/2023

- .4 AIA Document E203™–2013, Building Information Modeling and Digital Data Exhibit, dated as indicated below:  
*(Insert the date of the E203-2013.)*

NA

- .5 Drawings

Number	Title	Date
Refer to Construction Documents	Chaloner Middle School HVAC Replacement	10/2/2023

**.6** Specifications

Section	Title	Date	Pages
Refer to Project Manual	Chaloner Middle School HVAC Replacement	10/2/2023	

**.7** Addenda:

Number	Date	Pages
TBD	TBD	TBD

**.8** Other Exhibits:

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

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

[ **NA** ] The Sustainability Plan:

Title	Date	Pages

[ **REFER TO PROJECT MANUAL** ] Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
Refer to Project Manual	Chaloner Middle School HVAC Replacement	10/16/2023	

**.9** Other documents listed below:

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

NA

**SECTION 00 42 00 - PROPOSAL FORM**

PROJECT: Chaloner Middle School HAVC Replacement  
1200 Virginia Avenue  
Roanoke Rapids, North Carolina 27870

OWNER: Roanoke Rapids Graded School District  
536 Hamilton Street  
Roanoke Rapids, North Carolina 27870

ARCHITECT: Smith Sinnett Architecture  
4600 Lake Boone Trail, Suite 205  
Raleigh, North Carolina 27607

The undersigned, as bidder, hereby declares that the only person or persons interested in this proposal as principal or principals is or are named herein and that no other person than herein mentioned has any interest in this proposal or in the contract to be entered into; that this proposal is made without connection with any other person, company or parties making a bid or proposal; and that it is in all respects fair and in good faith without collusion or fraud. The bidder further declares that he has examined the site of the work and the contract documents relative thereto, and has read all special provisions furnished prior to the opening of bids; that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees if this proposal is accepted to contract with Roanoke Rapids Graded School District Board of Education in the form of contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of

**Roanoke Rapids High School**

in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the Roanoke Rapids Graded School District Board of Education, and Smith Sinnett Architecture with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents.

The low Bidder will be determined by the total cost of the Contract with the lump sum prices of the alternates accepted being added to or deducted from the Base Bid to give the total cost of the Contract. Bidders are required to give a price for Base Bid, all Alternates, and all Unit Prices as applicable to their Contract. All Bidders are required to be licensed and in good standing with their respective North Carolina Licensing Board.

**SINGLE PRIME CONTRACT:**

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**BASE BID:**

Amount: \_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

**ALTERNATE 1: Owner Preferred Manufacturer – VPAC - Bard**

Amount: \_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

**ALTERNATE 2: Owner Preferred Manufacturer – Electrical - Siemens**

Amount: \_\_\_\_\_ Dollars (\$ \_\_\_\_\_)

**ALLOWANCES** - (Refer to Division 01 Section 01 21 00 – Allowances for amounts to be included in bid shall be based on the Unit Prices provided as part of Section 01 22 00) Acknowledge Allowances have been included with in the Base Bid.

UP/A-1 \_\_\_\_\_ A-1 \_\_\_\_\_

**UNIT PRICES** - (Refer to Division 01 Section 01 22 00 - Unit Prices for Quantities)

Unit prices quoted and accepted shall apply throughout the life of the contract, except as otherwise specifically noted. Unit prices shall be applied, as appropriate, to compute the total value of changes in the base bid quantity of the work and in the given Allowances all in accordance with the contract documents.

Unit Price No. UP/A-1; **Acoustic Ceiling Tile and Grid:** per sf. Unit Price (\$) \_\_\_\_\_

The bidder further proposes and agrees hereby to commence work under this contract on a date to be specified in a written order of the designer and shall fully complete all work thereunder within the time specified in the Supplementary General Conditions Article 9. Applicable liquidated damages amount is also stated in the Supplementary General Conditions Article 9.

The bidder certifies that as of the date of this bid, the bidder submitting this bid is not listed on the Final Divestment List created by the State Treasurer pursuant to N.C. Gen. Stat. § 143-6A-4. The individual signing this bid form certifies that he or she is authorized by the bidder to make the foregoing statement.

**MAJOR SUBCONTRACTORS if any** (Name, City & State)

General Subcontractor:

\_\_\_\_\_ Lic \_\_\_\_\_

Plumbing Subcontractor:

\_\_\_\_\_ Lic \_\_\_\_\_

Mechanical Subcontractor:

\_\_\_\_\_ Lic \_\_\_\_\_

Electrical Subcontractor:

\_\_\_\_\_ Lic \_\_\_\_\_

GS143-128(d) requires all single prime bidders to identify their subcontractors for the above subdivisions of work. A contractor whose bid is accepted shall not substitute any person as subcontractor in the place of the subcontractor listed in the original bid, except (i) if the listed

subcontractor's bid is later determined by the contractor to be non-responsible or non-responsive or the listed subcontractor refuses to enter into a contract for the complete performance of the bid work, or (ii) with the approval of the awarding authority for good cause shown by the contractor.

**ADDENDUM**

(Addendum received and used in computing bid)

Addendum No. 1 \_\_\_\_\_ Addendum No. 3 \_\_\_\_\_ Addendum No. 5 \_\_\_\_\_

Addendum No. 2 \_\_\_\_\_ Addendum No. 4 \_\_\_\_\_ Addendum No. 6 \_\_\_\_\_

**Proposal Signature Page**

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The undersigned further agrees that in the case of failure on his part to execute the said contract and the bonds within ten (10) consecutive calendar days after being given written notice of the award of contract, the certified check, cash or bid bond accompanying this bid shall be paid into the funds of the owner's account set aside for the project, as liquidated damages for such failure; otherwise the certified check, cash or bid bond accompanying this proposal shall be returned to the undersigned. No proposal may be withdrawn after the scheduled closing time for the receipt of Bids for a period of ninety (60) days.

Respectfully submitted this day of \_\_\_\_\_

\_\_\_\_\_  
(Name of firm or corporation making bid)

WITNESS:

By: \_\_\_\_\_

Signature

\_\_\_\_\_

(Proprietorship or Partnership)

Name: \_\_\_\_\_

Print or type

Title: \_\_\_\_\_

(Owner/Partner/Pres./V.Pres)

Address: \_\_\_\_\_

ATTEST:

\_\_\_\_\_

By: \_\_\_\_\_

License No. \_\_\_\_\_

Title: \_\_\_\_\_

Federal I.D. No. \_\_\_\_\_

(Corp. Sec. or Asst. Sec. only)

(CORPORATE SEAL)

**MINORITY BUSINESS PARTICIPATION REQUIREMENTS**

*Provide with the bid* - Under GS 143-128.2(c) the undersigned bidder shall identify **on its bid** (Identification of Minority Business Participation Form) the minority businesses that it will use on the project with the total dollar value of the bids that will be performed by the minority businesses. **Also** list the good faith efforts (Affidavit A) made to solicit minority participation in the bid effort.

**NOTE:** A contractor that performs all of the work with its own workforce may submit an Affidavit (**B**) to that effect in lieu of Affidavit (**A**) required above. The MB Participation Form must still be submitted even if there is zero participation.

*After the bid opening* - The Owner will consider all bids and alternates and determine the lowest responsible, responsive bidder. Upon notification of being the apparent low bidder, the bidder shall then file within 72 hours of the notification of being the apparent lowest bidder, the following:

An Affidavit (**C**) that includes a description of the portion of work to be executed by minority businesses, expressed as a percentage of the total contract price, which is equal to or more than the 10% goal established. This affidavit shall give rise to the presumption that the bidder has made the required good faith effort and Affidavit **D** is not necessary;

**\* OR \***

If less than the 10% goal, Affidavit (**D**) of its good faith effort to meet the goal shall be provided. The document must include evidence of all good faith efforts that were implemented, including any advertisements, solicitations and other specific actions demonstrating recruitment and selection of minority businesses for participation in the contract.

**Note:** Bidders must always submit **with their bid** the Identification of Minority Business Participation Form listing all MB contractors, vendors and suppliers that will be used. If there is no MB participation, then enter none or zero on the form. Affidavit A **or** Affidavit B, as applicable, also must be submitted with the bid. Failure to file a required affidavit or documentation with the bid or after being notified apparent low bidder is grounds for rejection of the bid.

**END OF SECTION 00 42 00**

 **AIA® Document A310™ – 2010****Bid Bond****CONTRACTOR:**

(Name, legal status and address)

**SURETY:**

(Name, legal status and principal place of business)

**OWNER:**

(Name, legal status and address)

Roanoke Rapids Graded School District Board of Education  
536 Hamilton Street  
Roanoke Rapids, NC 27870

**BOND AMOUNT: \$****PROJECT:**

(Name, location or address, and Project number, if any)

Chaloner Middle School HVAC Replacement  
Chaloner Middle School  
2100 Virginia Avenue  
Roanoke Rapids, NC 27870

**ADDITIONS AND DELETIONS:**

The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An *Additions and Deletions Report* that notes added information as well as revisions to the standard form text is available from the author and should be reviewed. A vertical line in the left margin of this document indicates where the author has added necessary information and where the author has added to or deleted from the original AIA text.

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

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

The Contractor and Surety are bound to the Owner in the amount set forth above, for the payment of which the Contractor and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, as provided herein. The conditions of this Bond are such that if the Owner accepts the bid of the Contractor within the time specified in the bid documents, or within such time period as may be agreed to by the Owner and Contractor, and the Contractor either (1) enters into a contract with the Owner in accordance with the terms of such bid, and gives such bond or bonds as may be specified in the bidding or Contract Documents, with a surety admitted in the jurisdiction of the Project and otherwise acceptable to the Owner, for the faithful performance of such Contract and for the prompt payment of labor and material furnished in the prosecution thereof; or (2) pays to the Owner the difference, not to exceed the amount of this Bond, between the amount specified in said bid and such larger amount for which the Owner may in good faith contract with another party to perform the work covered by said bid, then this obligation shall be null and void, otherwise to remain in full force and effect. The Surety hereby waives any notice of an agreement between the Owner and Contractor to extend the time in which the Owner may accept the bid. Waiver of notice by the Surety shall not apply to any extension exceeding sixty (60) days in the aggregate beyond the time for acceptance of bids specified in the bid documents, and the Owner and Contractor shall obtain the Surety's consent for an extension beyond sixty (60) days.

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

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so

Init.

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User Notes:

(1160473161)



**SECTION 00 43 39 - MINORITY BUSINESS**



**END OF SECTION 00 43 39**



Attach to Bid Attach to Bid

**AFFIDAVIT A – Listing of Good Faith Efforts**

County of \_\_\_\_\_

Affidavit of \_\_\_\_\_  
(Name of Bidder)

I have made a good faith effort to comply under the following areas checked:

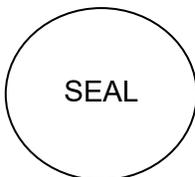
**Bidders must earn at least 50 points from the good faith efforts listed for their bid to be considered responsive.** (1 NC Administrative Code 30 I.0101)

- 1 – (10 pts)** Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.
- 2 --(10 pts)** Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.
- 3 – (15 pts)** Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- 4 – (10 pts)** Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- 5 – (10 pts)** Attended prebid meetings scheduled by the public owner.
- 6 – (20 pts)** Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- 7 – (15 pts)** Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.
- 8 – (25 pts)** Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- 9 – (20 pts)** Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.
- 10 - (20 pts)** Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

The undersigned, if apparent low bidder, will enter into a formal agreement with the firms listed in the Identification of Minority Business Participation schedule conditional upon scope of contract to be executed with the Owner. Substitution of contractors must be in accordance with GS143-128.2(d) Failure to abide by this statutory provision will constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of the minority business commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_  
Signature: \_\_\_\_\_  
Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_  
Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_  
Notary Public \_\_\_\_\_  
My commission expires \_\_\_\_\_

Attach to Bid   Attach to Bid

**AFFIDAVIT B -- Intent to Perform Contract with Own Workforce.**

County of \_\_\_\_\_

Affidavit of \_\_\_\_\_

(Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the \_\_\_\_\_ contract.  
(Name of Project)

In making this certification, the Bidder states that the Bidder does not customarily subcontract elements of this type project, and normally performs and has the capability to perform and will perform all elements of the work on this project with his/her own current work forces; and

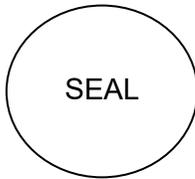
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement. The Bidder agrees to make a Good Faith Effort to utilize minority suppliers where possible.

The undersigned hereby certifies that he or she has read this certification and is authorized to bind the Bidder to the commitments herein contained.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_

**AFFIDAVIT C - Portion of the Work to be Performed by  
HUB Certified/Minority Businesses**

County of \_\_\_\_\_

(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)

If the portion of the work to be executed by HUB certified/minority businesses as defined in GS143-128.2(g) and 128.4(a),(b),(e) is equal to or greater than 10% of the bidders total contract price, then the bidder must complete this affidavit.  
This affidavit shall be provided by the apparent lowest responsible, responsive bidder within **72 hours** after notification of being low bidder.

Affidavit of \_\_\_\_\_ I do hereby certify that on the  
(Name of Bidder)

\_\_\_\_\_ (Project Name)  
Project ID# \_\_\_\_\_ Amount of Bid \$ \_\_\_\_\_

I will expend a minimum of \_\_\_\_\_% of the total dollar amount of the contract with minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below.

Attach additional sheets if required

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

\*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**\*\* HUB Certification with the state HUB Office required to be counted toward state participation goals.**

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_

**AFFIDAVIT D – Good Faith Efforts**

County of \_\_\_\_\_

**(Note this form is to be submitted only by the apparent lowest responsible, responsive bidder.)**

If the goal of 10% participation by HUB Certified/ minority business **is not** achieved, the Bidder shall provide the following documentation to the Owner of his good faith efforts:

Affidavit of \_\_\_\_\_ I do hereby certify  
 that on the \_\_\_\_\_

(Name of Bidder)

\_\_\_\_\_ (Project Name)  
 Project ID# \_\_\_\_\_ Amount of Bid \$ \_\_\_\_\_

I will expend a minimum of \_\_\_\_\_% of the total dollar amount of the contract with HUB certified/ minority business enterprises. Minority businesses will be employed as construction subcontractors, vendors, suppliers or providers of professional services. Such work will be subcontracted to the following firms listed below. (Attach additional sheets if required)

Name and Phone Number	*Minority Category	**HUB Certified Y/N	Work Description	Dollar Value

\*Minority categories: Black, African American (**B**), Hispanic (**H**), Asian American (**A**) American Indian (**I**), Female (**F**) Socially and Economically Disadvantaged (**D**)

**\*\* HUB Certification with the state HUB Office required to be counted toward state participation goals.**

**Examples** of documentation that may be required to demonstrate the Bidder's good faith efforts to meet the goals set forth in these provisions include, but are not necessarily limited to, the following:

- A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.
- B. Copies of quotes or responses received from each firm responding to the solicitation.
- C. A telephone log of follow-up calls to each firm sent a solicitation.
- D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.
- E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.
- F. Copy of pre-bid roster
- G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.
- H. Letter detailing reasons for rejection of minority business due to lack of qualification.
- I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

Failure to provide the documentation as listed in these provisions may result in rejection of the bid and award to the next lowest responsible and responsive bidder.

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date: \_\_\_\_\_ Name of Authorized Officer: \_\_\_\_\_

Signature: \_\_\_\_\_

Title: \_\_\_\_\_



State of \_\_\_\_\_, County of \_\_\_\_\_

Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_

Notary Public \_\_\_\_\_

My commission expires \_\_\_\_\_

## OWNER-CONTRACTOR AGREEMENT

THIS AGREEMENT is made this \_\_\_ day of \_\_\_\_\_, 202\_\_ by and between the Roanoke Rapids Graded School District Board of Education (herein referred to as the “Owner”), whose mailing address is 536 Hamilton Street, Roanoke Rapids, North Carolina 27870 and \_\_\_\_\_ (herein referred to as the “Contractor”), whose mailing address is \_\_\_\_\_. Correspondence, submittals, and notices relating to or required under this Agreement shall be sent in writing to the above addresses unless either party is notified in writing by the other of a change in address.

In consideration of the promises made herein and other good and valuable consideration, the following terms and conditions are hereby mutually agreed to, by and between the Owner and Contractor for the Chaloner Middle School HAVC Replacement Project.

The following documents, if any, are attached as Exhibits to this Contract and incorporated by reference herein. The parties specifically agree that any terms and conditions that the Contractor may have included in its proposal, attached as Exhibit \_\_, shall not be deemed incorporated into this Agreement, unless specifically agreed to in writing by the Owner.

- List Exhibits

1. Scope of Services. The project includes [insert general project description here] as more particularly described on Exhibit \_\_. The Contractor shall perform the Work described on Exhibit \_\_. The Work shall be performed in accordance with the terms of this Agreement and any plans and specifications referenced herein, all of which are incorporated into this Agreement. The Contractor shall provide all materials, tools, equipment, and labor, and supply all other services and things necessary to fully and properly perform and complete the Work as required by this Agreement. The Contractor shall perform the Work in compliance with all governmental laws and regulations. The Contractor shall also, unless otherwise specified, supply and pay for all transportation, utilities, fuel, sanitary facilities, and incidentals necessary for the completion of the Work, and be responsible for the safe, proper and lawful construction of the Work, and shall perform the Work in the best and most workmanlike manner, as shown on or stated in any plans or specifications referenced herein, or reasonably implied therefrom. All materials shall be new and of quality specified. Workmanship shall at all times be of a grade accepted as the best practice of the particular trade involved, and as stipulated in written standards of recognized organizations or institutes of the respective trades, except as exceeded or qualified by any plans or specifications referenced herein. The Contractor shall keep the site and surrounding area reasonably free from rubbish at all times. Before final inspection and acceptance of the Work, the Contractor shall thoroughly clean the site, and completely prepare the Work and site for use by the Owner.
2. Representation of the Contractor. In order to execute this Agreement and recognizing that the Owner is relying thereon, the Contractor, by executing this Agreement, makes the following express commitments to the Owner:
  - (A) The Contractor is fully qualified and licensed to act as the Contractor for the full scope of work for this Project and shall maintain any and all licenses, permits, insurance, and any authorizations necessary to act as the contractor.
  - (B) The Contractor has become familiar with the Project site and all conditions under which the Project is to be constructed and has identified to the Owner any and all issues.
  - (C) The Contractor has received and carefully reviewed all contract documents as listed above in Paragraph 1 and has found them complete, accurate, adequate, and sufficient for the construction.
  - (D) The Contractor warrants title of all material, supplies, and equipment installed or incorporated into this Project and agrees upon completion of all work delivered to Owner free of any claims, liens, and charges.
3. Compensation. Provided that the Contractor shall strictly and completely perform all of its obligations under this Agreement, the Owner shall pay the Contractor \$ \_\_\_\_\_. Allowances in the amount of \$ \_\_\_\_\_ covering: \_\_\_\_\_; and Contingencies in the amount of \$ \_\_\_\_\_ covering: \_\_\_\_\_ are included in this contract sum. The use of allowances and/or contingencies shall be documented in writing and approved by the Owner. In the event that there are any funds remaining in any allowance and/or contingency, those funds shall be retained solely by the Owner. No compensation shall be paid for any additional work that is not approved in advance by the Owner. One progress payment per month, if any, may be made by the Owner to the Contractor only after certification that a portion of the Work is complete. Under no circumstances will the Owner make more than one payment per month. The Owner shall pay the contractor within forty-five (45) business days following approval of a payment request. Each payment request shall be signed by the Contractor and shall constitute the Contractor’s surety that the quantity of work has reached the level for which payment is requested, that the work has been properly installed or performed in strict conformance with the requirements of this Agreement, and that the Contractor knows of no reason why payment should not be made as requested.

The submission of a payment request also constitutes an affirmative representation and warranty that all work is free and clear of any lien, claim, or other encumbrance upon payment from the Owner. Final payment will be withheld until Contractor has provided Owner with copies of all Operation and Maintenance (O & M) Manuals and warranties applicable to the Work.

If requested by the Owner, the Contractor shall provide to the Owner a Schedule of Values for approval apportioning the Contract Price among the different elements of the Project for purposes of periodic and final payment within ten (10) calendar days of the date of commencement. The Schedule of Values shall be presented in enough detail to adequately apportion the contract to allow for breakdown of payments and shall include overhead and profit within each item. The Contractor's schedule of values shall not inflate any portion of the work. The Contractor acknowledges that the same documentation required for a Change in the Work shall be provided as backup for the use of allowances.

The amount of each payment request shall be computed as follows:

- (A) take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less maximum retainage allowed by law. Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as amended;
- (B) add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitable stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less maximum retainage allowed by law;
- (C) subtract the aggregate of previous payments made by the Owner; and
- (D) subtract amounts if any, for which the Owner has withheld or nullified a Certificate for Payment.

When payment is received from the Owner, the Contractor shall promptly pay all subcontractors, materialmen, laborers, and suppliers the amounts that are due for the work covered by such payment. In the event the Owner becomes informed that the Contractor has not paid these parties, the Owner has the right to issue future payments to the Contractor less the amounts owed to any subcontractor, supplier, or laborer. Continued claims by subcontractors for lack of payment may be deemed a breach of this Agreement by the Contractor.

The Owner shall have the right to refuse to make payment and, if necessary, demand the return of a portion or all of the amount previously paid to the Contractor due to:

- (A) the quality of a portion, or all, of the Contractor's work is not in accordance with the requirements of this contract;
- (B) the quantity of the Contractor's work not being as represented by the Contractor's payment request;
- (C) the Contractor's rate of progress being such that in the Owner's opinion, will not provide for final completion as required by this Contract;
- (D) the Contractor's failure to adequately keep records of as-built conditions; and
- (E) the Contractor's failure to use payments to pay project related obligation including but not limited to subcontractors, laborers, and material and equipment suppliers.

4. Date of Commencement and Substantial Completion. The Contractor shall commence the Work promptly upon the date established in the Notice to Proceed and diligently continue its performance until final completion. If there is no Notice to Proceed, the date of commencement shall be the date of this contract. The contract time shall be measured from the date of commencement and the Contractor shall achieve Substantial Completion of the entire Work not later than **240 Days after the Anticipated Award date of November 21<sup>st</sup>, 2023 which is anticipated on or around July 18<sup>th</sup>, 2024.** The Contractor shall achieve Final Completion within **Thirty (30) days** of date established above for Substantial Completion.
5. Substantial and Final Completion. When Substantial Completion has been achieved, the Contractor shall notify the Owner in writing that he/she is ready for a pre-final punch list. At this time, the Contractor shall have already conducted its own internal punch list of the completed work. The Owner and/or Design Consultant shall conduct an inspection of the completed work and provide a written list of unfinished items or items in need of correcting. The Contractor shall bear the cost of any and all corrections of incomplete work, correcting and bringing into conformance all defective or nonconforming work. The Contractor shall notify the Owner when all nonconforming work has been completed and is ready for final inspection and subsequent final payment. If the Contractor feels it is outside of their control to finish the Work within the time prescribed, they must submit proper reasoning to the Owner in writing and at that time it is the Owner's discretion to accept or reject the request.

Prior to being entitled to receive final payment, the Contractor shall furnish the Owner:

- (A) an affidavit that all of the Contractor's obligations to subcontractors, laborers, equipment and material suppliers, or other third parties involved in the Project, have been paid or otherwise satisfied;
  - (B) waiver of right of claim against the Surety bond; and
  - (C) all product warranties, operating manuals, instruction manuals, record drawings, test results, and other documents expressly required to complete the Project.
6. Liquidated Damages. Should the Contractor fail to substantially complete the Work on or before the date stipulated for Substantial Completion, or such later date as may result from extension of time granted by Owner, he shall pay the Owner, as liquidated damages, the sum of **Two Hundred Fifty Dollars \$250.00** for each consecutive calendar day that terms of the Agreement remain unfulfilled beyond the date allowed by the Agreement, which sum is agreed upon as a reasonable and proper measure of damages which the Owner will sustain per day by failure of the Contractor to complete Work within time as stipulated; it being recognized by the Owner and the Contractor that the injury to the Owner which could result from a failure of the Contractor to complete on schedule is uncertain and cannot be computed exactly. In no way shall costs for liquidated damages be construed as a penalty on the Contractor. For each consecutive calendar day that the Work remains incomplete after the date established for Final Completion, the Contractor shall pay the Owner, as liquidated damages, the sum of **Two Hundred Fifty Dollars \$250.00**. This amount is the minimum measure of damages the Owner will sustain due to the delay in the completion of all remedial work, the delay in the correction of the deficient work, the disruption to the school and the learning environment, the cost of contract management time and resources, administration time, and the inability to use the facilities fully. This amount is in addition to the liquidated damages prescribed above for Substantial Completion. The amount of liquidated damages set forth above shall be assessed cumulatively. This provision for liquidated damages does not bar Owner's right to enforce other rights and remedies against Contractor, including but not limited to, specific performance or injunctive relief.
7. Changes in the Work. If the Owner elects to have a change in the Work performed on a lump sum or a time and material basis, the same shall be performed by the Contractor. The Contractor shall submit to the Owner complete documentation supporting the cost of the change in the Work in a format acceptable to the Owner. The Owner may require authentication of all time and material tickets and invoices prior to payment for the change in the Work. The failure of the Contractor to provide any required documentation shall constitute a waiver by the Contractor of any claim for the cost of that portion of the change in the Work. Up to 15% of direct material and labor costs can be applied as overhead and profit for the Contractor or any Subcontractor actually performing the work (said overhead and profit to include all small tools) and may further include the reasonably anticipated rental costs in connection with the Change in the Work, plus up to 6% thereof as overhead and profit. The Contractor and/or subcontractor may include up to 6% markup on any Change in the Work performed by a lower-tiered subcontractor. Payroll costs are limited to 39% of the net pay of the worker. Overhead and profit shall not be applied by the entity performing the work to labor burden, any sales and use tax paid for any purpose, or to any transportation or shipping costs incurred by the Contractor or any Subcontractor. Any change in the contract sum resulting from a Change Order shall be mutually agreed upon by the Contractor and the Owner together with any conditions relating thereto. If no mutual agreement can be reached between the Owner and the Contractor, the change in contract price, if any, shall be derived by the Owner determining reasonable actual costs incurred or saved.
8. Insurance. The Contractor shall obtain and maintain in effect during the term of this Agreement, general liability and automobile liability insurance in which the Owner and the Contractor shall each be named as insured parties in an amount not less than \$1,000,000, with a \$2,000,000 aggregate, for personal injury, including death, to any one person, and from claims for property damages in an amount of not less than \$1,000,000 for each occurrence arising from any act or omission of Contractor, its agents, employees or subcontractors. The Contractor shall obtain and maintain in effect during the term of this Agreement a policy or policies of workers' compensation insurance which shall cover all of Contractor's employees and all individuals who enter onto Owner's property on behalf of Contractor pursuant to this Agreement. The Contractor shall promptly furnish to the Owner certificates of insurance evidencing such insurance coverage. Insurance required by this section shall contain an endorsement to provide the Owner at least 10-day's written notice of any intent to cancel or terminate by either the Contractor or insurance company. Contractor's Worker's Compensation policy shall contain an endorsement waiving subrogation against Owner. All such insurance policies shall be provided by insurance companies properly licensed in North Carolina and having a financial rating of at least "A" by A.M. Best or equivalent.
9. Hold Harmless. To the fullest extent allowed by law, the Contractor shall indemnify and hold the Owner harmless from and against any and all losses, liabilities, claims, lawsuits, judgments, and demands whatsoever, including costs of investigation (including reasonable legal fees and all costs) caused by any act or omission or intentional wrongdoing of the Contractor or its agents, employees or subcontractors. The parties agree that this indemnification clause is an "evidence of indebtedness" for purpose of N. C. Gen. Stat. § 6-21.2 and shall survive the termination, completion or expiration of this Agreement.
10. Codes, Permits, Applicable Laws and Owner's Policies. The Contractor shall at Contractor's expense obtain the required permits, give all notice and comply with all laws, ordinances, codes, rules, regulations and Owner's policies bearing on the conduct of the Work under this Agreement. If the Contractor observes that the drawings and specifications are at

variance therewith, Contractor shall promptly notify the Owner in writing. If the Contractor performs any Work knowing (or under circumstances in which Contractor ought to have known) it to be contrary to such laws, ordinances, codes, rules and regulations. Contractor shall bear all cost arising therefrom. This Agreement and the relationship of the parties shall be construed under the laws of the state of North Carolina. Contractor shall not employ any individuals to provide services to the Owner who are not authorized by federal law to work in the United States. Contractor represents and warrants that it is aware of and in compliance with the Immigration Reform and Control Act and North Carolina law (Article 2 of Chapter 64 of the North Carolina General Statutes) requiring use of the E-Verify system for employers who employ twenty-five (25) or more employees and that it is and will remain in compliance with these laws at all times while providing services pursuant to this Agreement. Contractor certifies that as of the date of this Agreement, Contractor is not listed on the Final Divestment List created by the North Carolina State Treasurer pursuant to N.C. Gen. Stat. § 147-86.58. Contractor acknowledges that the Owner has adopted applicable Richmond County Board of Education Policies governing conduct on Owner's property and agrees to abide by any and all relevant Owner policies while on Owner's property. The Contractor acknowledges that Owner's policies are available and can be viewed on the Owner's website at <https://www.wcpss.net/Page/45862>.

11. Counterparts and Execution. This Agreement may be executed in any number of counterparts, each of which shall be deemed an original but all of which together will constitute one and the same agreement. The Parties agree that scanned, faxed, and/or electronically transmitted copies of this Agreement will have the same validity and force as an original, and that scanned, faxed, or electronic signatures shall be deemed original signatures for purposes of this Agreement and given the same legal effect as original signatures.
12. Safety Requirements. The Contractor shall be responsible for the Work area and the construction of the Work and provide all the necessary protections as required by laws, rules, regulations or ordinances governing such conditions and as required by the Owner. He shall be responsible for any damage Contractor or Contractor's employees, agents, suppliers or subcontractors cause to the Owner's property or that of others on the job and shall promptly repair any such damage. The Contractor shall clearly mark or post signs warning of hazards existing and shall barricade excavations and similar hazards. Contractor shall maintain all necessary protective devices and signs throughout the progress of the Work.
13. Warranties. The Contractor guarantees and warrants to the Owner all Work as follows: that all materials and equipment furnished under this Agreement will be new and the best of its respective kind unless otherwise specified; that all Work will be of good quality in accordance with the industry standards; that the Work will be free of omissions and poor quality, defective material or workmanship; that the Work, including but not limited to, mechanical and electrical devices and equipment, shall be fit and fully usable for its intended and specified purpose and shall operate satisfactorily with ordinary care; that the products or materials incorporated in the Work will not contain asbestos; and that all subcontractors, agents or employees of Contractor will be fully qualified, possess any requisite licenses, and otherwise be legally entitled to perform the services provided. If, within one year (two years for painting) after the date of completion of the Work or designated portion thereof or within one year after acceptance by the Owner of designated equipment or within such longer period of time as may be prescribed by law or by the terms of any applicable special warranty required by this Agreement, any of the Work is found to be defective, not in accordance with this Agreement, or not in accordance with the guarantees and warranties specified in this Agreement, the Contractor shall correct it within five (5) working days or such other period as mutually agreed, after receipt of a written notice from the Owner to do so. For items which remain incomplete or uncorrected on the date of Substantial Completion, the one-year warranty shall begin on the date of Final Completion of the Work.
14. Termination for Convenience. The Owner may terminate this Agreement at any time in its complete discretion upon ten (10) days written notice. In the event of a termination for convenience, all finished or unfinished work and materials pursuant to this Agreement shall be turned over to the Owner and become its property. If the Agreement is terminated by the Owner in accordance with this section, the Owner shall only be responsible for paying Contractor for Work performed and accepted and materials delivered to the site as of the date of termination. In the event of a termination for convenience by Owner, Contractor's warranty shall still apply to all portions of the Work and all equipment installed by Contractor prior to termination.
15. Lunsford Act/Criminal Background Checks. Contractor acknowledges that G.S. § 14-208.18 prohibits anyone required to register as a sex offender under Article 27A of Chapter 14 of the General Statutes from knowingly being on the premises of any school. Contractor shall provide certification, on the form attached as Exhibit B, that it has conducted sexual offender registry checks and criminal background checks on each of its owners, employees, agents and subcontractors who will engage in any service on or delivery of goods to Owner's property (sex offender checks can be conducted at no cost at <http://www.nsopw.gov/>). Contractor shall not assign or allow any individual to deliver goods or provide services on Owner's property if said individual appears on any of the listed sex offender registries or who has ever had any of the following criminal convictions, or similar criminal convictions, without receiving prior written permission from Owner, which Owner may withhold in its reasonable discretion: murder, rape, sexual offense, sexual assault, statutory rape, indecent liberties with a minor, child abuse, kidnapping, abduction, manufacture, sale or delivery of controlled substances,

assault with a deadly weapon, assault inflicting serious bodily injury, manslaughter, trafficking or exploitation of minors or felony level burglary, robbery, embezzlement, theft or larceny.

16. Anti-Nepotism. Unless disclosed to the School System in writing prior to the Board's approval and execution of the Agreement, Contractor warrants that, to the best of its knowledge and in the exercise of due diligence, none of its corporate officers, directors, or trustees and none of its employees who will directly provide services under this Agreement are immediate family members of any member of the Owner's Board of Education or of any principal or central office staff administrator employed by such Board. For purposes of this provision, "immediate family" means spouse, parent, child, brother, sister, grandparent, or grandchild, and includes step, half, and in-law relationships. Should Contractor become aware of any family relationship covered by this provision, or should such a family relationship arise at any time during the term of this Agreement, Contractor shall immediately disclose the family relationship in writing to the Superintendent of the Schools. Unless discussed prior to the execution of the Agreement or formally waived by the Owner, the existence of a family relationship covered by this Agreement is grounds for immediate termination by Owner without further financial liability to Contractor.
17. Entire Agreement. All of the representations and obligations of the parties are contained herein, and no modification, waiver or amendment of this Agreement or of any of its conditions or provisions shall be binding upon a party unless in writing signed by both parties. The waiver by any party of a breach of any provision of this Agreement shall not operate or be construed as a waiver of any subsequent breach of that provision by the same party, or of any other provision or condition of the Agreement. If any section, subsection, term or provision of this Agreement or the application thereof to any party or circumstance shall, to any extent, be invalid or unenforceable, the remainder of said section, subsection, term or provision of the Agreement or the application of the same to parties or circumstances other than those to which it was held invalid or unenforceable, shall not be affected thereby and each remaining section, subsection, term or provision of this Agreement shall be valid or enforceable to the fullest extent permitted by law.
18. Risk of Loss. Contractor shall bear the risk of loss in the event that any of the Work is stolen, lost damaged or destroyed prior to Final Completion of the Work and acceptance by Owner, unless caused by the intentional or reckless acts of Owner or Owner's authorized agents. If any of the Work is stolen, lost, damaged, or destroyed prior to Final Completion of the Work and acceptance by the Owner, due to any reason except the intentional or reckless acts of Owner or Owner's authorized agents, Contractor shall bear the full cost of repairing or replacing all such Work, including all equipment and materials.
19. Interpretation of Agreement. Contractor and Owner acknowledge that the Agreement shall not be construed against Owner due to the fact that it may have been drafted by Owner. For purposes of construing this Agreement, both Contractor and Owner shall be considered to have jointly drafted the Agreement.
20. Taxes. The Contractor shall pay all sales, consumer, use and other similar taxes for the Work or portions thereof provided by the Contractor which are legally enacted at the time bids are received, whether or not yet effective. The Contractor shall indemnify and hold the Owner harmless from any claims arising out of the Contractor's failure to pay all required taxes, including claims by the county for its inability to recover taxes that were not properly paid to the State of North Carolina by the Contractor.
21. Authorization to do Business. Contractor is duly qualified to do business in North Carolina. If Contractor is a business entity that is not registered in North Carolina, prior to beginning the services described by this Contract, Contractor shall either (i) obtain a certificate of authority from the Secretary of State for North Carolina, pursuant to N. C. Gen. Stat. § 55-15-03, or (ii) provide a letter from an attorney indicating that the attorney has reviewed N. C. Gen. Stat. § 55-15-01 and determined that Provider is not required to obtain a certificate of authority pursuant to N. C. Gen. Stat. § 55-15-01(b).
22. Federally Funded Projects. The Contractor is notified that this project will be financed with federal funds. The Contractor shall ensure that all subcontracts and other contracts for goods and services for this project have the below provisions of this section their contracts. Contractor agrees to comply with the following provisions. Failure to comply with any and all provisions herein may be cause for the Owner to issue a cancellation notice to the Contractor.
  - a. Remedies for Breach.

The Owner reserves all rights and privileges under the applicable laws and regulations with respect to this Agreement in the event of breach of contract by either party.
  - b. Termination for Cause and for Convenience by Owner.

In addition to the Owner's right to terminate this Agreement as provided in Section 12 above, the Owner reserves the right to immediately terminate this Agreement in the event of a breach or default of the agreement by Contractor, in the event Contractor fails to: (1) meet schedules, deadlines, and/or delivery dates within the time specified by this Agreement; (2) make any payments owed; or (3) otherwise perform in accordance with the Agreement. The Owner also reserves the right to terminate the Agreement immediately, with written notice to Contractor, for convenience, if the Owner believes, in its sole discretion that it is in the best interest of the Owner to do so. The Contractor will be compensated for work performed and accepted and goods accepted by the Owner as of the termination date if the Agreement is terminated for convenience of the Owner. The award of this Agreement is not exclusive and the Owner reserves the right to purchase goods and services from other vendors when it is in the best interest of the Owner.
  - c. Equal Employment Opportunity.

Except as otherwise provided under 41 CFR Part 60, when funds will be expended by the Owner pursuant to this Agreement that meet the definition of “federally assisted construction contract” in 41 CFR Part 60-1.3, Contractor certifies it will comply with the equal opportunity clause provided under 41 CFR 60-1.4(b), in accordance with Executive Order 11246, “Equal Employment Opportunity” (30 FR 12319, 12935, 3 CFR Part, 1964-1965 Comp., p. 339), as amended by Executive Order 11375, “Amending Executive Order 11246 Relating to Equal Employment Opportunity,” and implementing regulations at 41 CFR part 60, “Office of Federal Contract Compliance Programs, Equal Employment Opportunity, Department of Labor.”

- d. Davis-Bacon Act, as Amended (40 U.S.C. 3141-3148).

During the term of this Agreement, the Contractor certifies it will be in compliance with all applicable Davis-Bacon Act provisions. In accordance with the statute, Contractor shall pay wages to laborers and mechanics at a rate not less than the prevailing wages specified in a wage determination made by the Secretary of Labor. In addition, the Contractor shall pay wages not less than once a week, unless employees voluntarily agree to a different schedule. The Owner will report all suspected or reported violations to the Federal awarding agency. Contractor certifies it will comply with the Copeland “Anti-Kickback” Act (40 U.S.C. 3145), as supplemented by Department of Labor regulations (29 CFR Part 3, “Contractors and Subcontractors on Public Building or Public Work Financed in Whole or in Part by Loans or Grants from the United States”). The Act provides that each vendor or subrecipient must be prohibited from inducing, by any means, any person employed in the construction, completion, or repair of public work, to give up any part of the compensation to which he or she is otherwise entitled. The Owner will report all suspected or reported violations to the Federal awarding agency.
- e. Contract Work Hours and Safety Standards Act (40 U.S.C. 3701-3708).

The Contractor certifies that during the term of an award for all contracts in excess of \$100,000 that involve the employment of mechanics or laborers, the Contractor will be in compliance with all applicable provisions of the Contract Work Hours and Safety Standards Act. Under 40 U.S.C. 3702 of the Act, each vendor must be required to compute the wages of every mechanic and laborer on the basis of a standard work week of 40 hours. Work in excess of the standard work week is permissible provided that the worker is compensated at a rate of not less than one and a half times the basic rate of pay for all hours worked in excess of 40 hours in the work week. The requirements of 40 U.S.C. 3704 are applicable to construction work and provide that no laborer or mechanic must be required to work in surroundings or under working conditions which are unsanitary, hazardous or dangerous. These requirements do not apply to the purchases of supplies or materials or articles ordinarily available on the open market, or contracts for transportation or transmission of intelligence.
- f. Rights to Inventions Made Under a Contract or Agreement.

If the Federal award meets the definition of “funding agreement” under 37 CFR §401.2 (a) and Contractor wishes to enter into a contract with a small business firm or nonprofit organization regarding the substitution of parties, assignment or performance of experimental, developmental, or research work under that “funding agreement,” Contractor agrees to comply with the requirements of 37 CFR Part 401, “Rights to Inventions Made by Nonprofit Organizations and Small Business Firms Under Government Grants, Contracts and Cooperative Agreements,” and any implementing regulations issued by the awarding agency.
- g. Clean Air Act (42 U.S.C. 7401-7671q.) and the Federal Water Pollution Control Act (33 U.S.C. 1251-1387) Compliance.

The Contractor certifies that during the term of an award for all contracts by the Owner associated with this Agreement in excess of \$150,000, the Contractor agrees to comply with all applicable standards, orders or regulations issued pursuant to the Clean Air Act (42 U.S.C. 7401-7671q) and the Federal Water Pollution Control Act as amended (33 U.S.C. 1251- 1387). Violations must be reported to the Federal awarding agency and the Regional Office of the Environmental Protection Agency (EPA).
- h. Debarment and Suspension.

Contractor certifies that during the term of an award for all contracts by the Owner associated with this Agreement, the Contractor certifies that neither it nor its principals is presently debarred, suspended, proposed for debarment, declared ineligible, or voluntarily excluded from participation by any federal department or agency.
- i. Compliance with Byrd Anti-Lobbying Amendment (31 U.S.C. 1352).

When federal funds are expended by the Owner for a contract exceeding \$100,000, the Contractor certifies that during the term and after the awarded term of all contracts by the Owner associated with this Agreement, the Contractor certifies that it is in compliance with all applicable provisions of the Byrd Anti-Lobbying Amendment (31 U.S.C. 1352). The Contractor further certifies that:

  1. No Federal appropriated funds have been paid or will be paid for on behalf of the Contractor, to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with the awarding of a Federal contract, the making of a Federal grant, the making of a Federal loan, the entering into a cooperative agreement, and the extension, continuation, renewal, amendment, or modification of a Federal contract, grant, loan, or cooperative agreement.
  2. If any funds other than Federal appropriated funds have been paid or will be paid to any person for influencing or attempting to influence an officer or employee of any agency, a Member of Congress, an officer or employee of congress, or an employee of a Member of Congress in connection with this Federal grant or cooperative agreement, the undersigned shall complete and submit Standard Form-LLL, “Disclosure Form to Report Lobbying”, in accordance with its instructions.

3. The Contractor shall require that the language of this certification be included in the award documents for all covered sub-awards exceeding \$100,000 in Federal funds at all appropriate tiers and that all subrecipients shall certify and disclose accordingly.

j. Compliance with Solid Waste Disposal Act.

In the event the Contract involves the purchase of more than \$10,000 in items designed by guidelines of the Environmental Protection Agency at 40 C.F.R. Part 247, Contractor agrees to comply with the requirements of section 6002 of the Solid Waste Disposal Act. In particular, the Contractor certifies that the percentage of recovered materials to be used in the performance of the Agreement will be at least the amount required by applicable specifications or other contractual requirements.

k. Prohibition on Certain Telecommunications and Video Surveillance Services or Equipment.

As detailed in 2 CFR § 200.216, Contractor certifies that any equipment, services, or systems provided through this Agreement shall not use covered telecommunications equipment or services as a substantial or essential component of a system or as part of any system.

l. Domestic Preference.

As detailed in 2 CFR § 200.322, as appropriate and to the extent consistent with law, Contractor certifies that, to the greatest extent practicable, the goods, products, or materials furnished through this award will be produced in the United States (including but not limited to iron, aluminum, steel, cement, and other manufactured products).

m. Records Retention Requirements.

The Contractor certifies that it will comply with the record retention requirements detailed in 2 CFR § 200.334. The Contractor further certifies that Contractor will retain all records as required by 2 CFR § 200.334 for a period of three years after grantees or subgrantees submit final expenditure reports or quarterly or annual financial reports, as applicable, and all other pending matters are closed.

n. Certification of Non-Collusion Statement.

Contractor certifies under penalty of perjury that its response to this procurement solicitation is in all respects bona fide, fair, and made without collusion or fraud with any person, joint venture, partnership, corporation or other business or legal entity.

o. Prohibition on Gifts.

Contractor certifies that it will comply with the prohibition against giving gifts, gratuities, favors or anything of monetary value to an officer, employee or agent of the School System. Contractor understands and agrees that violation of these standards will result in termination of the Agreement and may result in ineligibility for future contract awards.

22. Notice. All notices shall be in writing and shall be deemed submitted if mailed or emailed to the representatives as listed below at the respective addresses:

Owner's representative/Address:

Contractor's Representative/Address:

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

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

IN WITNESS WHEREOF, the Owner has caused this Agreement to be signed and the Contractor has caused this Agreement to be signed by a person with the authority to enter this Agreement, as hereinafter attested, all as of the day and year first above written.

**RICHMOND COUNTY BOARD OF EDUCATION**

(Seal)

Name \_\_\_\_\_, Title \_\_\_\_\_

This instrument has been pre-audited in the manner required by the School Budget and Fiscal Control Act. G.S. 115C-441(a).

Finance Officer \_\_\_\_\_ Date \_\_\_\_\_

**CONTRACTOR: “Type full legal name here”**

\_\_\_\_\_(Seal)  
Name \_\_\_\_\_, Title \_\_\_\_\_

## PERFORMANCE BOND

IT IS HEREBY AGREED that (Insert full name and address of Contractor)

as Principal, hereinafter called Contractor, and, (Insert full name and address of Surety)

as Surety, hereinafter called Surety, are held and firmly bound unto the

as Obligee, hereinafter called Owner, in the amount of \_\_\_\_\_  
(\$ \_\_\_\_\_), for the payment whereof Contractor and Surety bind themselves, their heirs,  
executors, administrators, successors and assigns, jointly and severally, firmly by these  
obligations.

WHEREAS, Contractor has by written agreement dated \_\_\_\_\_, 20\_\_\_\_, entered  
into a contract with Owner for the construction of Chaloner Middle School HVAC Replacement

in accordance with Drawings and Specifications prepared by Smith Sinnett Architecture, P.A.

which contract is by reference made a part hereof, and is hereinafter referred to as the Contract.

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Contractor  
shall promptly and faithfully perform said Contract, then this obligation shall be null and void;  
otherwise it shall remain in full force and effect. The Surety hereby waives notice of any  
alteration or extension of time made by the Owner.

Whenever Contractor shall be, and declared by Owner to be in default, under the Contract, the  
Owner having performed Owner's obligations thereunder, the Surety may promptly remedy the  
default, or shall promptly:

- 1) Complete the Contract in accordance with its terms and conditions, or

2) Obtain a bid or bids for completing the Contract in accordance with its terms and conditions, and upon determination by Surety of the lowest responsible bidder, or, if the Owner elects, upon determination by the Owner and the Surety jointly of the lowest responsible bidder, arrange for a contract between such bidder and Owner, and make available as Work progresses (even though there should be a default or a succession of defaults under the contract or contracts of completion arranged under this paragraph) sufficient funds to pay the cost of completion less the balance of the contract price; but not exceeding, including other costs and damages for which the Surety may be liable hereunder, the amount set forth in the first paragraph hereof. The term "balance of the contract price," as used in this paragraph, shall mean the total amount payable by Owner to Contractor under the Contract and any amendments thereto, less the amount properly paid by Owner to Contractor.

Any suit under this bond must be instituted before the expiration of any applicable statute of limitations under the Contract.

No right of action shall accrue on this bond to or for the use of any person or corporation other than the Owner named herein or the heirs, executors, administrators or successors of the Owner.

Signed and sealed this \_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_.

**PRINCIPAL**

[Affix corporate seal]

\_\_\_\_\_  
(Name) \_\_\_\_\_  
(Title) \_\_\_\_\_

\_\_\_\_\_  
(Witness)

**SURETY**

[Affix corporate seal]

\_\_\_\_\_  
(Name) \_\_\_\_\_  
(Title) \_\_\_\_\_

(Witness)

## **LABOR AND MATERIAL PAYMENT BOND**

THIS BOND IS ISSUED SIMULTANEOUSLY WITH PERFORMANCE BOND IN FAVOR OF THE OWNER CONDITIONED ON THE FULL AND FAITHFUL PERFORMANCE OF THE CONTRACT

**IT IS HEREBY AGREED** that (Insert full name and address of Principal)

as Principal, hereinafter called "Principal," and, (Insert full name and address of Surety)

as Surety, hereinafter called "Surety," are held and firmly bound unto the

as Obligee, hereinafter called Owner, for the use and benefit of claimants as hereinbelow defined, in the amount of \_\_\_\_\_ DOLLARS AND ZERO CENTS (\$ \_\_\_\_\_), for the payment whereof Principal and Surety bind themselves, their heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these obligations.

WHEREAS, Principal has by written agreement dated \_\_\_\_\_ 2022, entered into a contract with Owner for the construction of Chaloner Middle School HVAC Replacement

in accordance with Drawings and Specifications prepared by Smith Sinnett Architecture, P.A.

which contract is by reference made a part hereof, and is hereinafter referred to as the "Contract."

NOW, THEREFORE, THE CONDITION OF THIS OBLIGATION is such that, if Principal shall promptly make payment to all claimants as hereinafter defined, for all labor and material used or reasonably required for use in the performance of the Contract, then this obligation shall be void; otherwise it shall remain in full force and effect, subject, however, to the following conditions:

1. A claimant is defined as one having a direct contract with the principal or with a Subcontractor of the Principal for labor, material, or both, used or reasonably required for use in the performance of the Contract, labor and material being construed to include that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental of equipment directly applicable to the Contract.

2. The above named Principal and Surety hereby jointly and severally agree with the Owner that every claimant as herein defined, who has not been paid in full before the expiration of a period of ninety (90) days after the date on which the last of such claimant's work or labor was done or performed, or materials were furnished by such claimant, may sue on this bond for the use of such claimant, prosecute the suit to final judgment for such sum or sums as

may be justly due claimant, and have execution thereon. The Owner shall not be liable for the payment of any costs or expenses of any such suit.

3. No suit or action shall be commenced hereunder by any claimant:

a) Unless claimant, other than one having a direct contract with the Principal, shall have given written notice to any two of the following: the Principal, the Owner, or the Surety above named, within ninety (90) days, after such claimant did or performed the last of the work or labor, or furnished the last of the materials for which said claim is made, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were furnished, or for whom the work or labor was done or performed. Such notice shall be served by mailing the same by registered mail or certified mail; postage prepaid, in an envelope addressed to the Principal, Owner or Surety, at any place where an office is regularly maintained for the transaction of business, or served in any manner in which legal process may be served in the state in which the aforesaid project is located, save that such service need not be made by a public officer.

b) After the expiration of one (1) year following the date on which Principal ceased Work on said Contract, it being understood, however, that if any limitation embodied in this bond is prohibited by any law controlling the construction hereof such limitation shall be deemed to be amended so as to be equal to the minimum period of limitation permitted by such law.

c) Other than in a state court of competent jurisdiction in and for the county or other political subdivision of the state in which the Project, or any part thereof, is situated, or in the United States District Court for the district in which the Project, or any part thereof, is situated, and not elsewhere.

4. The amount of this bond shall be reduced by and to the extent of any payment or payments made in good faith hereunder, inclusive of the payment by Surety of mechanics' liens which may be filed of record against said improvement, whether or not claim for the amount of such lien be presented under and against this bond.

Signed and sealed this \_\_\_\_ day of \_\_\_\_\_ 20 \_\_\_\_.

**PRINCIPAL**

[Affix corporate seal]

\_\_\_\_\_  
(Name)\_\_\_\_\_

(Title)\_\_\_\_\_

\_\_\_\_\_  
(Witness)

**SURETY**

[Affix corporate seal]

\_\_\_\_\_  
(Name)\_\_\_\_\_

(Title)\_\_\_\_\_

\_\_\_\_\_  
(Witness)

## **SECTION 00 90 10 - SPECIAL CONDITIONS**

The following requirements are, in fact, Conditions of the Contract, and are in addition to the General Conditions, Supplementary General Conditions and Special Conditions and are not intended to replace or otherwise conflict with those Conditions. These Special Requirements are particular to the Work of this Project and are intended to inform the Contractor of non-standard conditions affecting the Work of the Contract.

### **ARTICLE 1 - QUALIFICATION OF PROJECT SUPERINTENDENT**

The Contractor shall be required to demonstrate his capability to provide a qualified project superintendent for the project who is acceptable to the Owner and Architect. The project superintendent shall have at least five years of successful experience on projects of similar size, scope and nature. Contractor shall be required to substantiate these qualifications with a written submittal within seven calendar days after opening of the Bids. The Contractor is charged with providing a qualified and experienced superintendent for this project to the satisfaction of the Owner and Architect. The Owner reserves the right to disapprove a proposed superintendent who does not appear to be fully qualified and experienced to accomplish the work of this project.

### **ARTICLE 2 - SINGLE PRIME AND SEPARATE PRIME CONTRACT BIDS**

Bids will be received for Single Prime Contracts only. Opening of Bids, as it relates to the number of bids required to allow opening, and award of Contracts, as it relates to low bid and the number of bids required to allow award, shall be governed by the guidelines and procedures recommended by the State Department of Construction of the N.C. Department of Administration for bid openings for single prime informal contract bids.

Those Bidders submitting Single Prime Contract bids shall be aware that all work of the project is included in the Work of a Single Prime Contractor, regardless of the divisions of work indicated on the Drawings and in the Project Manual. All references and indications in the Drawings and the Project Manual to Separate Prime Contracts shall apply to the Single Prime Contract.

Single Prime Contract Bidders must include the names of their major subcontractors on the Proposal form as indicated, to include Plumbing and Electrical.

Bid Alternates and Unit Prices identified shall be bid, as identified, by the Single Prime Contract Bidder, as indicated on the Proposal form.

All Allowances identified shall all be included in the Single Prime Contract Bid.

### **ARTICLE 3 - COORDINATION AND COOPERATION WITH OTHER CONTRACTORS**

Prime Contractor shall be aware that the Owner has or may engage other contractors to accomplish work concurrently with the Work of this project, which will have a direct effect on the accomplishment of the Work of this project. Contractors will be required to cooperate and coordinate with these other contractors during the course of the project to avoid delays in the work of this project of that of the other contractors.

### **ARTICLE 4 – RESERVED**

### **ARTICLE 5 - UNDERGROUND SERVICES**

Prime Contractor and all subcontractors shall field locate all underground services whether shown on drawings or not, including, but not limited to the following: utilities, underground wire, fiber optic lines, cable, conduit, and pipe, prior to initiating any excavation on any area of the proposed site. Provide and pay for underground utility locator service, metal detectors and hand digging as necessary to satisfy above requirements. Prime Contractor (s) and their subcontractors shall be responsible for utility services damaged during construction and shall repair at their own expense any utility services damaged by their work. Repairs shall be completed within 24 hours or less.

## **ARTICLE 6 - AMERICANS WITH DISABILITIES ACT (ADA)**

It is the design intent of this project to comply with the Americans with Disabilities Act and Chapter 11 of the North Carolina Building Code 2012 and ANSI ICC A117.1-2009. All items and assemblies manufactured or fabricated for installation on this project shall be ADA compliant. Shop drawing submittals shall indicate ADA compliance. Installation of all items and assemblies shall be ADA compliant. All contractors shall submit a statement that all work to the best of their knowledge is ADA compliant prior to release of final retainage. Remedy of non-compliant circumstances should they arise shall consist of written notification to the Architect by the Contractor prior installation or fabrication of the respective building component or arrangement. Should any contractor, subcontractor, or regulatory authority having jurisdiction become aware of any non-compliant circumstance he shall notify the Architect at once.

## **ARTICLE 7 - RESTRICTIONS ON CONSTRUCTION PERSONNEL**

Behavior of construction personnel on the site shall be expected to be exemplary. Foul language, rude or crude behavior, suggestive comments or actions, or other behavior considered unacceptable will not be tolerated. Shirts will be required to be worn at all times. Contractors will be responsible to counsel their personnel concerning the above restrictions and will be responsible to insure that these restrictions are enforced. Failure on the part of construction personnel to comply with the intent of these restrictions will be grounds for their permanent removal and banning from the Project site.

## **ARTICLE 8 – E-PROCUREMENT**

ATTENTION: E-Procurement rules WILL apply for Registered E-Procurement Vendors only. Reference the General Contract Terms and Conditions, (Contractual and Consultant Services), paragraphs 19 and 20.

### **1.8. REGISTERED E-PROCUREMENT VENDORS:**

ELECTRONIC PROCUREMENT (APPLIES TO ALL CONTRACTS THAT INCLUDE E-PROCUREMENT AND ARE IDENTIFIED AS SUCH IN THE BODY OF THE SOLICITATION DOCUMENT): Purchasing shall be conducted through the Statewide E-Procurement Service. The State's third party agent shall serve as the Supplier Manager for this E-Procurement Service.

THE SUCCESSFUL BIDDER (S) SHALL PAY A TRANSACTION FEE OF 1.75% (.0175) ON THE TOTAL DOLLAR AMOUNT (EXCLUDING SALES TAXES) OF EACH PURCHASE ORDER ISSUED THROUGH THE STATEWIDE E-PROCUREMENT SERVICE. This applies to all purchase orders, regardless of the quantity or dollar amount of the purchase order. The transaction fee shall not be stated or included as a separate item in the proposed contract or invoice. There are no additional fees or charges to the contractor for the services rendered by the Supplier Manager under this contract. Contractor will receive a credit for transaction fees they paid for the purchase of any item(s) if an item(s) is returned through no fault of the contractor. Transaction fees are non-refundable when an item is rejected and returned, or declined, due to the contractor's failure to perform or comply with specifications or requirements of the contract.

Contractor or its Authorized Reseller, as applicable, will be invoiced monthly for the State's transaction fee by the Supplier Manager. The transaction fee shall be based on purchase orders issued for the prior month. Unless Supplier Manager receives written notice from the Contractor identifying with specificity any errors in an invoice within thirty (30) days of the receipt of invoice, such invoice shall be deemed to be correct and Contractor shall have waived its right to later dispute the accuracy and completeness of the invoice. Payment of the transaction fee by the Contractor is due to the account designated by the State within thirty (30) days after receipt of the correct invoice for the transaction fee, which includes payment of all portions of an invoice not in dispute. Within thirty (30) days of the receipt of invoice, contractor may request in writing an extension of the invoice payment due date for that portion of the transaction fee invoice for which payment of the related goods by the governmental purchasing entity has not been received by the Contractor. If payment of the transaction fee is not received by the State within this payment period, it shall be considered a material breach of contract. The Supplier Manager shall provide, whenever reasonably requested by the contractor in writing (including

electronic documents), supporting documentation from the E-Procurement Service that accounts for the amount of the invoice.

The Supplier Manager will capture the order from the State approved user, including the shipping and payment information, and submit the order in accordance with the E-Procurement Service. Subsequently, the Supplier Manager will send those orders to the appropriate contractor on State Contract. The State or State approved user, not the Supplier Manager, shall be responsible for the solicitation, bids received, evaluation of bids received, award of contract, and the payment for goods delivered.

Contractor agrees at all times to maintain the confidentiality of its user name and password for the Statewide E-Procurement Services. If a contractor is a corporation, partnership or other legal entity, then the contractor may authorize its employees to use its password. Contractor shall be responsible for all activity and all charges by such employees. Contractor agrees not to permit a third party to use the Statewide E-Procurement Services through its account. If there is a breach of security through the contractor's account, contractor shall immediately change its password and notify the Supplier Manager of the security breach by e-mail. Contractor shall cooperate with the State and the Supplier Manager to mitigate and correct any security breach.

8.2. NON-REGISTERED E-PROCUREMENT VENDORS: E-Procurement Rules DO NOT apply.

## **ARTICLE 9 – DISPUTE RESOLUTION**

See the Following 2 pages for Dispute Resolution Policy in the Roanoke Rapids Board of Education Policy Manual in Policy Code: 9120 Bidding for Construction Work.





**END OF SECTION 00 90 10**

**SECTION 01 10 00 - SUMMARY**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  1. Adjust list below to suit Project.
  2. Work covered by the Contract Documents.
  3. Type of the Contract.
  4. Work phases.
  5. Work under other contracts.
  6. Use of premises.
  7. Work restrictions.
  8. Specification formats and conventions.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

- A. Project Identification: **Chaloner Middle School HVAC Replacement**
  1. Project Location: **1200 Virginia Avenue, Roanoke Rapids, NC 27870.**
- B. Owner: **Roanoke Rapids Graded School District, 536 Hamilton Street, Roanoke Rapids, North Carolina 27870.**
- C. Architect: Smith Sinnett Architecture, 4600 Lake Boone Trail, Suite 205, Raleigh, North Carolina 27607.
- D. **This bid package consists of the replacement of the existing HVAC system with a wall hung unit. Window demolition and light framing will be required along with any utilities required to operate the new units.** The project includes all other work as shown, indicated or reasonably implied on the drawings and/or specifications for a complete, first class job.

1.4 TYPE OF CONTRACT

- A. Project will be constructed under a single prime contract. Bidders submitting single prime contract bids, and subsequently successful single prime Contractors, shall be aware that all work of the project is included in the Work of a single prime contractor, regardless of the divisions of work indicated on the Drawings and in the Project Manual. All references and indications in the Drawings and the Project Manual to separate Prime Contracts shall apply to the Single Prime Contract. Bid Alternates and Unit Prices shall apply to the Single Prime Contract. Allowances shall be included in the Single Prime Contract.

1.5 WORK UNDER OTHER 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. Coordinate the Work of this Contract with work performed under separate contracts.

1.6 USE OF PREMISES

- A. General: Contractor shall have limited use of premises for construction operations as indicated on Drawings by the Contract limits or otherwise approved by the Owner and Architect.
- B. Use of Site: Limit use of premises to limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.
  - 1. Limits: Confine constructions operations to limits indicated on drawings.
  - 2. Owner Occupancy: The Owner **WILL** occupy any portion of the site.

1.7 WORK RESTRICTIONS

- A. On-Site Work Hours: Work shall be generally performed 7:00 am to 7:00 pm Monday through Friday, except otherwise indicated or as needed to meet the project schedule.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

- A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "Master Format" numbering system.
- B. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.
- C. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.
- D. 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:
- E. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be inferred as the sense requires. Singular words shall be interpreted as plural, and plural words shall be interpreted as singular where applicable as the context of the Contract Documents indicates. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.
  - 1. 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.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 10 00**

## SECTION 01 21 00 - ALLOWANCES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements governing allowances.
  - 1. Certain items are specified in the Contract Documents by allowances. Allowances have been established in lieu of additional requirements and to defer selection of actual materials and equipment to a later date when additional information is available for evaluation. If necessary, additional requirements will be issued by Change Order.
  - 2. The Contractor shall include in the Contract Sum all allowances states in the Contract Documents. The Contractor's costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for the original allowance shall be included in the Contract Sum and not in the allowance, unless indicated otherwise herein. Coordinate allowance work with related work to ensure that each selection in completely integrated and interfaced with related work. Include all allowance amounts as a separate line item amount on each application for payment.
- B. Types of allowances include the following:
  - 1. Unit-cost allowances.
  - 2. Quantity allowances.
  - 3. Contingency Allowances.
- C. Related Sections include the following:
  - 1. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders for allowances.
  - 2. Division 01 Section "Unit Prices" for procedures for using unit prices as bases to establish allowance value.
  - 3. Divisions 02 through 26 Sections for items of Work covered by allowances.
  - 4. Division 31 Section "Earth Moving for Sites" and "Earth Moving for Building" for procedures for measurements and payment for Unsuitable Soil Replacement.

#### 1.3 SELECTION AND PURCHASE

- A. At the earliest practical date after award of the Contract, advise the Architect of the date when final selection and purchase of each product or system described by an allowance must be completed to avoid delaying the Work.
- B. At Architect's request, obtain proposals for each allowance for use in making final selections. Include recommendations that are relevant to performing the Work. **Provide a minimum of three (3) proposals for each allowance** for use in making final selections, unless instructed otherwise by the Architect. Furnish proposals in time so as not to delay the project. Include recommendations that are relevant to performing the Work.
- C. Purchase products and systems selected by Architect from the designated supplier.

#### 1.4 SUBMITTALS

- A. Submit proposals for purchase of products or systems included in allowances, in the form specified for Change Orders.
- B. Submit invoices or delivery slips to show actual quantities of materials delivered to the site for use in fulfillment of each allowance.
- C. Coordinate and process submittals for allowance items in same manner as for other portions of the Work.

#### 1.5 COORDINATION

- A. Coordinate allowance items with other portions of the Work. Furnish templates as required to coordinate installation.

#### 1.6 ALLOWANCES

- A. Refer to Schedule of Allowances for Amounts and Quantities
- B. Quantity & Lump Sum Allowances
  - 1. Allowance shall include cost to Contractor of specific products and materials ordered by Owner under allowance and shall include taxes, freight, and delivery to Project site.
  - 2. Contractor's costs for receiving and handling at Project site, labor, installation, overhead and profit, and similar costs related to products and materials ordered by Owner under allowance shall be included as part of the Contract Sum and not part of the allowance.
- C. Unit-Cost Allowances
  - 1. Each change order amount for unit-cost type allowances shall be based solely on the difference between the actual unit purchase amount and the unit allowance, multiplied by the final measure or count of work-in-place, with reasonable allowances, where applicable, for cutting losses, tolerances, mixing wastes, normal product imperfections and similar margins.
  - 2. Include installation costs in the purchase amount only where indicated as a part of the allowance. When requested, prepare explanations and documentation to substantiate the margins as claimed. Prepare and submit substantiation of a change in the scope of work (if any) claimed in the change orders related to unit-cost type allowances. The Owner reserves the right to establish the actual quantity of work- in-place by an independent quantity survey, measure or count.
  - 3. Unit-Cost Allowances shall be based on the Unit Price value established.
- D. Contingency Allowances
  - 1. Use the contingency allowance only as directed by Architect for Owner's purposes and only by Change Orders that indicate amounts to be charged to the allowance.
  - 2. Contractor's related costs for products and equipment ordered by Owner under the contingency allowance are included in the allowance and are not part of the Contract Sum. These costs include delivery, installation, taxes, insurance, equipment rental, and similar costs.
  - 3. Allowances for overhead and profit shall be provided within the contract price and not included as part of any change order till the allowance amount has been spent.

#### 1.7 CHANGE ORDER MARK-UP

- A. Except as otherwise indicated, comply with provisions of General Conditions and other requirements stated in this section. For each allowance, Contractor's claims for increased costs (for either purchase order amount or Contractor's handling, labor, installation, overhead, and profit), because of a change in scope or nature of the allowance work as described in contract documents, must be submitted within 60 days of initial change order authorizing work to proceed on that allowance; otherwise, such claims will be rejected.

- B. As a procedural restriction no mark-up (increase or decrease) shall be included in the change order amount for Contractor's increase or decrease in handling, labor, installation, overhead or profit unless purchase order amount varies by more than 15% from allowance amount.
- C. Change orders prepared to return unused allowance amounts to the Owner shall be subject to the same requirements for the return of appropriate profit and overhead as other change orders in accordance with the Conditions of the Contract. Where the Contractor has been directed not to include his related costs (profit and overhead) in the Contract Sum for contingency allowances, the return of profit and overhead shall not be expected.

## 1.8 UNUSED MATERIALS

- A. Return unused materials purchased under an allowance to manufacturer or supplier for credit to Owner, after installation has been completed and accepted.
  - 1. If requested by Architect, prepare unused material for storage by Owner when it is not economically practical to return the material for credit. If directed by Architect, deliver unused material to Owner's storage space. Otherwise, disposal of unused material is Contractor's responsibility.

## PART 2 - PRODUCTS (Not Used)

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine products covered by an allowance promptly on delivery for damage or defects. Return damaged or defective products to manufacturer for replacement.

### 3.2 PREPARATION

- A. Coordinate materials and their installation for each allowance with related materials and installations to ensure that each allowance item is completely integrated and interfaced with related work.

### 3.3 SCHEDULE OF ALLOWANCES

- A. **Allowance No. UP/A-1:** Acoustic Ceiling Tile and Grid
  - 1. Purpose: To adjust the contract sum in case a quantity different from that **indicated in the allowance is required.**
  - 2. Unit of measurement: **square feet.**
  - 3. Include the following in the unit price:
    - a. Demolition, removal, transport, and disposal of all materials.
    - b. Match systems, styles, and color
    - c. Overhead and profit.
    - d. Allowance shall be based on the unit price quoted in the Proposal.
  - 4. Include all other related costs in the contract sum.
  - 5. Method of measurement: Quantities will be verified by the Architect and or Owner
  - 6. Allowance Quantity: **500-sf.**

- B. Allowance No. 2: Contingency**
1. Contingency allowance shall be provided as follows and the price shall be adjusted based on the actual cost of subcontracts, materials, and labor, excluding overhead and profit. **Allowances for overhead and profit shall be provided within the contract price.** If there is unused allowance at the conclusion of the project, the allowance plus 5% profit will be deducted from the contract.
  2. **Contingency: \$40,000.00**

**END OF SECTION 01 21 00**

**SECTION 01 22 00 - UNIT PRICES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for unit prices and effects all prime Contracts.
- B. Related Sections include the following:
  - 1. Division 01 Section below contains requirements that relate directly to unit prices.
  - 2. Division 01 Section "Allowances" for procedures to adjust quantity allowances and quantities of Unit Prices to be included in the Base Bid.
  - 3. Division 01 Section "Contract Modification Procedures" for procedures for submitting and handling Change Orders.
  - 4. Division 01 Section "Quality Requirements" for general testing and inspecting requirements.
  - 5. Division 31 Section "Earth Moving for Sites" and "Earth Moving for Building" for procedures for measurement and payment for Unsuitable Soil Replacement.

1.3 DEFINITIONS

- A. Unit price is an amount proposed by bidders, stated on the Bid Form, as a price per unit of measurement for materials or services added to or deducted from the Contract Sum by appropriate modification, if estimated quantities of Work required by the Contract Documents are increased or decreased. Unit Prices shall be used to calculate Allowance values.

1.4 PROCEDURES

- A. Unit prices include all necessary material, plus cost for delivery, installation, insurance, applicable taxes, overhead, and profit.
- B. Measurement and Payment: Refer to individual Specification Sections for work that requires establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.
- C. Owner reserves the right to reject Contractor's measurement of work-in-place that involves use of established unit prices and to have this work measured, at Owner's expense, by an independent surveyor acceptable to Contractor.
- D. List of Unit Prices: A list of unit prices is included in Part 3. Specification Sections referenced in the schedule contain requirements for materials described under each unit price.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 LIST OF UNIT PRICES

- A. **Allowance No. UP/A-1:** Acoustic Ceiling Tile and Grid.
1. Purpose: To adjust the contract sum in case a quantity different from that indicated in the allowance is required.
  2. Unit of measurement: square feet.

**END OF SECTION 01 22 00**

**SECTION 01 23 00 - ALTERNATES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for alternates.

1.3 DEFINITIONS

- A. Alternate: An amount proposed by bidders and stated on the Bid Form for certain work defined in the Bidding Requirements that may be added to the Base Bid amount if Owner decides to accept a corresponding change either in the amount of construction to be completed or in the products, materials, equipment, systems, or installation methods described in the Contract Documents.
  - 1. The cost or credit for each alternate is the net addition to the Contract Sum to incorporate alternate into the Work. No other adjustments are made to the Contract Sum.

1.4 PROCEDURES

- A. Coordination: Modify or adjust affected adjacent work as necessary to completely integrate work of the alternate into Project.
- B. Include as part of each alternate, miscellaneous devices, accessory objects, and similar items incidental to or required for a complete installation whether or not indicated as part of alternate.
- C. Notification: Immediately following award of the Contract, notify each party involved, in writing, of the status of each alternate. Indicate if alternates have been accepted, rejected, or deferred for later consideration. Include a complete description of negotiated modifications to alternates.
- D. Execute accepted alternates under the same conditions as other work of the Contract.
- E. Schedule: A Schedule of Alternates is included at the end of this Section. Specification Sections referenced in schedule contain requirements for materials necessary to achieve the work described under each alternate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 SCHEDULE OF ALTERNATES

**A. Alternate No. 1; Owner Preferred Manufacturer– Vertical Packaged Outdoor Mounted Heat Pump (VPAC)**

State the amount to be added to the Base Bid for providing all labor and materials indicated and required to accomplish Work involved in providing the Owner Preferred Manufacturer Listed Below:

1. Vertical Packaged Outdoor Mounted Heat Pump (VPAC)
  - a. Bard

**B. Alternate No. 2; Owner Preferred Manufacturer– Electric Equipment**

State the amount to be added to the Base Bid for providing all labor and materials indicated and required to accomplish Work involved in providing the Owner Preferred Manufacturer Listed Below:

1. Electric Equipment
  - a. Siemens

**END OF SECTION 01 23 00**

**SECTION 01 25 00 - SUBSTITUTION PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Administrative and procedural requirements for handling requests for substitutions made after award of the Contract.
- B. Related Sections:
  - 1. Division 01 Section "References" specifies the applicability of industry standards to products specified.
  - 2. Division 01 Section "Submittals" specifies requirements for submitting the Contractor's Construction Schedule and the Submittal Schedule.

1.3 DEFINITIONS

- A. Definitions in this Article do not change or modify the meaning of other terms used in the Contract Documents.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction required by the Contract Documents proposed by the Contractor after award of the Contract are considered to be requests for substitutions. The following are not considered to be requests for substitutions:
  - 1. Substitutions requested during the bidding period, and accepted by Addendum prior to award of the Contract, are included in the Contract Documents and are not subject to requirements specified in this Section for substitutions.
  - 2. Revisions to the Contract Documents requested by the Owner or Architect.
  - 3. Specified options of products and construction methods included in the Contract Documents.
  - 4. The Contractor's determination of and compliance with governing regulations and orders issued by governing authorities.

1.4 SUBMITTALS

- A. Within 30 consecutive calendar days after the notice to proceed, each prime contractor shall submit a schedule for anticipated submission of all shop drawings, product data, samples, and similar submittals to the Project Expediter and the Designer. This schedule shall indicate the items, relevant specification sections, other related submittal, data, and the date when these items will be furnished to the designer.
- B. Each contractor shall obtain written approval from the designer for the use of products, materials, equipment, assemblies or installation methods claimed as equal to those specified. Such approvals must be obtained as soon after contract awards as possible and before any materials are ordered. Applications for approvals shall be made by the contractor and not by subcontractors or material suppliers within thirty 30 days following award of contract. When the submittal schedule provided is approved, no further

substitutions will be permitted except in unusual or extenuating circumstances. If no list is submitted, the contractor shall supply materials specified.

- C. Substitution Request Submittal: The Architect will consider requests for substitution if received within 10 consecutive calendar days prior to bid. Requests received more than 10 consecutive calendar days prior to bid will be rejected at the discretion of the Architect.
1. Submit 3 copies of each request for substitution for consideration. Submit requests in the form and according to procedures required for change-order proposals.
  2. Identify the product or the fabrication or installation method to be replaced in each request. Include related Specification Section and Drawing numbers.
  3. Provide complete documentation showing compliance with the requirements for substitutions, and the following information, as appropriate:
    - a. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by the Owner and separate contractors that will be necessary to accommodate the proposed substitution.
    - b. A detailed comparison of significant qualities of the proposed substitution with those of the Work specified. Significant qualities may include elements, such as performance, weight, size, durability, and visual effect.
    - c. Product Data, including Drawings and descriptions of products and fabrication and installation procedures. Samples, where applicable or requested.
    - d. A statement indicating the substitution's effect on the Contractor's Construction Schedule compared to the schedule without approval of the substitution. Indicate the effect of the proposed substitution on overall Contract Time.
    - e. Cost information, including a proposal of the net change, if any in the Contract Sum.
    - f. The Contractor's certification that the proposed substitution conforms to requirements in the Contract Documents in every respect and is appropriate for the applications indicated.
    - g. The Contractor's waiver of rights to additional payment or time that may subsequently become necessary because of the failure of the substitution to perform adequately.
  4. Architect's Action: If necessary, the Architect will request additional information or documentation for evaluation within one week of receipt of a request for substitution. The Architect will notify the Contractor of acceptance or rejection of the substitution within 2 weeks of receipt of the request, or one week of receipt of additional information or documentation, whichever is later. Acceptance will be in the form of a change order.
    - a. Use the product specified if the Architect cannot make a decision on the use of a proposed substitute within the time allocated.

## PART 2 - PRODUCTS

### 2.1 SUBSTITUTIONS

- A. Conditions: The Architect will receive and consider the Contractor's request for substitution when one or more of the following conditions are satisfied, as determined by the Architect. If the following conditions are not satisfied, the Architect will return the requests without action except to record noncompliance with these requirements.
1. Extensive revisions to the Contract Documents are not required.
  2. Proposed changes are in keeping with the general intent of the Contract Documents.
  3. The request is timely, fully documented, and properly submitted.
  4. The specified product or method of construction cannot be provided within the Contract Time.
  5. The Architect will not consider the request if the product or method cannot be provided as a result of failure to pursue the Work promptly or coordinate activities properly.
  6. The request is directly related to an "or-equal" clause or similar language in the Contract Documents.

7. The requested substitution offers the Owner a substantial advantage, in cost, time, energy conservation, or other considerations, after deducting additional responsibilities the Owner must assume. The Owner's additional responsibilities may include compensation to the Architect for redesign and evaluation services, increased cost of other construction by the Owner, and similar considerations.
  8. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
  9. The specified product or method of construction cannot be provided in a manner that is compatible with other materials and where the Contractor certifies that the substitution will overcome the incompatibility.
  10. The specified product or method of construction cannot be coordinated with other materials and where the Contractor certifies that the proposed substitution can be coordinated.
  11. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provides the required warranty.
  12. Where a proposed substitution involves more than one contractor, each contractor shall cooperate with the other contractors involved to coordinate the Work, provide uniformity and consistency, and assure compatibility of products.
- B. The Contractor's submittal and the Architect's acceptance of Shop Drawings, Product Data, or Samples for construction activities not complying with the Contract Documents do not constitute an acceptable or valid request for substitution, nor do they constitute approval.

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 25 00**

**SECTION 01 26 00 - CONTRACT MODIFICATION PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
- B. Related Sections include the following:
  - 1. Division 01 Section "Allowances" for procedural requirements for handling and processing allowances.
  - 2. Division 01 Section "Unit Prices" for administrative requirements for using unit prices.
  - 3. Division 01 Section "Submittal Procedures" for requirements for the Contractor's Construction Schedule.
  - 4. Division 01 Section "Payment Procedures" for administrative procedures governing Applications for Payment.
  - 5. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK

- A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on appropriate form.

1.4 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.
- B. Proposal Requests issued by **Architect** are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.  
Within **time specified in Proposal Request** after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
  - 1. 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.
  - 2. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
  - 3. Include costs of labor and supervision directly attributable to the change.
  - 4. 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.

- C. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes 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 Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.
  
- D. Proposal Request Form: Use AIA Document G709 for Proposal Requests.

#### 1.5 ALLOWANCES

- A. Allowance Adjustment: To adjust allowance amounts, base each Change Order proposal on the difference between purchase amount and the allowance, multiplied by final measurement of work-in-place. If applicable, include reasonable allowances for cutting losses, tolerances, mixing wastes, normal product imperfections, and similar margins.
  - 1. Include installation costs in purchase amount only where indicated as part of the allowance.
  - 2. If requested, prepare explanation and documentation to substantiate distribution of overhead costs and other margins claimed.
  - 3. Submit substantiation of a change in scope of work, if any, claimed in Change Orders related to unit-cost allowances.
  - 4. Owner reserves the right to establish the quantity of work-in-place by independent quantity survey, measure, or count.
  
- B. Submit claims for increased costs because of a change in scope or nature of the allowance described in the Contract Documents, whether for the Purchase Order amount or Contractor's handling, labor, installation, overhead, and profit. Submit claims within **(7) Seven** days of receipt of the Change Order or Construction Change Directive authorizing work to proceed. Owner will reject claims submitted later than **(7) seven** days after such authorization.
  - 1. Do not include Contractor's or subcontractor's indirect expense in the Change Order cost amount unless it is clearly shown that the nature or extent of work has changed from what could have been foreseen from information in the Contract Documents.
  - 2. No change to Contractor's indirect expense is permitted for selection of higher- or lower-priced materials or systems of the same scope and nature as originally indicated.

#### 1.6 CHANGE ORDER PROCEDURES

- A. On Owner's approval of a Proposal Request, **Architect** will issue an electronic Change Order for signing and approval of Owner, and Contractor.

#### 1.7 CONSTRUCTION CHANGE DIRECTIVE

- A. **Construction** Change Directive: **Architect** may issue a **Construction** Change Directive on **appropriate electronic form**. Directive shall be followed up by a Change Order.

- B. **Construction** Change Directive contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.
- C. Documentation: Maintain detailed records on a time and material basis of work required by the **Construction** Change Directive.
  - 1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 26 00**

**SECTION 01 29 00 - PAYMENT PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.
- B. Related Sections include the following:
  - 1. Division 01 Section "Allowances" for procedural requirements governing handling and processing of allowances.
  - 2. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
  - 3. Division 01 Section "Unit Prices" for administrative requirements governing use of unit prices.

1.3 DEFINITIONS

- A. Schedule of Values: A statement furnished by Contractor allocating portions of the Contract Sum to various portions of the Work and used as the basis for reviewing Contractor's Applications for Payment.

1.4 SCHEDULE OF VALUES

- A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule.
  - 1. Correlate 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. Submittals Schedule.
    - c. Contractor's Construction Schedule.
    - d. List of Subcontractors.
    - e. Schedule of Allowances
    - f. Schedule of Alternates.
    - g. List of Products.
    - h. List of Principal Suppliers and Fabricators.
  - 2. Submit the Schedule of Values to Architect at earliest possible date but no later than (7) seven days before the date scheduled for submittal of initial Applications for Payment.
  - 3. Subschedules: Where the Work is separated into phases requiring separately phased payments, provide subschedules showing values correlated with each phase of payment.
- B. Format and Content: Use the 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. Submit draft of AIA Document G703 Continuation Sheets. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
  - a. Related Specification Section or Division.
  - b. Description of the Work.
  - c. Name of subcontractor.
  - d. Name of manufacturer or fabricator.
  - e. Name of supplier.
  - f. Change Orders (numbers) that affect value.
  - g. Dollar value.
    - 1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.
3. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. **Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 5 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.
  - a. Differentiate between items stored on-site and items stored off-site. DO NOT bill for off-site stored materials.
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. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
8. 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.
  - a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
9. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.
10. Shop Drawings and Mobilization- Applications for payment shall not include preparation of shop drawings or mobilization. These items shall be included as part of work-in-place.
11. General Conditions: Applications for Payment for General Conditions shall be paid for in proportion to the amount of work completed.
12. Bonds and Insurance: Applications for Bonds and Insurance shall be accompanied with invoices from the Bond and Insurance provider.

#### 1.5 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: The date for each progress payment is indicated in the Agreement between Owner and Contractor. The period of construction Work covered by each Application for Payment is the period indicated in the Agreement.
- C. Payment Application Forms: Use **AIA Document G702 and Contractor's construction schedule indicating Item No., % complete, amount earned, amount earned current pay period, and amount remaining** as form for Applications for Payment.
- D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. **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 **5** five signed and notarized original copies of each Application for Payment to **Architect** by a method ensuring receipt **within 24 hours**. One copy shall include waivers of lien and similar attachments if required.
  - 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 a notarized waiver of mechanic's lien from the Prime Contractor. With each Application for Payment, submit waivers of mechanic's liens from subcontractors, sub-subcontractors, and suppliers for construction period covered by the previous application. With each Application for Payment, submit waivers of mechanic's lien from every entity who is 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 final or full waivers.
  - 3. Owner reserves the right to designate which entities involved in the Work must submit waivers.
  - 4. Submit final Application for Payment with or preceded by final waivers from every entity involved with performance of the Work covered by the application who is lawfully entitled to a lien.
  - 5. Waiver Forms: Submit waivers of lien on forms, executed in a manner acceptable to Owner.
- G. Bill of Material: With each Application for Payment, submit a bill of materials for each stored material listed for payment on the pay application. The bill of material shall state the quantity of material, stored on site, that is being billed for on the current Application for Payment. The bill of material shall correspond to the actually verified amount stored on site.
- H. NC Sales Tax Form: With each Application for Payment, submit a NC Sales Tax form. Refer to form at end of this section.
- I. 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. Products list.
  - 5. Schedule of unit prices.
  - 6. Submittals Schedule (preliminary if not final).
  - 7. List of Contractor's staff assignments.
  - 8. List of Contractor's principal consultants.
  - 9. Copies of building permits.

10. Copies of authorizations and licenses from authorities having jurisdiction for performance of the Work.
  11. Initial progress report.
  12. Report of preconstruction conference.
  13. Certificates of insurance and insurance policies.
  14. Performance and payment bonds.
  15. Data needed to acquire Owner's insurance.
  16. Initial settlement survey and damage report if required.
- J. Application for Payment at Substantial Completion: After issuing 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.
  3. Occupancy Permits and similar approvals.
  4. Warranties (guarantees) and maintenance agreements.
  5. Test/adjust/balance records.
  6. Maintenance instructions.
  7. Startup performance reports.
  8. Changeover information related to Owner's occupancy, use, operation, and maintenance.
  9. Final Cleaning.
  10. Application for reduction of retainage and consent of surety.
  11. List of discrepancies (punchlist items), recognized as Owner approved exceptions that shall be completed within 30 days.
  12. Advice on shifting insurance coverages.
- K. Final Payment Application: 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, "Contractor's Affidavit of Payment of Debts and Claims."
  5. AIA Document G706A, "Contractor's Affidavit of Release of Liens."
  6. AIA Document G707, "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.
  9. Final, liquidated damages settlement statement.
  10. Transmittal of required project construction records to the Owner.
  11. Certified property survey
  12. Removal of temporary facilities and services.
  13. Removal of surplus materials, rubbish, and similar elements.
  14. Change or door locks to Owner's access.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 29 00**

**SECTION 01 31 00 - PROJECT MANAGEMENT AND COORDINATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:
  - 1. Coordination Drawings.
  - 2. Administrative and supervisory personnel.
  - 3. Project meetings.
  - 4. Requests for Interpretation (RFIs).
- B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.
- C. Related Sections include the following:
  - 1. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

- A. RFI: Request from Contractor seeking interpretation or clarification of the Contract Documents.

1.4 COORDINATION

- A. The General Contractor shall coordinate construction activities of other contractors, the Owner, and other entities involved to assure efficient and orderly installation of each part of the work.
- B. 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.
- C. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
  - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
  - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
  - 3. Make adequate provisions to accommodate items scheduled for later installation.
  - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.
- D. 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.
- E. Administrative Procedures: The General Contractor shall 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.
  9. Project closeout activities.
- F. Conservation: The General Contractor shall coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.
  1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

## 1.5 COORDINATION DRAWINGS

- A. Coordination Drawings, General: Prepare coordination drawings according to requirements in individual Sections, where installation is not completely shown on Shop Drawings, where limited space availability necessitates coordination, or if coordination is required to facilitate integration of products and materials fabricated or installed by more than one entity.
  1. Content: Project-specific information, drawn accurately to a scale large enough to indicate and resolve conflicts. Do not base coordination drawings on standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - b. Indicate dimensions shown on the Drawings. Specifically note dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Engineer indicating proposed resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
- B. Coordination Drawing Organization: Organize coordination drawings as follows:
  1. Floor Plans and Reflected Ceiling Plans: Show architectural and structural elements, and mechanical, plumbing, fire-protection, fire-alarm, and electrical Work. Show locations of visible ceiling-mounted devices relative to acoustical ceiling grid.
  2. Plenum Space: Indicate sub framing for support of ceiling and wall systems, mechanical and electrical equipment, and related Work. Locate components within ceiling plenum to accommodate layout of light fixtures indicated on Drawings.
  3. Mechanical Rooms: Provide coordination drawings for mechanical rooms showing plans and elevations of mechanical, plumbing, fire-protection, fire-alarm, and electrical equipment.
  4. Structural Penetrations: Indicate penetrations and openings required for all disciplines.
  5. Slab Edge and Embedded Items: Indicate slab edge locations and sizes and locations of embedded items for metal fabrications, sleeves, anchor bolts, bearing plates, angles, door floor closers, slab depressions for floor finishes, curbs and housekeeping pads, and similar items.
  6. Review: Design team will review coordination drawings to confirm that the Work is being coordinated, but not for the details of the coordination, which are Contractor's responsibility.

## 1.6 SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
    - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
    - b. Indicate required installation sequences.
    - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
  2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches.
  3. Number of Copies: Submit two opaque copies of each submittal. Architect will return one copy.
    - a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.
  4. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.
1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

## 1.7 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

- A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.
1. Include special personnel required for coordination of operations with other contractors.
- B. Project Manager: General Contractor shall be required to provide and identify a qualified Project Manager who is responsible for overseeing all administrative activities for their Work.
1. The Contractor shall be required to demonstrate his capability to provide a qualified Project Manager for the project who is acceptable to the Owner and Architect. The Project Manager shall have at least five years successful experience on projects of similar size, scope and nature. Contractor shall be required to substantiate these qualifications with a written submittal within seven calendar days after opening of the Bids.
  2. The Contractor is charged with providing a qualified and experienced Project Manager for this project to the satisfaction of the Owner and Architect, and the Owner reserves the right to disapprove a proposed Project Manager who does not appear to be fully qualified and experienced to accomplish the work of the Project.
  3. This Project Manager shall have the necessary authority to speak on behalf of the Contractor and commit the Contractor's resources.
  4. Duties and responsibilities anticipated to be the responsibility of the Project Manager include, but are not limited to, the following:
    - a. Preparation, submittal and coordination of required submittals.
    - b. Scheduling and sequencing the Work.
    - c. Preparation of coordination drawings.
    - d. Coordination of materials and equipment purchasing, scheduling and delivery.
    - e. Coordination of Subcontractor/Installer and labor force scheduling.

- f. Other duties and responsibilities as necessary and customary to back up and assist the Superintendent.
5. Project Manager shall have email access for the entire length of the project for communication with the design team, emailing of submittals, reports, field reports, proposal requests, RFIs, and change orders.

## 1.8 PROJECT MEETINGS

- A. General: Architect will schedule and conduct the Preconstruction Conference and Monthly Meetings 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: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.
- B. Preconstruction Conference: Architect will 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. Hold the conference at Project site or another convenient location. Conduct the meeting to review responsibilities and personnel assignments.
  1. Attendees: Authorized representatives of Owner, Architect, and their consultants; Contractor and its superintendent; major subcontractors; suppliers; and other concerned parties shall attend the conference. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Discuss items of significance that could affect progress, including the following:
    - a. Tentative construction schedule.
    - b. Phasing.
    - c. Critical work sequencing and long-lead items.
    - d. 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 (and existing building if required).
    - m. Work restrictions.
    - n. Owner's occupancy requirements.
    - o. Responsibility for temporary facilities and controls.
    - p. Construction waste management and recycling.
    - q. Parking availability.
    - r. Office, work, and storage areas.
    - s. Equipment deliveries and priorities.
    - t. First aid.
    - u. Security.
    - v. Progress cleaning.
    - w. Working hours.
  3. Minutes: **Architect will record** and distribute meeting minutes.
- C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
  1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
    - a. The Contract Documents.
    - b. Options.
    - c. Related RFIs.
    - d. Related Change Orders.
    - e. Purchases and Deliveries.
    - f. Submittals.
    - g. Review of mockups.
    - h. Possible conflicts.
    - i. Compatibility problems.
    - j. Time schedules.
    - k. Weather limitations.
    - l. Manufacturer's written recommendations.
    - m. Warranty requirements.
    - n. Compatibility of materials.
    - o. Acceptability of substrates.
    - p. Temporary facilities and controls.
    - q. Space and access limitations.
    - r. Regulations of authorities having jurisdiction.
    - s. Testing and inspecting requirements.
    - t. Installation procedures.
    - u. Coordination with other work.
    - v. Required performance results.
    - w. Protection of adjacent work, construction and personnel.
  3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- D. Monthly Meetings: Architect will schedule and conduct monthly meetings minimum 1 per other. Additional monthly meetings may be added if requested by any party.
1. Attendees: 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. In addition, representatives of Owner, Architect, and Engineer will be present All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous monthly meetings. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.

- 7) Site utilization.
  - 8) Temporary facilities and controls.
  - 9) Work hours.
  - 10) Hazards and risks.
  - 11) Progress cleaning.
  - 12) Quality and work standards.
  - 13) Status of correction of deficient items.
  - 14) Field observations.
  - 15) RFIs.
  - 16) Status of proposal requests.
  - 17) Pending changes.
  - 18) Status of Change Orders.
  - 19) Pending claims and disputes.
  - 20) Documentation of information for payment requests.
3. Minutes: Architect will record and distribute to all relevant parties the monthly minutes.
  4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
    - a. Schedule Updating: Revise Contractor's Construction Schedule after each monthly meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- E. Progress Meetings: Conduct progress meetings at **weekly** intervals. Coordinate dates of meetings with preparation of payment requests.
1. Attendees: 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. In addition, representatives of Owner and Architect may be present All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.
      - 1) Review schedule for next period.
    - b. Review present and future needs of each entity present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Status of correction of deficient items.
      - 14) Field observations.
      - 15) RFIs.
      - 16) Status of proposal requests.
      - 17) Pending changes.
      - 18) Status of Change Orders.

- 19) Pending claims and disputes.
- 20) Documentation of information for payment requests.
3. Minutes: Contractor will record and distribute to all relevant subcontractors the weekly minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
  - a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.
- F. Coordination Meetings: Contractor shall conduct project coordination meetings at **weekly** intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and pre-installation conferences.
  1. Attendees: 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. In addition, representatives of Owner and Architect may be present All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.
  2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.
    - a. Construction Schedule: Review progress since the last coordination meeting. Determine whether each contract is on time, ahead of schedule, or behind schedule, in relation to 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.
    - b. Schedule Updating: Revise Construction Schedule after each coordination meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with report of each meeting.
    - c. Review present and future needs of each contractor present, including the following:
      - 1) Interface requirements.
      - 2) Sequence of operations.
      - 3) Status of submittals.
      - 4) Deliveries.
      - 5) Off-site fabrication.
      - 6) Access.
      - 7) Site utilization.
      - 8) Temporary facilities and controls.
      - 9) Work hours.
      - 10) Hazards and risks.
      - 11) Progress cleaning.
      - 12) Quality and work standards.
      - 13) Change Orders.
    - d. Reporting: Contractor shall Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

#### 1.9 REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.
  1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned 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 interpretation and the following:

1. Project name.
  2. Date.
  3. Name of Contractor.
  4. Name of Architect.
  5. RFI number, numbered sequentially.
  6. Specification Section number and title and related paragraphs, as appropriate.
  7. Drawing number and detail references, as appropriate.
  8. Field dimensions and conditions, as appropriate.
  9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
  10. Contractor's signature.
  11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
    - a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.
- C. Hard-Copy RFIs:
1. Identify each page of attachments with the RFI number and sequential page number.
- D. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
1. Attachments shall be electronic files in PDF format.
- E. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow **ten** working days for Architect's response for each RFI. RFIs received 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 or substitutions.
    - b. Requests for coordination information already indicated in the Contract Documents.
    - c. Requests for adjustments in the Contract Time or the Contract Sum.
    - d. Requests for interpretation of Architect's actions on submittals.
    - e. Incomplete RFIs or RFIs with numerous errors.
  2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
  3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
    - a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within **(10)** days of receipt of the RFI response.
- 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.
- G. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log **weekly**.  
**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.
  8. Identification of related Minor Change in the Work, Field Order, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 GENERAL COORDINATION PROVISIONS

- A. **Inspection of Conditions:** The Contractor shall require the Installer of each major component to inspect both the substrate and conditions under which work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.
- B. **Coordinate temporary enclosures** with required inspections and tests to minimize the necessity of uncovering completed construction for that purpose.

3.2 CLEANING AND PROTECTION

- A. **Clean and protect construction** in progress and adjoining materials in place during handling and installation. Apply protective covering where required to assure protection from damage or deterioration at Substantial Completion.
- B. **Clean and provide maintenance** on completed construction as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to assure operability without damaging effects.
- C. **Limiting Exposures:** Each contractor shall supervise its 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. Where applicable, such exposures include, but are not limited to, the following:
  - 1. Excessive static or dynamic loading, internal or external pressures, high or low temperatures.
  - 2. Thermal shock.
  - 3. Excessively high or low humidity.
  - 4. Air contamination or pollution.
  - 5. Water or ice.
  - 6. Solvents or Chemicals.
  - 7. Light.
  - 8. Radiation.
  - 9. Puncture
  - 10. Abrasion.
  - 11. Heavy traffic.
  - 12. Soiling, staining, and corrosion.
  - 13. Bacteria.
  - 14. Rodent and insect infestation.
  - 15. Combustion.
  - 16. Electrical current.
  - 17. High-speed operation.
  - 18. Improper lubrication.
  - 19. Unusual wear or other misuse.
  - 20. Contact between incompatible materials.
  - 21. Destructive testing.
  - 22. Misalignment.
  - 23. Excessive weathering.
  - 24. Unprotected storage.
  - 25. Improper shipping or handling.
  - 26. Theft or Vandalism.

**END OF SECTION 01 31 00**

**SECTION 01 32 00 - CONSTRUCTION PROGRESS DOCUMENTATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:
  - 1. Preliminary Construction Schedule.
  - 2. Contractor's Construction Schedule.
  - 3. Submittals Schedule.
  - 4. Daily construction reports.
  - 5. Material location reports.
  - 6. Field condition reports.
  - 7. Special reports.
- B. Related Sections include the following:
  - 1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
  - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
  - 3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
  - 4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 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 activities are activities on the critical path. They 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. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.
- C. 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.
- D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
- E. Event: The starting or ending point of an activity.
- F. Float: The measure of leeway in starting and completing an activity.
  - 1. Float time **belongs to Owner**.
  - 2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.

3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.
- G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.
- H. Major Area: A story of construction, a separate building, or a similar significant construction element.
- I. Milestone: A key or critical point in time for reference or measurement.
- J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.
- K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

#### 1.4 SUBMITTALS

- A. Qualification Data: For scheduling consultant.
- B. Submittals Schedule: Submit **three** copies of schedule. Arrange the following information in a tabular format:
  1. Scheduled date for first submittal.
  2. Specification Section number and title.
  3. Submittal category (action or informational).
  4. Name of subcontractor.
  5. Description of the Work covered.
  6. Scheduled date for Architect's final release or approval.
- C. Preliminary Construction Schedule: Submit **one** opaque copies.
  1. Approval of cost-loaded preliminary construction schedule will not constitute approval of Schedule of Values for cost-loaded activities.
- D. Preliminary Network Diagram: Submit **one** opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.
- E. Contractor's Construction Schedule: Submit **two** opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
  1. Submit an electronic copy of schedule.
- F. CPM Reports: Concurrent with CPM schedule, **submit three** copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
  1. Activity Report: List of all activities sorted by activity number and then early start date, or actual start date if known.
  2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
  3. Total Float Report: List of all activities sorted in ascending order of total float.
  4. Earnings Report: Compilation of Contractor's total earnings from **commencement of the Work the Notice to Proceed** until most recent Application for Payment.
- G. Daily Construction Reports: Submit **one** copies at **monthly** intervals.
- H. Material Location Reports: Submit **one** copies at **monthly** intervals.
- I. Field Condition Reports: Submit **one** copies at time of discovery of differing conditions.
- J. Special Reports: Submit **one** copies at time of unusual event.

#### 1.5 QUALITY ASSURANCE

- A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.
- B. Prescheduling Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to the Preliminary Construction Schedule and Contractor's Construction Schedule, including, but not limited to, the following:

1. Review software limitations and content and format for reports.
2. Verify availability of qualified personnel needed to develop and update schedule.
3. Discuss constraints, including **phasing, work stages, area separations, and interim milestones.**
4. Review schedule for work of Owner's separate contracts.
5. Review time required for review of submittals and resubmittals.
6. Review requirements for tests and inspections by independent testing and inspecting agencies.
7. Review and finalize list of construction activities to be included in schedule.
8. Review submittal requirements and procedures.
9. Review procedures for updating schedule.

## 1.6 COORDINATION

- A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.
- B. Coordinate Contractor's Construction Schedule with the Schedule of Values, list of subcontracts, Submittals Schedule, progress reports, payment requests, and other required schedules and reports.
  1. Secure time commitments for performing critical elements of the Work from parties involved.
  2. Coordinate each construction activity in the network with other activities and schedule them in proper sequence.

## PART 2 - PRODUCTS

### 2.1 SUBMITTALS SCHEDULE

- A. Preparation: Submit a schedule of submittals, arranged in chronological order by dates required by construction schedule. Include time required for review, resubmittal, ordering, manufacturing, fabrication, and delivery when establishing dates.
  1. Coordinate Submittals Schedule with list of subcontracts, the Schedule of Values, and Contractor's Construction Schedule.
  2. Initial Submittal: Submit concurrently with preliminary **bar-chart schedule**. Include submittals required during the first 60 days of construction. List those required to maintain orderly progress of the Work and those required early because of long lead time for manufacture or fabrication.
    - a. At Contractor's option, show submittals on the Preliminary Construction Schedule, instead of tabulating them separately.
  3. Final Submittal: Submit concurrently with the first complete submittal of Contractor's Construction Schedule.

### 2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

- A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
- B. 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.
- C. Activities: Treat each story or separate area as a separate numbered activity for each principal 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. Submittal Review Time: Include review and resubmittal times indicated in Division 01 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.

3. 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.
- D. 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. Phasing: Arrange list of activities on schedule by phase.
  2. Work under More Than One Contract: Include a separate activity for each contract.
  3. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
  4. Work Restrictions: Show the effect of the following items on the schedule:
    - a. Coordination with existing construction.
    - b. Limitations of continued occupancies.
    - c. Use of premises restrictions.
    - d. Provisions for future construction.
    - e. Seasonal variations.
    - f. Environmental control.
  5. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
    - a. Subcontract awards.
    - b. Submittals.
    - c. Purchases.
    - d. Mockups.
    - e. Fabrication.
    - f. Sample testing.
    - g. Deliveries.
    - h. Installation.
    - i. Tests and inspections.
    - j. Adjusting.
    - k. Curing.
- E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, Substantial Completion, and Final Completion.
- F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.
  1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.
  2. Contractor shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Architect's approval, be assigned to fabrication and delivery activities. Costs shall be under required principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
  3. Each activity cost shall reflect an accurate value subject to approval by Architect.
  4. Total cost assigned to activities shall equal the total Contract Sum.
- G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

## 2.3 PRELIMINARY CONSTRUCTION SCHEDULE

- A. Bar-Chart Schedule: Submit preliminary horizontal bar-chart-type construction schedule within **seven** 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. Outline significant construction activities for first **60** days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

2.4 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 to Proceed**. Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
- B. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
  - 1. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in **10** percent increments within time bar.

2.5 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

- A. General: Prepare network diagrams using AON (activity-on-node) format.
- B. Preliminary Network Diagram: Submit diagram within **14** days of date established for **the Notice to Proceed**. Outline significant construction activities for the first **60** days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.
- C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work.
  - 1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than **30** days after date established for **the Notice to Proceed**.
    - a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.
  - 2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.
  - 3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.
  - 4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
- D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.
  - 1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
    - a. Preparation and processing of submittals.
    - b. Mobilization and demobilization.
    - c. Purchase of materials.
    - d. Delivery.
    - e. Fabrication.
    - f. Utility interruptions.
    - g. Installation.
    - h. Work by Owner that may affect or be affected by Contractor's activities.
    - i. Testing.
  - 2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.
  - 3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.
  - 4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
    - a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.
- E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:
  - 1. Contractor or subcontractor and the Work or activity.

2. Description of activity.
  3. Principal events of activity.
  4. Immediate preceding and succeeding activities.
  5. Early and late start dates.
  6. Early and late finish dates.
  7. Activity duration in workdays.
  8. Total float or slack time.
  9. Average size of workforce.
  10. Dollar value of activity (coordinated with the Schedule of Values).
- F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:
1. Identification of activities that have changed.
  2. Changes in early and late start dates.
  3. Changes in early and late finish dates.
  4. Changes in activity durations in workdays.
  5. Changes in the critical path.
  6. Changes in total float or slack time.
  7. Changes in the Contract Time.
- G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.
1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
  2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
  3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
  4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
    - a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
    - b. Submit value summary printouts **[one week]** before each regularly scheduled progress meeting.

## 2.6 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.
  7. Accidents.
  8. Meetings and significant decisions.
  9. Unusual events (refer to special reports).
  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. **Construction** Change Directives received and implemented.
  16. Services connected and disconnected.
  17. Equipment or system tests and startups.
  18. Partial Completions and occupancies.
  19. Substantial Completions authorized.
- B. Material Location Reports: At **monthly** intervals, prepare and submit a comprehensive list of materials delivered to and stored at Project site. List shall be cumulative, showing materials previously reported plus items recently delivered. Include with list a statement of progress on and delivery dates for materials or items of equipment fabricated or stored away from Project site.

- C. Field Condition Reports: Immediately on discovery of a difference between field conditions and the Contract Documents, prepare and submit a detailed report. Submit with a request for interpretation. Include a detailed description of the differing conditions, together with recommendations for changing the Contract Documents.

## 2.7 SPECIAL REPORTS

- A. General: Submit special reports directly to Owner within **one** day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.
- B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

## 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 **one week** before each 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 Actual Completion percentage for each activity.
- B. Distribution: Distribute copies of approved schedule 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 01 32 00**

## SECTION 01 33 00 - SUBMITTAL PROCEDURES

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.
- B. Related Sections include the following:
  - 1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
  - 2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
  - 3. Division 01 Section "Quality Requirements" for submitting test and inspection reports **and for mockup requirements**.
  - 4. Division 01 Section "Closeout Procedures" for submitting warranties.
  - 5. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 6. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
  - 7. Divisions 02 through 26 Sections for specific requirements for submittals in those Sections.

#### 1.3 DEFINITIONS

- A. Action Submittals: Written and graphic information that requires Architect's responsive action.
- B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.
- C. Field Samples: Full-size physical examples erected on-site to illustrate finishes, coatings, or finish materials. Field samples are used to establish the standard by which the Work will be judged.
- D. Mockups: Full-size assemblies for review of construction, coordination, testing, or operation; they are not Samples.

#### 1.4 SUBMITTAL PROCEDURES

- A. General: Electronic copies of CAD Drawings of the Contract Drawings **will not** be provided by Architect for Contractor's use in preparing submittals unless a Waiver is provided by the Contractor.
- B. 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
- C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.
- D. Processing Time: Allow enough 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 twenty-one (21) 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 fourteen (14) days for review of each resubmittal.
  4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow twenty-one (21) days for initial review of each submittal.
    - a. Steel may be submitted for sequential review.
  5. Concurrent Consultant Review: Where the Contract Documents indicate that submittals may be transmitted simultaneously to Architect and to Architect's consultants, allow twenty-one (21) days for review of each submittal. Submittal will be returned to **Architect** before being returned to Contractor:
    - a. Concurrent Consultant Review: Civil (Site and Site utilities, Structural (Steel and Concrete), Plumbing, Mechanical and Electrical).
- E. Identification: Place a permanent label or title block on each submittal 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** on label or beside title block to record Contractor's review and approval markings and action taken by Architect.
  3. Include the following information on label for processing and recording action taken:
    - a. Project name.
    - b. Date.
    - c. Name and address of Architect.
    - d. Name and address of Contractor.
    - e. Name and address of subcontractor.
    - f. Name and address 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., 06100.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 06100.01.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.
- F. Deviations: **Highlight** or otherwise specifically identify deviations from the Contract Documents on submittals.

- G. Additional 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.
  - 1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
  - 2. Additional copies submitted for maintenance manuals will **not** be marked with action taken and will be returned.
- H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will **return submittals, without review**, received from sources other than Contractor.
  - 1. Transmittal Form: Use facsimile of sample form provided at end of Section.
  - 2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.
- I. 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 "."
- J. 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.
- K. Use for Construction: Use only final submittals with mark indicating **approval notation from Architect's action stamp** taken by Architect.

## 1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

- A. General: At Contractor's written request, copies of Architect's CAD files will be provided to Contractor for Contractor's use in connection with Project, subject to the following conditions:
  - 1. Contractor shall sign waiver form provided by Architect.

## PART 2 - PRODUCTS

### 2.1 ACTION SUBMITTALS

- A. General: Prepare and submit Action Submittals required by individual Specification Sections.
- 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 printed 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 written recommendations.
    - b. Manufacturer's product specifications.
    - c. Manufacturer's installation instructions.
    - d. Standard color charts.
    - e. Manufacturer's catalog cuts.

- f. Wiring diagrams showing factory-installed wiring.
  - g. Printed performance curves.
  - h. Operational range diagrams.
  - i. Mill reports.
  - j. Standard product operation and maintenance manuals.
  - k. Compliance with specified referenced standards.
  - l. Testing by recognized testing agency.
  - m. Application of testing agency labels and seals.
  - n. Notation of coordination requirements.
4. Submit Product Data before or concurrent with Samples.
  5. Number of Copies: Submit **six** copies of Product Data, unless otherwise indicated. Architect will return **two** copies. Mark up and retain one returned copy as a Project Record Document.
- 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. **Submittal of Architect's or Engineers's CAD Drawings are not permitted**
1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
    - a. Dimensions.
    - b. Identification of products.
    - c. Fabrication and installation drawings.
    - d. Roughing-in and setting diagrams.
    - e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
    - f. Shopwork manufacturing instructions.
    - g. Templates and patterns.
    - h. Schedules.
    - i. Design calculations.
    - j. Compliance with specified standards.
    - k. Notation of coordination requirements.
    - l. Notation of dimensions established by field measurement.
    - m. Relationship to adjoining construction clearly indicated.
    - n. Seal and signature of professional engineer if specified.
    - o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.
  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 **30 by 40 inches**. Retain one of two subparagraphs below. First subparagraph assumes Architect and Contractor will make copies from opaque print.
  3. Number of Copies: Submit two opaque (bond) copies of each submittal. Architect will return one copy.
  4. Number of Copies: Submit **six** opaque copies of each submittal, unless copies are required for operation and maintenance manuals. Submit **six** copies where copies are required for operation and maintenance manuals. Architect will retain **two** copies; remainder will be returned
- 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 appropriate Specification Section.

- E. 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.
  - 1. 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. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.
- F. 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.
  - 1. Number of Samples: Submit **two** 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.
  - 2. No color selection shall be made until all samples of items requiring color selections have been submitted to the Architect. Color selections shall be submitted to the Contractor in a finish schedule.
- G. 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.
  - 1. Number of Samples: Submit **three** sets of Samples. Architect will retain **two** Sample sets; remainder will be returned
    - a. Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.
    - b. If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least **three** sets of paired units that show approximate limits of variations.
- H. Product Schedule or List: As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:
  - 1. Type of product. Include unique identifier for each product.
  - 2. Number and name of room or space.
  - 3. Location within room or space.
  - 4. Number of Copies: Submit **three** copies of product schedule or list, unless otherwise indicated. Architect will return **two** copies.
- I. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.
- J. Submittals Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- K. Application for Payment: Comply with requirements specified in Division 01 Section "Payment Procedures."
- L. Schedule of Values: Comply with requirements specified in Division 01 Section "Payment Procedures."
- M. 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.
4. Number of Copies: Submit **three** copies of subcontractor list, unless otherwise indicated. Architect will return **one** copies.

## 2.2 INFORMATIONAL SUBMITTALS

- A. General: Prepare and submit Informational Submittals required by other Specification Sections.
  1. Number of Copies: Submit **two** copies of each submittal, unless otherwise indicated. Architect will not return copies.
  2. Certificates and Certifications: Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
  3. Test and Inspection Reports: Comply with requirements specified in Division 01 Section "Quality Requirements."
- B. Coordination Drawings: Comply with requirements specified in Division 01 Section "Project Management and Coordination."
- C. Contractor's Construction Schedule: Comply with requirements specified in Division 01 Section "Construction Progress Documentation."
- D. Qualification Data: Prepare written information that demonstrates capabilities and experience of firm or person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.
- F. Installer Certificates: Prepare 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.
- G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.
- H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.
- I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.
- J. Material Test Reports: Prepare 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.
- K. Product Test Reports: Prepare written reports indicating 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.
- L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:
  1. Name of evaluation organization.
  2. Date of evaluation.
  3. Time period when report is in effect.
  4. Product and manufacturers' names.
  5. Description of product.
  6. Test procedures and results.
  7. Limitations of use.
- M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

- N. Preconstruction Test Reports: Prepare 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.
- O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.
- P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, 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.
- Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."
- R. Design Data: Prepare 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.
- S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:
  - 1. Preparation of substrates.
  - 2. Required substrate tolerances.
  - 3. Sequence of installation or erection.
  - 4. Required installation tolerances.
  - 5. Required adjustments.
  - 6. Recommendations for cleaning and protection.
- T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:
  - 1. Name, address, and telephone number of factory-authorized service representative making report.
  - 2. Statement on condition of substrates and their acceptability for installation of product.
  - 3. Statement that products at Project site comply with requirements.
  - 4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
  - 5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
  - 6. Statement whether conditions, products, and installation will affect warranty.
  - 7. Other required items indicated in individual Specification Sections.
- U. Insurance Certificates and Bonds: Prepare written information indicating current status of insurance or bonding coverage. Include name of entity covered by insurance or bond, limits of coverage, amounts of deductibles, if any, and term of the coverage.
- V. Construction Comply with requirements specified in Division 01 Section "Photographic Documentation."
- W. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.
  - 1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

### 2.3 DELEGATED DESIGN

- 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 Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit **three** copies of a statement, 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.

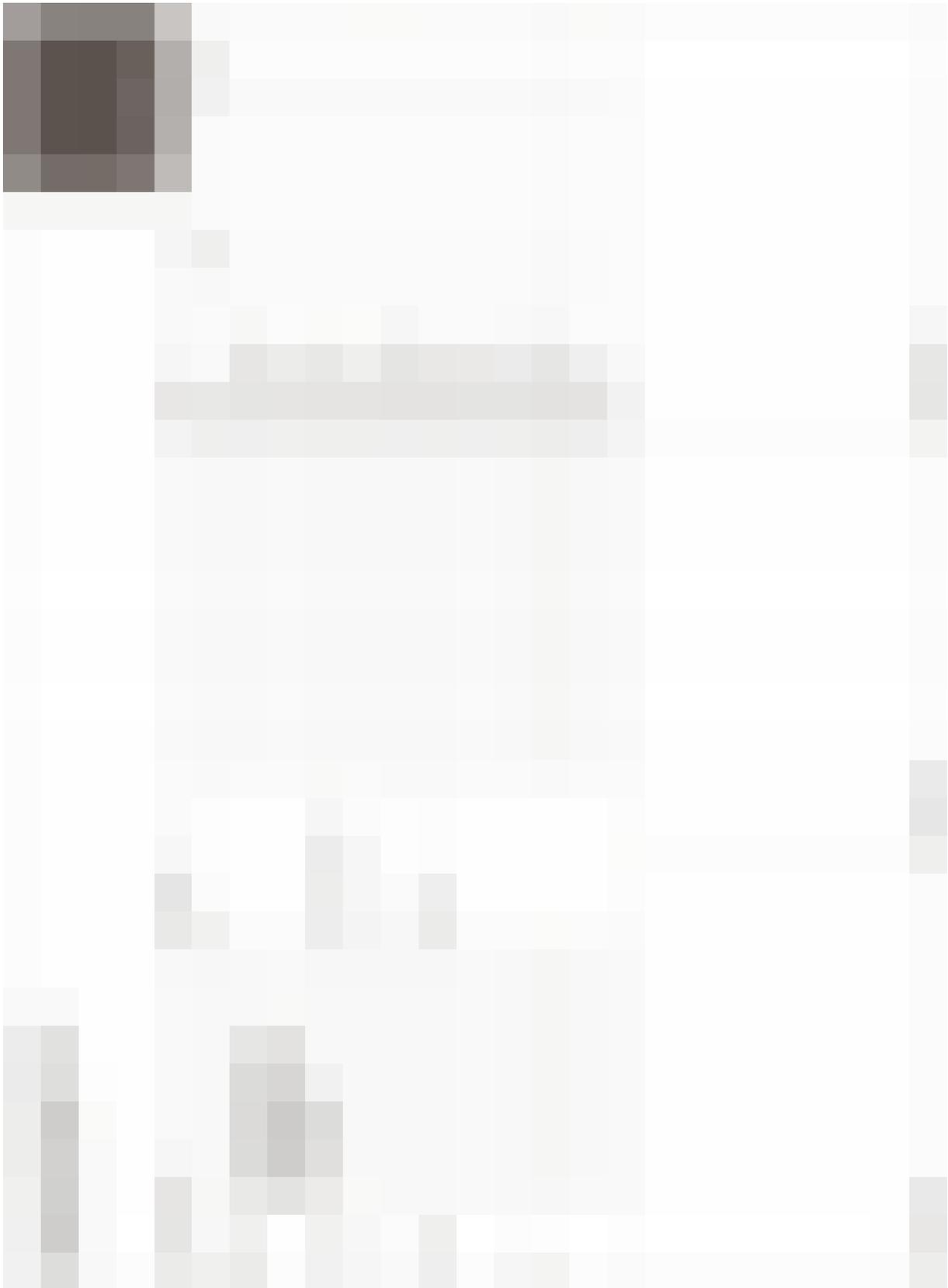
### PART 3 - EXECUTION

#### 3.1 CONTRACTOR'S REVIEW

- A. 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. 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 modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken.
- 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. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.
- E. No submittal involving the selection of a color will be released until all colors are selected and approved by the Owner.
- F. Submittals not required by the Contract Documents may not be reviewed and may be discarded.



**END OF SECTION 01 33 00**

## SECTION 01 40 00 - QUALITY REQUIREMENTS

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for quality assurance and quality control.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
  - 1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.
  - 2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.
  - 3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.
- C. Related Sections include the following:
  - 1. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.
  - 2. Divisions 02 through 26 Sections for specific test and inspection requirements.

#### 1.3 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 used to verify selections made under sample submittals, to demonstrate aesthetic effects and, where indicated, qualities of materials and execution, and to review construction, coordination, testing, or operation; they are not Samples. **Approved mockups establish the standard by which the Work will be judged.**
- D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.

- E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.
- F. 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 industry standards.
- G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.
- H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.
- I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.
- J. 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. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.
- K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of **five** previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

#### 1.4 CONFLICTING REQUIREMENTS

- A. General: 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 uncertainties and 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.

#### 1.5 SUBMITTALS

- A. Qualification Data: For testing agencies specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include proof of qualifications in the form of a recent report on the inspection of the testing agency by a recognized authority.
- B. Schedule of Tests and Inspections: Prepare in tabular form and include the following:
  - 1. Specification Section number and title.
  - 2. Description of test and inspection.
  - 3. Identification of applicable standards.
  - 4. Identification of test and inspection methods.

5. Number of tests and inspections required.
  6. Time schedule or time span for tests and inspections.
  7. Entity responsible for performing tests and inspections.
  8. Requirements for obtaining samples.
  9. Unique characteristics of each quality-control service.
- C. Reports: Prepare and submit certified written reports that 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.
- D. Permits, Licenses, and Certificates: For Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

## 1.6 QUALITY ASSURANCE

- A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.
- B. 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.
- C. 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.
- D. 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.
- 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 to those indicated for this Project in material, design, and extent.
- F. Specialists: Certain sections of the Specifications 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. Requirement for specialists shall not supersede building codes and regulations governing the Work.

- G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; 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. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to 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. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
    - d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
    - e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
    - f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; 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 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.
- K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 26.

## 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. Payment for these services will be made from testing and inspecting allowances, as authorized by Change Orders.

3. 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.
- B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not. Cost for these services are included in the Contract Sum
  1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.
    - a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.
  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 factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."
- 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.
- H. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for **the Notice to Proceed**.

1. Distribution: Distribute schedule to Owner, Architect, testing agencies, and each party involved in performance of portions of the Work where tests and inspections are required.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 ACCEPTABLE TESTING AGENCIES

- A. Testing agency will be hired by and paid for by the Owner.

3.2 TEST AND INSPECTION LOG

- A. Prepare a record of tests and inspections. Include the following:
  1. Date test or inspection was conducted.
  2. Description of the Work tested or inspected.
  3. Date test or inspection results were transmitted to Architect.
  4. Identification of testing agency or special inspector conducting test or inspection.
- B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.3 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. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
  2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."
- 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 01 40 00**

**SECTION 01 42 00 - REFERENCES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 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," "approved," "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": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
- 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.
- J. "Installer": An installer is the Contractor or another entity engaged by the Contractor, either as an employee, subcontractor, or contractor of lower tier, who performs a particular construction activity including installation, erection, application, or similar operations. Installers are required to be experienced in the operations they are engaged to perform.
  - 1. The term "experienced," when used with the term "installer," means having successfully completed a minimum of 5 previous projects similar in size and scope to this Project; being familiar with the special requirements indicated; and having complied with requirements of authorities having jurisdiction.
  - 2. Trades: Using terms such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as

"carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

3. Assigning Specialists: Certain Sections of the Specifications require that specific construction activities shall be performed by specialists who are recognized experts in those operations. The specialists must be engaged for those activities, and their assignments are requirements over which the Contractor has no option. However, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.

K. "Testing Agencies": A testing agency is an independent entity engaged to perform specific inspections or tests, either at the Project site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

L. This requirement shall not be interpreted to conflict with enforcing building codes and similar regulations governing the Work. It is also not intended to interfere with local trade-union jurisdictional settlements and similar conventions.

### 1.3 SPECIFICATION FORMAT AND CONTEC EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's "MasterFormat 2004" numbering system.

B. Specification Content: These 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:

C. Abbreviated Language: Language used in the Specifications and other Contract Documents is abbreviated. Words and meanings shall be interpreted as appropriate. Words implied, but not stated, shall be interpolated as the sense requires. Singular words shall be interpreted as plural and plural words interpreted as singular where applicable as the context of the Contract Documents indicates.

D. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the Text, subjective language is used for clarity to describe responsibilities that must be fulfilled indirectly by the Contractor or by others when so noted.

E. 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.

### 1.4 SUBMITTALS

A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits, licenses, certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, correspondence, records, and similar documents, established for compliance with standards and regulations bearing on performance of the Work.

### 1.5 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. **Conflicting Requirements:** Where compliance with 2 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 uncertainties and requirements that are different but apparently equal to the Architect for a decision before proceeding.
  - 1. **Minimum Quantity or Quality Levels:** The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of the requirements. Refer uncertainties to the Architect for a decision before proceeding.
- C. **Publication Dates:** Comply with standards in effect as of date of the Contract Documents, unless otherwise indicated.
- D. **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.
- E. **Abbreviations and Acronyms for 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. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

#### 1.6 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 Research's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."
- 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. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.
- 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. Names, telephone numbers, and Web-site addresses are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 42 00**

**SECTION 01 50 00 - TEMPORARY FACILITIES AND CONTROLS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.
- B. Related Sections include the following:
  - 1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
  - 2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.

1.3 DEFINITIONS

- A. Permanent Enclosure: As determined by Architect, permanent or temporary roofing is complete, insulated, and weathertight; exterior walls are insulated and weathertight; and all openings are closed with permanent construction or substantial temporary closures.

1.4 USE CHARGES

- A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, **Owner's construction forces**, Architect, **occupants of Project**, testing agencies, and authorities having jurisdiction.
- B. Water Service: **OWNER WILL** pay all water service connection expenses or charges for water used by all entities for construction operations. **OWNER WILL** pay for actual water use charges until Substantial Completion.
- C. Electric Power Service: **OWNER WILL** pay all electric power service use charges for electricity used by all entities for construction operations. **OWNER WILL** pay for actual electrical use charges until Substantial Completion.

1.5 SUBMITTALS

- A. Site Plan: Show temporary facilities, utility hookups, staging areas, and parking areas for construction personnel.

1.6 QUALITY ASSURANCE

- A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.
- B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.7 PROJECT CONDITIONS

- A. Temporary Use of Permanent Facilities: Installer of each permanent service shall 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 MATERIALS

2.2 TEMPORARY FACILITIES

- A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.
- B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Office shall be used by the Owner and Architect as necessary. Furnish and equip offices as follows:
  - 1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
  - 2. Conference room of sufficient size to accommodate meetings of **10** individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and **4-foot-** square tack board.
  - 3. Drinking water and private toilet.
  - 4. Coffee machine and supplies.
  - 5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of **68 to 72 deg F**.
  - 6. Lighting fixtures capable of maintaining average illumination of **20 fc** at desk height.

2.3 EQUIPMENT

- A. Fire Extinguishers: Portable, UL rated; with class and extinguishing agent as required by locations and classes of fire exposures.
- B. HVAC Equipment: 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 testing agency acceptable to authorities having jurisdiction, and marked for intended use.

3. Permanent HVAC System: If Owner authorizes 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.

### 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.
- 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. Water Service: Use of Owner's existing water service facilities will be permitted, as long as facilities are cleaned and maintained in a condition acceptable to Owner. At Substantial Completion, restore these facilities to condition existing before initial use.
  1. Where installations below an outlet might be damaged by spillage or leakage, provide a drip pan of suitable size to minimize water damage. Drain accumulated water promptly from pans.
- C. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.
  1. Use of Owner's existing toilet facilities will be not be permitted
- D. 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.
- E. 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.
- F. 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.  
Connect temporary service to Owner's existing power source, as directed by Owner.
- G. 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.
  2. Install lighting for Project identification sign.

- H. Provide superintendent with cellular telephone or portable two-way radio for use when away from field office.

### 3.3 SUPPORT FACILITIES INSTALLATION

- A. General: Comply with the following:
  - 1. Provide incombustible construction for offices, shops, and sheds located within construction area or within **30 feet** of building lines. Comply with NFPA 241.
  - 2. Locate, and relocate if necessary, construction support facilities to limit site disturbance as indicated in Section 01 10 00 Summary.
  - 3. Maintain support facilities until near Substantial Completion. Remove before Substantial Completion. Personnel remaining after Substantial Completion will be permitted to use permanent facilities, under conditions acceptable to Owner.
- B. Parking: **Use designated areas of Owner's existing** parking areas for construction personnel.
- C. 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 nor endanger permanent Work or temporary facilities.
  - 2. Remove snow and ice as required to minimize accumulations.
- D. Project Identification and Temporary Signs: Provide Project identification and other signs. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.
  - 1. Provide temporary, directional signs for construction personnel and visitors.
  - 2. Maintain and touchup signs so they are legible at all times.
- E. Waste Disposal Facilities: Provide waste-collection containers in sizes adequate to handle waste from construction operations. Comply with requirements of authorities having jurisdiction.
- F. Burning of any materials including but not limited to construction debris on site is prohibited.

### 3.4 CURITY AND PROTECTION FACILITIES INSTALLATION

- A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.
  - 1. Comply with work restrictions specified in Division 01 Section "Summary."
- B. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Division 31 Section "Site Clearing."
- C. Temporary Erosion and Sedimentation Control: Provide measures to prevent soil erosion and discharge of soil-bearing water runoff and airborne dust to adjacent properties and walkways, according to requirements of authorities having jurisdiction.
  - 1. Inspect, repair, and maintain erosion- and sedimentation-control measures during construction until permanent vegetation has been established.
- D. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

- E. 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. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.
- F. Site Enclosure Fence: **Before construction of building additions begin**, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering new construction area, except by entrance gates.
  - 1. Extent of Fence: As required to enclose portion determined sufficient to accommodate construction operations.
- G. Temporary Fire Protection: Install and maintain temporary fire-protection facilities of types needed to protect against reasonably predictable and controllable fire losses. Comply with NFPA 241.
  - 1. Prohibit smoking in **construction** areas.
  - 2. Supervise welding operations, combustion-type temporary heating units, and similar sources of fire ignition according to requirements of authorities having jurisdiction.
  - 3. Develop and supervise an overall fire-prevention and -protection program for personnel at Project site. Review needs with local fire department and establish procedures to be followed. Instruct personnel in methods and procedures. Post warnings and information.

### 3.5 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. Burning of any materials including but not limited to construction debris on site is prohibited.
- C. 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.
- D. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until Final Acceptance.
- E. 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 Final Acceptance. 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. Repair or replace street paving, curbs, and sidewalks at temporary entrances, as required by authorities having jurisdiction.
  - 3. At Final Acceptance, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

**END OF SECTION 01 50 00**

**SECTION 01 60 00 - PRODUCT REQUIREMENTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This 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; product substitutions; and comparable products.
- B. Related Sections include the following:
  - 1. Division 01 Section "Allowances" for products selected under an allowance.
  - 2. Division 01 Section "Alternates" for products selected under an alternate.
  - 3. Division 01 Section "References" for applicable industry standards for products specified.
  - 4. Division 01 Section "Closeout Procedures" for submitting warranties for Contract closeout.
  - 5. Divisions 02 through 26 Sections for specific requirements for warranties on products and installations specified to be warranted.

1.3 DEFINITIONS

- A. Products: Items purchased for incorporating into the Work, whether purchased for Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
  - 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, or where indicated as a product substitution, to have the indicated qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics that equal or exceed those of specified product.
- B. Substitutions: Changes in products, materials, equipment, and methods of construction from those required by the Contract Documents and proposed by Contractor.
- C. Basis-of-Design Product Specification: Where a specific manufacturer's product is named and accompanied by the words "basis of design," including make or model number or other designation, to establish the significant qualities related to type, function, dimension, in-service performance, physical properties, appearance, and other characteristics for purposes of evaluating comparable products of other named manufacturers.

#### 1.4 SUBMITTALS

- A. Product List: Submit a list, in tabular form, showing specified products. Include generic names of products required. Include manufacturer's name and proprietary product names for each product.
1. Coordinate product list with Contractor's Construction Schedule and the Submittals Schedule.
  2. Form: Tabulate information for each product under the following column headings:
    - a. Specification Section number and title.
    - b. Generic name used in the Contract Documents.
    - c. Proprietary name, model number, and similar designations.
    - d. Manufacturer's name and address.
    - e. Supplier's name and address.
    - f. Installer's name and address.
    - g. Projected delivery date or time span of delivery period.
    - h. Identification of items that require early submittal approval for scheduled delivery date.
- B. Initial Submittal: Within 30 days after date of commencement of the Work, submit 3 copies of initial product list. Include a written explanation for omissions of data and for variations from Contract requirements.
1. At Contractor's option, initial submittal may be limited to product selections and designations that must be established early in Contract period.
- C. Completed List: Within 60 days after date of commencement of the Work, submit 3 copies of completed product list. Include a written explanation for omissions of data and for variations from Contract requirements.
- D. Architect's Action: Architect will respond in writing to Contractor within 15 days of receipt of completed product list. Architect's response will include a list of unacceptable product selections and a brief explanation of reasons for this action. Architect's response, or lack of response, does not constitute a waiver of requirement to comply with the Contract Documents.
- E. Substitution Requests: The Architect will consider requests for substitution if received within 10 consecutive calendar days prior to bid. Requests received more than 10 consecutive calendar days prior to bid will be rejected at the discretion of the Architect. 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:
  2. Documentation: Show compliance with requirements for substitutions and the following, as applicable:
    - a. Statement indicating why specified material or product cannot be provided.
    - b. Coordination information, including a list of changes or modifications needed to other parts of the Work and to construction performed by Owner and separate contractors that will be necessary to accommodate proposed substitution.
    - c. Product Data, including drawings and descriptions of products and fabrication and installation procedures.
    - d. Samples, where applicable or requested.
    - e. List of similar installations for completed projects with project names and addresses and names and addresses of architects and owners.
    - f. Material test reports from a qualified testing agency indicating and interpreting test results for compliance with requirements indicated.
    - g. Research/evaluation reports evidencing compliance with building code in effect for Project, from a model code organization acceptable to authorities having jurisdiction.
    - h. Detailed comparison of Contractor's Construction Schedule using proposed substitution with products specified for the Work, including effect on the overall Contract Time. If specified product or method of construction cannot be provided within the Contract Time, include letter from manufacturer, on manufacturer's letterhead, stating lack of availability or delays in delivery.

- i. Cost information, including a proposal of change, if any, in the Contract Sum.
      - j. Contractor's certification that proposed substitution complies with requirements in the Contract Documents and is appropriate for applications indicated.
      - k. 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 **7** 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 **7** days of receipt of additional information or documentation, whichever is later.
      - a. Form of Acceptance: Change Order.
      - b. Use product specified if Architect cannot make a decision on use of a proposed substitution within time allocated.
  - F. Comparable Product 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. 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** days of receipt of request, or **7** days of receipt of additional information or documentation, whichever is later.
      - a. Form of Approval: As specified in Division 01 Section "Submittal Procedures."  
Use product specified if Architect cannot make a decision on use of a comparable product request within time allocated.
  - G. Basis-of-Design Product Specification Submittal: Comply with requirements in Division 01 Section "Submittal Procedures." Show compliance with requirements.

## 1.5 QUALITY ASSURANCE

- A. Compatibility of Options: If Contractor is given option of selecting between two or more products for use on Project, product selected shall be compatible with products previously selected, even if previously selected products were also options.
  1. Each contractor is responsible for providing products and construction methods compatible with products and construction methods of other contractors.
  2. If a dispute arises between contractors over concurrently selectable but incompatible products, Architect will determine which products shall be used.

## 1.6 PRODUCT DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle products using means and methods that will prevent damage, deterioration, and loss, including theft. 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 ensure compliance with the Contract Documents and to ensure 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. Store cementitious products and materials on elevated platforms.
  5. Store foam plastic from exposure to sunlight, except to extent necessary for period of installation and concealment.
  6. Comply with product manufacturer's written instructions for temperature, humidity, ventilation, and weather-protection requirements for storage.
  7. Protect stored products from damage and liquids from freezing.
  8. Provide a secure location and enclosure at Project site for storage of materials and equipment by Owner's construction forces. Coordinate location with Owner.

## 1.7 PRODUCT WARRANTIES

- A. Warranties specified in other Sections shall be in addition to, and run concurrent with, other warranties required by the Contract Documents. Manufacturer's disclaimers and limitations on product warranties do not relieve Contractor of obligations under requirements of the Contract Documents.
1. Manufacturer's Warranty: Preprinted written warranty published by individual manufacturer for a particular product and specifically endorsed by manufacturer to Owner.  
Special Warranty: Written warranty required by or incorporated into the Contract Documents, either to extend time limit provided by manufacturer's warranty or to provide more rights for Owner.
- B. Special Warranties: Prepare a written document that contains appropriate terms and identification, ready for execution. Submit a draft for approval before final 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 appropriate form properly executed.
  3. Refer to Divisions 02 through 26 Sections for specific content requirements and particular requirements for submitting special warranties.
- C. Submittal Time: Comply with requirements in Division 01 Section "Closeout Procedures."

## PART 2 - PRODUCTS

### 2.1 PRODUCT SELECTION PROCEDURES

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, that 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. Where products are accompanied by the term "match sample," sample to be matched is Architect's.

6. Descriptive, performance, and reference standard requirements in the Specifications establish "salient characteristics" of products.
  7. Or Equal: Where products are specified by name and accompanied by the term "or equal" or "or approved equal" or "or approved," comply with provisions in Part 2 "Comparable Products" Article to obtain approval for use of an unnamed product.
- B. Product Selection Procedures:
1. Products: Where Specifications include a list of names of both products and manufacturers, provide one of the products listed that complies with requirements.
  2. Visual Selection Specification: Where Specifications include the phrase "as selected from manufacturer's colors, patterns, textures" or a similar phrase, select a product that complies with other specified requirements.
    - a. Standard Range: Where Specifications include the phrase "standard range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that does not include premium items.
    - b. Full Range: Where Specifications include the phrase "full range of colors, patterns, textures" or similar phrase, Architect will select color, pattern, density, or texture from manufacturer's product line that includes both standard and premium items. Where specifications include the phrase "custom color" or similar phrase, provide a custom color not in the manufacturer's product line.

## PART 3 - EXECUTION

### 3.1 INSTALLATION OF PRODUCTS

- A. Comply with manufacturer's instructions and recommendations for installation of products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other Work.
- B. Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of Final Inspection.

**END OF SECTION 01 60 00**



**SECTION 01 71 23 - FIELD ENGINEERING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  - 1. Land survey work.
- B. Related Sections:
  - 1. Division 01 Section "Product Management and Coordination" for procedures for coordinating field engineering with other construction activities.
  - 2. Division 01 Section "Submittal Procedures" for submitting Project record surveys.
  - 3. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents and recording of Owner-accepted deviations from indicated lines and levels.

1.3 SUBMITTALS

- A. Certificates: Submit a certificate signed by the land surveyor or professional engineer certifying the location and elevation of improvements.
- B. Project Record Documents: Submit a record of Work performed and record survey data as required under provisions of "Submittals" and "Project Closeout" Sections.

1.4 QUALITY ASSURANCE

- A. Surveyor Qualifications: Engage a land surveyor registered in North Carolina, to perform required land-surveying services.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify layout information shown on the Drawings, in relation to the property survey and existing benchmarks, before proceeding to lay out the Work. Locate and protect existing benchmarks and control points. Preserve permanent reference points during construction.

- B. Do not change or relocate benchmarks or control points without prior written approval. Promptly report lost or destroyed reference points or requirements to relocate reference points because of necessary changes in grades or locations.
- C. Promptly replace lost or destroyed Project control points. Base replacements on the original survey control points. Establish and maintain a minimum of 2 permanent benchmarks on the site, referenced to data established by survey control points. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
- D. Existing Underground Utilities and Equipment: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning site work, investigate and verify the existence and location of underground utilities and other construction. Prime Contractor and all subcontractors shall field locate all underground services whether shown on drawings or not, including, but not limited to the following: utilities, underground wires, fiber optic lines, cables, conduits, and pipes, prior to initiating any excavation on any area of the proposed site. Provide and pay for underground utility locator service, metal detectors and hand digging as necessary to satisfy above requirement. Provide drawing prior to commencing work signed by the locator service that delineates the underground services. Locator service shall field locate all services with high visibility paint. Maintain ground markings during the course of work and stay clear of underground service until work that may damage underground services is complete. Prime Contractor (s) and their subcontractors shall be responsible for utility services damaged during construction and shall repair at their own expense any utility services damaged by their work. Repair within 24 hours or less.
- E. Prior to construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping.

### 3.2 PREFORMANCE

- A. Work from lines and levels established by the property survey. Establish benchmarks and markers to set lines and levels at each story of construction and elsewhere as needed to locate each element of the Project. Calculate and measure required dimensions within indicated or recognized tolerances. Do not scale Drawings to determine dimensions. Advise entities engaged in construction activities of marked lines and levels provided for their use. As construction proceeds, check every major element for line, level, and plumb.
- B. Surveyor's Log: Maintain a surveyor's log of control and other survey work. Make this log available for reference. Record deviations from required lines and levels, and advise the Architect when deviations that exceed indicated or recognized tolerances are detected. On Project Record Drawings, record deviations that are accepted and not corrected. 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 site work.
- C. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes, and invert elevations.
- D. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels, and control lines and levels required for mechanical and electrical work.
- E. Existing Utilities: Furnish information necessary to adjust, move, or relocate existing structures, utility poles, lines, services, or other appurtenances located in or affected by construction. Coordinate with local authorities having jurisdiction.

**END OF SECTION 01 71 23**

## SECTION 01 73 29 - CUTTING AND PATCHING

### PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

#### 1.2 SUMMARY

- A. This Section includes procedural requirements for cutting and patching.
- B. Related Sections include the following:
  - 1. Divisions 2 through 26 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

#### 1.3 DEFINITIONS

- A. Cutting: Removal of in-place construction necessary to permit installation or performance of other Work.
- B. Patching: Fitting and repair work required to restore surfaces to original conditions after installation of other Work.

#### 1.4 RESPONSIBILITIES

- A. General: The Contractors shall recognize that cutting and patching work is historically and typically difficult to coordinate. The Contractors shall cooperate with each other and the Architect in coordinating the cutting and patching work on this project to overcome these historical and typical problems.
- B. Cutting and patching of completed new construction required due to out of sequence construction and/or improper coordination is the responsibility of the Contractor responsible for the out of sequence construction or improper coordination. Cutting and patching of new construction for these purposes shall be accomplished by the Contractor for General Work and shall be paid for by the Contractor responsible.
- C. Contractor for General Work shall cooperate with Architect and other Contractors to accomplish this cutting and patching with minimal disruption to construction.

#### 1.5 SUBMITTALS

- A. Cutting and Patching Proposal: Submit a proposal describing procedures at least **10** days before the time cutting and patching will be performed, requesting approval to proceed. Include the following information:
  - 1. Extent: Describe cutting and patching, show how they will be performed, and indicate why they cannot be avoided.
  - 2. Changes to In-Place Construction: Describe anticipated results. Include changes to structural elements and operating components as well as changes in building's appearance and other significant visual elements.

3. Products: List products to be used and firms or entities that will perform the Work.
4. Dates: Indicate when cutting and patching will be performed.
5. Utility Services and Mechanical/Electrical Systems: List services/systems that cutting and patching procedures will disturb or affect. List services/systems that will be relocated and those that will be temporarily out of service. Indicate how long services/systems will be disrupted.
6. Structural Elements: Where cutting and patching involve adding reinforcement to structural elements, submit details and engineering calculations showing integration of reinforcement with original structure.
7. **Architect's** Approval: Obtain approval of cutting and patching proposal before cutting and patching. Approval does not waive right to later require removal and replacement of unsatisfactory work.

## 1.6 QUALITY ASSURANCE

- A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
- B. Operational Elements: Do not cut and patch 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. Operational elements include but are not limited to:
  1. Primary operational systems and equipment.
  2. Air or smoke barriers.
  3. Fire-suppression systems.
  4. Mechanical systems piping and ducts.
  5. Control systems.
  6. Communication systems.
  7. Conveying systems.
  8. Electrical wiring systems.
  9. Operating systems of special construction in Division 13 Sections.
- C. Miscellaneous Elements: Do not cut and patch miscellaneous elements or related components in a manner that could change their load-carrying capacity, that results in reducing their capacity to perform as intended, or that result in increased maintenance or decreased operational life or safety. **Miscellaneous elements include but are not limited to the following:**
  1. Water, moisture, or vapor barriers.
  2. Membranes and flashings.
  3. Exterior curtain-wall construction.
  4. Equipment supports.
  5. Piping, ductwork, vessels, and equipment.
  6. Noise- and vibration-control elements and systems.
- D. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.
- E. Cutting and Patching Conference: Before proceeding, meet at Project site with parties involved in cutting and patching, including mechanical and electrical trades. Review areas of potential interference and conflict. Coordinate procedures and resolve potential conflicts before proceeding.

1.7 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during cutting and patching operations, by methods and with materials so as not to void existing warranties.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. General: Comply with requirements specified in other Sections.
- B. In-Place Materials: Use materials 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 match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine surfaces to be cut and patched and conditions under which cutting and patching are to be performed.
  - 1. Compatibility: Before patching, verify compatibility with and suitability of substrates, including compatibility with in-place finishes or primers.
  - 2. Proceed with installation only after unsafe or unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Temporary Support: Provide temporary support of Work to be cut.
- B. Protection: Protect 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.
- C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Existing Utility Services and Mechanical/Electrical Systems: Where existing services/systems are required to be removed, relocated, or abandoned, bypass such services/systems before cutting to **prevent** interruption to occupied areas.

3.3 PERFORMANCE

- A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
  - 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. 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 as small as possible, neatly to 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 or Masonry:** Cut using a cutting machine, such as an abrasive saw or a diamond-core drill.
  4. Excavating and Backfilling: Comply with requirements in applicable Division 31 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.
- C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.
1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.
  2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.
    - a. Clean piping, conduit, and similar features before applying paint or other finishing materials.
    - b. Restore damaged pipe covering to its original condition.
  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.
    - a. Where patching occurs in a painted surface, apply primer and intermediate paint coats over the patch and apply final paint coat over entire unbroken surface containing the patch. Provide additional coats until patch blends with adjacent surfaces.
  4. Ceilings: Patch, repair, or rehang 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.
- D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials. Thoroughly clean piping, conduit, and similar features before applying paint or other finishing materials. Restore damaged pipe covering to its original condition.

**END OF SECTION 01 73 29**

**SECTION 01 77 00 - CLOSEOUT PROCEDURES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
  - 1. Inspection procedures.
  - 2. Warranties.
  - 3. Final cleaning.
- B. Related Sections include the following:
  - 1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
  - 2. Division 01 Section "Execution" for progress cleaning of Project site.
  - 3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
  - 4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 5. Divisions 02 through 26 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 SUBMITTALS

- A. All closeout submittals, including but not limited to, Maintenance and Operation Manual, Warranties, Bonds, additional closeout submittals required by the **Owner** or **Architect** and additional requirements stated in the specifications shall be submitted in the following way:
  - 1. Bind all closeout documents in one uniform color, heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate all contents in 75% of the binder's width and allow of 25% free space for future items, and sized to receive **8-1/2-by-11-inch** paper.
  - 2. Provide heavy paper dividers with plastic-covered tabs for each separate section. Mark tab to identify the content of that section. Identify each binder on the front and spine with the typed or printed title of the Binder, Project name, and name of Contractor.

1.4 SUBSTANTIAL COMPLETION

- A. Preliminary Procedures: Before requesting inspection for determining date of Substantial Completion, complete the following. List items below that are incomplete in request.
  - 1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
  - 2. Advise Owner of pending insurance changeover requirements.
  - 3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.

4. Obtain and submit releases permitting Owner unrestricted use of the Work and access to services and utilities. Include occupancy permits, operating certificates, and similar releases.
  5. Prepare and submit Project Record Documents (marked up and signed plans and specifications), operation and maintenance manuals, and similar final record information.
  6. Deliver tools, spare parts, extra materials, and similar items to location designated by Owner. Label with manufacturer's name and model number where applicable.
  7. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
  8. Complete startup testing of systems.
  9. Submit test/adjust/balance records.
  10. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
  11. Advise Owner of changeover in heat and other utilities.
  12. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
  13. Complete final cleaning requirements, including touchup painting.
  14. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.
- B. Inspection: Submit a written request for inspection for Substantial Completion. 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.

#### 1.5 FINAL COMPLETION

- A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:
1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
  2. Submit certified copy of Architect's Substantial Completion inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
  3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
  4. Submit pest-control final inspection report and warranty.
  5. Instruct Owner's personnel in operation, adjustment, and maintenance of products, equipment, and systems.
- B. Inspection: Submit a written request for final inspection for 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.

#### 1.6 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

- A. Preparation: Submit **three** copies 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. Include the following information at the top of each page:
  - a. Project name.
  - b. Date.
  - c. Name of Architect.
  - d. Name of Contractor.
  - e. Page number.

## PART 2 - PRODUCTS

### 2.1 MATERIALS

- A. Cleaning Agents: Use cleaning materials and agents recommended by manufacturer or fabricator of the surface to be cleaned. Do not use cleaning agents that are potentially hazardous to health or property or that might damage finished surfaces.

## PART 3 - EXECUTION

### 3.1 FINAL CLEANING

- A. General: Provide 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 portion of Project:
  2. 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.
  3. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
  4. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
  5. Remove tools, construction equipment, machinery, and surplus material from Project site.
  6. Remove snow and ice to provide safe access to building.
  7. 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.
  8. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
  9. Sweep concrete floors broom clean in unoccupied spaces.
  10. 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.
  11. Remove labels that are not permanent.
  12. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
    - a. Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
  13. Replace parts subject to unusual operating conditions.
  14. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting from water exposure.

15. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.
  16. Leave Project clean and ready for occupancy.
- C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.
- D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

**END OF SECTION 01 77 00**

**SECTION 01 78 23 - OPERATION AND MAINTENANCE DATA**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This 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. Maintenance manuals for the care and maintenance of **products, materials, finishes, systems and equipment.**
- B. Related Sections include the following:
  - 1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
  - 2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
  - 3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
  - 4. Divisions 02 through 26 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

- A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.
- B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

- A. Initial Submittal: Submit **2** draft copies of each manual at least **15** days before requesting inspection for Substantial Completion. Include a complete operation and maintenance directory. Architect will return **one copy** of draft and mark whether general scope and content of manual are acceptable.
- B. Final Submittal: Submit **one copy** of each manual in final form at least **15** days before final inspection. Architect will return copy with comments within **15** days after final inspection.
  - 1. Correct or modify each manual to comply with Architect's comments. Submit **3** copies of each corrected manual within **15** days of receipt of Architect's comments.

1.5 COORDINATION

- A. Where operation and maintenance documentation includes information on installations by more than one factory-authorized service representative, assemble and coordinate information furnished by representatives and prepare manuals.

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

- A. Organization: Include a section in the directory for each of the following:
  - 1. List of documents.
  - 2. List of systems.
  - 3. List of equipment.
  - 4. Table of contents.
- B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.
- C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.
- D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.
- E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

- A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:
  - 1. Title page.
  - 2. Table of contents.
  - 3. Manual contents.
- B. Title Page: Enclose title page in transparent plastic sleeve. 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, address, and telephone number of Contractor.
  - 6. Name and address of Architect.
  - 7. Cross-reference to related systems in other operation and maintenance manuals.
- C. 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.
  - 1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.

- D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.
1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
    - a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
    - b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.
  2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. 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 diskettes for computerized electronic equipment.
  4. Supplementary Text: Prepared on 8-1/2-by-11-inch white bond paper.
  5. 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.

### 2.3 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.

## 2.4 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.
  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.
  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.

## 2.5 PRODUCT MAINTENANCE MANUAL

- 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.

1. Include procedures to follow and required notifications for warranty claims.

## 2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

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 printed 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 videotape, 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.

1. Scheduled Maintenance and Service: Tabulate actions for daily, weekly, monthly, quarterly, semiannual, and annual frequencies.
2. Maintenance and Service Record: Include manufacturers' forms for recording maintenance.

- 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.
- I. Include procedures to follow and required notifications for warranty claims.

### PART 3 - EXECUTION

#### 3.1 MANUAL PREPARATION

- A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.
- B. 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.
- C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.
- D. 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.
  - 1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
  - 2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.
- E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and delete references to information not applicable.
  - 1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.
- F. 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.
  - 2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."
  - 3. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

**END OF SECTION 01 78 23**

**SECTION 01 78 36 - WARRANTIES**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

1. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Section Includes:
  1. Warranty Requirements.
- B. Related Sections:
  1. Division 01 Section "Closeout Procedures" for specifies contract closeout procedures.
  2. Division 01 Section "Submittal Procedures" for specifies procedures for submitting warranties.
  3. Divisions 02 through 26 Sections for specific closeout and special cleaning requirements for the Work in those Sections.
- C. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the Work that incorporates the products. Manufacturer's disclaimers and limitations on product warranties do not relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.  
The General Contractor and each subcontractor are responsible for warranties related to its own contract.

1.3 DEFINITIONS

- A. Standard product warranties: Preprinted written warranties published by individual manufacturers for particular products and are specifically endorsed by the manufacturer to the Owner.
- B. Special warranties: Written warranties required by or incorporated in the Contract Documents, either to extend time limits provided by standard warranties or to provide greater rights for the Owner.

1.4 WARRANTY

- A. Related Damages and Losses: When correcting failed or damaged warranted construction, remove and replace construction that has been damaged as a result of such failure or must be removed and replaced to provide access for correction of warranted construction.
- B. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
- C. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of the Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefitted from use of the Work through a portion of its anticipated useful service life.
- D. Owner's Recourse: Expressed warranties made to the Owner are in addition to implied warranties and shall not limit the duties, obligations, rights, and remedies otherwise available under the law. Expressed warranty periods shall not be interpreted as limitations on the time in which the Owner can enforce such other duties, obligations, rights, or remedies. Rejection of Warranties: The Owner reserves the right to reject warranties and to limit selection to products with warranties not in conflict with requirements of the Contract Documents.

- E. Where the Contract Documents require a special warranty, or similar commitment on the Work or part of the Work, the Owner reserves the right to refuse to accept the Work, until the Contractor presents evidence that entities required to countersign such commitments are willing to do so.
- F. **Minimum One Year Warranty on All Work:** A one year unconditional non-prorated warranty shall be provided for all work, material and equipment on this project. Any and all defective work, material and equipment shall be corrected by the Contractor at his own expense during this one year period. Defective work, material or equipment including other related or adjacent work damaged directly or indirectly by defective work, material or equipment shall be corrected promptly and within 24 hours during this period of time unless emergencies require a more prompt repair by the Contractor. Longer term warranties shall apply where noted but shall be in addition to this warranty and not be used as a substitute for this warranty.

#### 1.5 OTHER WARRANTIES

- A. In addition to a one year warranty on all work, the contract documents contain other warranties. The Contractor shall include these written warranties in all submittal documents and closeout documents.

#### 1.6 SUBMITTALS

- A. Submit written warranties to the Architect. All warranties shall be dated from Final Completion or Beneficial Occupancy.
- B. When the Contract Documents require the Contractor, or the Contractor and a subcontractor, supplier or manufacturer to execute a special warranty, prepare a written document that contains appropriate terms and identification, ready for execution by the required parties. Submit a draft to the Owner, through the Architect, for approval prior to final execution.
- C. When warranted construction requires operation and maintenance manuals, provide additional copies of each required warranty, as necessary, for inclusion in each required manual. Services in this article may not be allowed for publicly funded projects.
- D. Partial Occupancy: Submit properly executed warranties within **15** days of completion of designated portions of the Work that are completed and occupied or used by Owner during construction period by separate agreement with Contractor.
- E. Form of Submittal: 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, 3-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.
- F. Provide additional copies of each warranty to include in operation and maintenance manuals.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

**END OF SECTION 01 78 36**

**SECTION 01 78 39 - PROJECT RECORD DOCUMENTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This 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 Sections include the following:
  - 1. Division 01 Section "Closeout Procedures" for general closeout procedures.
  - 2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
  - 3. Divisions 02 through 26 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

- A. Record Drawings: Comply with the following:
  - 1. Number of Copies: Submit **one** set of marked-up Record Prints.
  - 2. Number of Copies: Submit copies of Record Drawings as follows:
    - a. Final Submittal: Submit **one** set(s) of marked-up Record Prints, **[one]** set(s) of Record.
- B. Record Specifications: Submit **one mark up copy** of Project's Specifications, including addenda and contract modifications.
- C. Record Product Data: Submit **two copies** of each Product Data submittal.
  - 1. Where Record Product Data is required as part of operation and maintenance manuals, submit marked-up Product Data as an insert in manual instead of submittal as Record Product Data.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

- A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings on the job site at all times for the duration of the project.
  - 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 prepare the 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. Accurately record information in an understandable drawing technique.
  - c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.
2. Content: Types of items requiring marking include, but are not limited to, the following:
- a. Dimensional changes to Drawings.
  - b. Revisions to details shown on Drawings.
  - c. Depths of foundations below first floor.
  - d. Locations and depths of underground utilities.
  - e. Revisions to routing of piping and conduits.
  - f. Revisions to electrical circuitry.
  - g. Actual equipment locations.
  - h. Duct size and routing.
  - i. Locations of concealed internal utilities.
  - j. Changes made by Change Order or **Construction** Change Directive.
  - k. Changes made following Architect's written orders.
  - l. Details not on the original Contract Drawings.
  - m. Field records for variable and concealed conditions.
  - n. Record information on the Work that is shown only schematically.
3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.
4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.
5. Mark important additional information that was either shown schematically or omitted from original Drawings.
6. 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.
1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.
  2. Identification: As follows:
    - a. Project name.
    - b. Date.
    - c. Designation "PROJECT RECORD DRAWINGS."
    - d. Name of Architect.
    - e. Name of Contractor.

## 2.2 RECORD SPECIFICATIONS

- A. Preparation: Mark Specifications to indicate the actual product installation where installation varies from that indicated in Specifications, addenda, and contract modifications.
1. Give particular attention to information on concealed products and installations that cannot be readily identified and recorded later.
  2. Record the name of manufacturer, supplier, Installer, and other information necessary to provide a record of selections made.
  3. For each principal product, indicate whether Record Product Data has been submitted in operation and maintenance manuals instead of submitted as Record Product Data.
  4. Note related Change Orders and Record Drawings where applicable.

### 2.3 RECORD PRODUCT DATA

- A. 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, **Record Specifications**, and Record Drawings where applicable.

### 2.4 MISCELLANEOUS RECORD SUBMITTALS

- A. Assemble miscellaneous records required by other Specification Sections for miscellaneous record keeping and submittal in connection with actual performance of the Work. Bind or file miscellaneous records and identify each, ready for continued use and reference.

## 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 modifications to Project Record Documents as they occur; do not wait until the 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 01 78 39**

**SECTION 01 79 00 - DEMONSTRATION AND TRAINING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This 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.
  - 3. Demonstration and training video.
- B. Related Sections include the following:
  - 1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
  - 2. Divisions 02 through 26 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS

- A. Instruction Program: Submit **two** copies of outline of instructional program for demonstration and training, including 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. At completion of training, submit **one** complete training manual(s) for Owner's use.
- B. Demonstration and Training Video: Submit **two** copies within **seven** days of end of each training module.
  - 1. Identification: On each copy, provide an applied label with the following information:
    - a. Name of Project.
    - b. Name and address of photographer.
    - c. Name of Architect.
    - d. Name of Contractor.
    - e. Date was recorded.
    - f. Description of vantage point, indicating location, direction (by compass point), and elevation or story of construction.
- C. Transcript: Prepared on **8-1/2-by-11-inch** paper, punched and bound in heavy-duty, 3-ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video. Include name of Project and date of video on each page.

1.4 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.

- B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.
- C. Photographer Qualifications: A professional photographer who is experienced photographing construction projects.
- D. Preinstruction Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to demonstration and training including, but not limited to, the following:
  - 1. Inspect and discuss locations and other facilities required for instruction.
  - 2. Review and finalize instruction schedule and verify availability of educational materials, instructors' personnel, audiovisual equipment, and facilities needed to avoid delays.
  - 3. Review required content of instruction.
  - 4. For instruction that must occur outside, review weather and forecasted weather conditions and procedures to follow if conditions are unfavorable.

## 1.5 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
- C. 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 equipment not part of a system, as required by individual Specification Sections, and as follows:
  - 1. Heat generation, including pumps and piping.
  - 2. Refrigeration systems, including chillers, condensers, pumps and distribution piping.
  - 3. HVAC systems, including air-handling equipment, air distribution systems and terminal equipment and devices.
  - 4. HVAC instrumentation and controls.
  - 5. Electrical service and distribution, including transformers, switchboards, panelboards, uninterruptible power supplies and motor controls.
  - 6. Communication systems, including intercommunication, surveillance, clocks and programming, voice and data and television equipment.
- 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:
  - 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 combined training manual.
- B. Set up instructional equipment at instruction location.

#### 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. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.
  - 1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
  - 2. Owner will furnish an instructor to describe Owner's operational philosophy.
  - 3. Owner will furnish Contractor with names and positions of participants.
- C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.
  - 1. Schedule training with Owner, through Architect, with at least seven days' advance notice.
- D. Evaluation: At conclusion of each training module, assess and document each participant's mastery of module by use of a demonstration performance-based test.
- E. Cleanup: Collect used and leftover educational materials and. Remove instructional equipment. Restore systems and equipment to condition existing before initial training use.

#### 3.3 DEMONSTRATION AND TRAINING VIDEO

- A. General: Engage a qualified commercial photographer to record demonstration and training video. Record each training module separately. Include classroom instructions and demonstrations, board diagrams, and other visual aids, but not student practice.
  - 1. At beginning of each training module, record each chart containing learning objective and lesson outline.
- B. Video Format: Provide high-quality DVD video format capable of running on any typical computer system.
- C. Recording: Mount camera on tripod before starting recording, unless otherwise necessary to show area of demonstration and training. Display continuous running time.
- D. Narration: Describe scenes by audio narration by microphone. Include description of items being viewed. Describe vantage point, indicating location, direction (by compass point), and elevation or story of construction.

**END OF SECTION 01 79 00**

**SECTION 01 91 13  
GENERAL COMMISSIONING REQUIREMENTS**

**PART 1 GENERAL**

**1.01 SUMMARY**

- A. Commissioning is intended to achieve the following specific objectives; this section specifies the Contractor's responsibilities for commissioning:
  - 1. Verify that the work is installed in accordance with Contract Documents and the manufacturer's recommendations and instructions, and that it receives adequate operational checkout prior to startup: Startup reports and Prefunctional Checklists executed by Contractor are utilized to achieve this.
  - 2. Verify and document that functional performance is in accordance with Contract Documents: Functional Tests executed by Contractor and witnessed by the Commissioning Authority are utilized to achieve this.
  - 3. Verify that operation and maintenance manuals submitted to Owner are complete: Detailed operation and maintenance (O&M) data submittals by Contractor are utilized to achieve this.
  - 4. Verify that the Owner's operating personnel are adequately trained: Formal training conducted by Contractor is utilized to achieve this.
- B. Commissioning, including Functional Tests, O&M documentation review, and training, is to occur after startup and initial checkout and be completed before Substantial Completion.
- C. The Commissioning Authority directs and coordinates all commissioning activities; this section describes some but not all of the Commissioning Authority's responsibilities.
- D. The Commissioning Authority is employed by Owner.

**1.02 SCOPE OF COMMISSIONING**

- A. The following are to be commissioned:
- B. HVAC System, including:
  - 1. Major and minor equipment items.
  - 2. Piping systems and equipment.
  - 3. Ductwork and accessories.
  - 4. Control system.
  - 5. Variable frequency drives.
- C. Other equipment and systems explicitly identified elsewhere in Contract Documents as requiring commissioning.

**1.03 REFERENCE STANDARDS**

- A. CSI/CSC MF - Masterformat 2016.

**1.04 SUBMITTALS**

- A. Follow Division 01 for submittal procedures; except:
  - 1. Make all submittals specified in this section, and elsewhere where indicated for commissioning purposes, directly to the Commissioning Authority, unless they require review by Engineer; in that case, submit to Engineer first.
  - 2. Submit one copy to the Commissioning Authority, not to be returned.
  - 3. Make commissioning submittals on time schedule specified by Commissioning Authority.
  - 4. Submittals indicated as "Draft" are intended for the use of the Commissioning Authority in preparation of Prefunctional Checklists or Functional Test requirements; submit in editable electronic format, Microsoft Word 2010 preferred.
  - 5. As soon as possible after submittals made to Engineer are approved, submit copy of approved submittal to the Commissioning Authority.
- B. Product Data: If submittals to Engineer do not include the following, submit copies as soon as possible:
  - 1. Manufacturer's product data, cut sheets, and shop drawings.
  - 2. Manufacturer's installation instructions.

3. Startup, operating, and troubleshooting procedures.
  4. Fan and pump curves.
  5. Factory test reports.
  6. Warranty information, including details of Owner's responsibilities in regard to keeping warranties in force.
- C. Manufacturers' Instructions: Submit copies of all manufacturer-provided instructions that are shipped with the equipment as soon as the equipment is delivered.
- D. Startup Plans and Reports.
- E. Completed Prefunctional Checklists.
- F. Commissioning Issues Log:
1. Construction observations.
  2. Supporting photographs.

## **PART 2 PRODUCTS**

### **2.01 TEST EQUIPMENT**

- A. Provide all standard testing equipment required to perform startup and initial checkout and required Functional Testing; unless otherwise noted such testing equipment will NOT become the property of Owner.
- B. Calibration Tolerances: Provide testing equipment of sufficient quality and accuracy to test and/or measure system performance with the tolerances specified. If not otherwise noted, the following minimum requirements apply:
1. Temperature Sensors and Digital Thermometers: Certified calibration within past year to accuracy of 0.5 degree F and resolution of plus/minus 0.1 degree F.
  2. Pressure Sensors: Accuracy of plus/minus 2.0 percent of the value range being measured (not full range of meter), calibrated within the last year.
  3. Calibration: According to the manufacturer's recommended intervals and when dropped or damaged; affix calibration tags or keep certificates readily available for inspection.
- C. Equipment-Specific Tools: Where special testing equipment, tools and instruments are specific to a piece of equipment, are only available from the vendor, and are required in order to accomplish startup or Functional Testing, provide such equipment, tools, and instruments as part of the work at no extra cost to Owner; such equipment, tools, and instruments are to become the property of Owner.
- D. Dataloggers: Independent equipment and software for monitoring flows, currents, status, pressures, etc. of equipment.
1. Dataloggers required to for Functional Tests will be provided by the Commissioning Authority and will not become the property of Owner.

## **PART 3 EXECUTION**

### **3.01 COMMISSIONING PLAN**

- A. Commissioning Authority will prepare the Commissioning Plan.
1. Attend meetings called by the Commissioning Authority for purposes of completing the commissioning plan.
  2. Require attendance and participation of relevant subcontractors, installers, suppliers, and manufacturer representatives.
- B. Contractor is responsible for compliance with the Commissioning Plan.
- C. Commissioning Plan: The commissioning schedule, procedures, and coordination requirements for all parties in the commissioning process.
- D. Commissioning Schedule:
1. Submit anticipated dates of startup of each item of equipment and system to Commissioning Authority within 60 days after award of Contract.
  2. Re-submit anticipated startup dates monthly, but not less than 4 weeks prior to startup.

3. Prefunctional Checklists and Functional Tests are to be performed in sequence from components, to subsystems, to systems.
4. Provide sufficient notice to Commissioning Authority for delivery of relevant Checklists and Functional Test procedures, to avoid delay.

### **3.02 DOCUMENTATION IDENTIFICATION SYSTEM**

- A. Give each submitted form or report a unique identification; use the following scheme.
- B. Type of Document: Use the following prefixes:
  1. Startup Plan: SP-
  2. Startup Report: SR-
  3. Prefunctional Checklist: PC-
  4. Functional Test Procedure: FTP-
  5. Functional Test Report: FTR-
- C. System Type: Use the first 4 digits from CSI/CSC MF (Master Format), that are applicable to the system; for example:
  1. 2300: HVAC system as a whole.
  2. 2320: HVAC Piping and Pumps.
  3. 2330: HVAC Air Distribution.
- D. Component Number: Assign numbers sequentially, using 1, 2, or 3 digits as required to accommodate the number of units in the system.
- E. Test, Revision, or Submittal Number: Number each successive iteration sequentially, starting with 1.
- F. Example: PC-2320-001.2 would be the Prefunctional Checklist for equipment item 1 in the HVAC piping system, probably a pump; this is the second, revised submittal of this checklist.

### **3.03 STARTUP PLANS AND REPORTS**

- A. Startup Plans: For each item of equipment and system for which the manufacturer provides a startup plan, submit the plan not less than 8 weeks prior to startup.
- B. Startup Reports: For each item of equipment and system for which the manufacturer provides a startup checklist (or startup plan or field checkout sheet), document compliance by submitting the completed startup checklist prior to startup, signed and dated by responsible entity.
- C. Submit directly to the Commissioning Authority.

### **3.04 PREFUNCTIONAL CHECKLISTS**

- A. A Prefunctional Checklist is required to be filled out for each item of equipment or other assembly specified to be commissioned.
  1. No sampling of identical or near-identical items is allowed.
  2. These checklists do not replace manufacturers' recommended startup checklists, regardless of apparent redundancy.
  3. Prefunctional Checklist forms will not be complete until after award of the contract; the following types of information will be gathered via the completed Checklist forms:
    - a. Certification by installing contractor that the unit is properly installed, started up, and operating and ready for Functional Testing.
    - b. Confirmation of receipt of each shop drawing and commissioning submittal specified, itemized by unit.
    - c. Manufacturer, model number, and relevant capacity information; list information "as specified," "as submitted," and "as installed."
    - d. Serial number of installed unit.
    - e. List of inspections to be conducted to document proper installation prior to startup and Functional Testing; these will be primarily static inspections and procedures; for equipment and systems may include normal manufacturer's start-up checklist items and minor testing.
    - f. Sensor and actuator calibration information.

- B. Contractor is responsible for filling out Prefunctional Checklists, after completion of installation and before startup; witnessing by the Commissioning Authority is not required unless otherwise specified.
  - 1. Each line item without deficiency is to be witnessed, initialed, and dated by the actual witness; checklists are not complete until all line items are initialed and dated complete without deficiencies.
  - 2. Checklists with incomplete items may be submitted for approval provided the Contractor attests that incomplete items do not preclude the performance of safe and reliable Functional Testing; re-submission of the Checklist is required upon completion of remaining items.
  - 3. Individual Checklists may contain line items that are the responsibility of more than one installer; Contractor shall assign responsibility to appropriate installers or subcontractors, with identification recorded on the form.
  - 4. If any Checklist line item is not relevant, record reasons on the form.
  - 5. Contractor may independently perform startup inspections and/or tests, at Contractor's option.
  - 6. Regardless of these reporting requirements, Contractor is responsible for correct startup and operation.
  - 7. Submit completed Checklists to Commissioning Authority within two days of completion.
- C. Commissioning Authority is responsible for furnishing the Prefunctional Checklists to Contractor.
  - 1. Initial Drafts: Contractor is responsible for initial draft of Prefunctional Checklist where so indicated in Contract Documents.
  - 2. Provide all additional information requested by Commissioning Authority to aid in preparation of checklists, such as shop drawing submittals, manufacturers' startup checklists, and O&M data.
  - 3. Commissioning Authority may add any relevant items deemed necessary regardless of whether they are explicitly mentioned in Contract Documents or not.
  - 4. When asked to review the proposed Checklists, do so in a timely manner.
- D. Commissioning Authority Witnessing: Required for:
  - 1. Each piece of primary equipment, unless sampling of multiple similar units is allowed by the commissioning plan.
  - 2. A sampling of non-primary equipment, as allowed by the commissioning plan.
- E. Deficiencies: Correct deficiencies and re-inspect or re-test, as applicable, at no extra cost to Owner.
  - 1. If difficulty in correction would delay progress, report deficiency to the Commissioning Authority immediately.

### 3.05 FUNCTIONAL TESTS

- A. A Functional Test is required for each item of equipment, system, or other assembly specified to be commissioned, unless sampling of multiple identical or near-identical units is allowed by the final test procedures.
- B. Contractor is responsible for execution of required Functional Tests, after completion of Prefunctional Checklist and before closeout.
- C. Commissioning Authority is responsible for witnessing and reporting results of Functional Tests, including preparation and completion of forms for that purpose.
- D. Contractor is responsible for correction of deficiencies and re-testing at no extra cost to Owner; if a deficiency is not corrected and re-tested immediately, the Commissioning Authority will document the deficiency and the Contractor's stated intentions regarding correction.
  - 1. Deficiencies are any condition in the installation or function of a component, piece of equipment or system that is not in compliance with Contract Documents or does not perform properly.
  - 2. When the deficiency has been corrected, the Contractor completes the form certifying that the item is ready to be re-tested and returns the form to the Commissioning Authority; the Commissioning Authority will reschedule the test and the Contractor shall re-test.

3. Identical or Near-Identical Items: If 10 percent, or three, whichever is greater, of identical or near-identical items fail to perform due to material or manufacturing defect, all items will be considered defective; provide a proposal for correction within 2 weeks after notification of defect, including provision for testing sample installations prior to replacement of all items.
  4. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing.
  5. Contractor shall bear the cost of Owner and Commissioning Authority personnel time witnessing re-testing if the test failed due to failure to execute the relevant Prefunctional Checklist correctly; if the test failed for reasons that would not have been identified in the Prefunctional Checklist process, Contractor shall bear the cost of the second and subsequent re-tests.
- E. Functional Test Procedures:
1. Some test procedures are included in Contract Documents; where Functional Test procedures are not included in Contract Documents, test procedures will be determined by the Commissioning Authority with input by and coordination with Contractor.
  2. Examples of Functional Testing:
    - a. Test the dynamic function and operation of equipment and systems (rather than just components) using manual (direct observation) or monitoring methods under full operation (e.g., the chiller pump is tested interactively with the chiller functions to see if the pump ramps up and down to maintain the differential pressure setpoint).
    - b. Systems are tested under various modes, such as during low cooling or heating loads, high loads, component failures, unoccupied, varying outside air temperatures, fire alarm, power failure, etc.
    - c. Systems are run through all the HVAC control system's sequences of operation and components are verified to be responding as the sequence's state.
    - d. Traditional air or water test and balancing (TAB) is not Functional Testing; spot checking of TAB by demonstration to the Commissioning Authority is Functional Testing.
- F. Deferred Functional Tests: Some tests may need to be performed later, after substantial completion, due to partial occupancy, equipment, seasonal requirements, design or other site conditions; performance of these tests remains the Contractor's responsibility regardless of timing.

### **3.06 SENSOR AND ACTUATOR CALIBRATION**

- A. Calibrate all field-installed temperature, relative humidity, carbon monoxide, carbon dioxide, and pressure sensors and gauges, and all actuators (dampers and valves) on this piece of equipment shall be calibrated. Sensors installed in the unit at the factory with calibration certification provided need not be field calibrated.
- B. Calibrate using the methods described below; alternate methods may be used, if approved by Commissioning Authority and Owner beforehand. See PART 2 for test instrument requirements. Record methods used on the relevant Prefunctional Checklist or other suitable forms, documenting initial, intermediate and final results.
- C. All Sensors:
1. Verify that sensor location is appropriate and away from potential causes of erratic operation.
  2. Verify that sensors with shielded cable are grounded only at one end.
  3. For sensor pairs that are used to determine a temperature or pressure difference, for temperature make sure they are reading within 0.2 degree F of each other, and for pressure, within tolerance equal to 2 percent of the reading, of each other.
  4. Tolerances for critical applications may be tighter.
- D. Sensors Without Transmitters - Standard Application:
1. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
  2. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
  3. If not, install offset, calibrate or replace sensor.
- E. Sensors With Transmitters - Standard Application.
1. Disconnect sensor.

2. Connect a signal generator in place of sensor.
  3. Connect ammeter in series between transmitter and building automation system control panel.
  4. Using manufacturer's resistance-temperature data, simulate minimum desired temperature.
  5. Adjust transmitter potentiometer zero until 4 mA is read by the ammeter.
  6. Repeat for the maximum temperature matching 20 mA to the potentiometer span or maximum and verify at the building automation system.
  7. Record all values and recalibrate controller as necessary to comply with specified control ramps, reset schedules, proportional relationship, reset relationship and P/I reaction.
  8. Reconnect sensor.
  9. Make a reading with a calibrated test instrument within 6 inches of the site sensor.
  10. Verify that the sensor reading, via the permanent thermostat, gauge or building automation system, is within the tolerances in the table below of the instrument-measured value.
  11. If not, replace sensor and repeat.
  12. For pressure sensors, perform a similar process with a suitable signal generator.
- F. Sensor Tolerances for Standard Applications: Plus/minus the following maximums:
1. Watthour, Voltage, Amperage: 1 percent of design.
  2. Pressure, Air, Water, Gas: 3 percent of design.
  3. Air Temperatures (Outside Air, Space Air, Duct Air): 0.4 degrees F.
  4. Relative Humidity: 4 percent of design.
  5. Barometric Pressure: 0.1 inch of Hg.
  6. Flow Rate, Air: 10 percent of design.
  7. Flow Rate, Water: 4 percent of design.
  8. AHU Wet Bulb and Dew Point: 2.0 degrees F.
- G. Critical Applications: For some applications more rigorous calibration techniques may be required for selected sensors. Describe any such methods used on an attached sheet.
- H. Valve/Damper Stroke Setup and Check:
1. For all valve/damper actuator positions checked, verify the actual position against the control system readout.
  2. Set pump/fan to normal operating mode.
  3. Command valve/damper closed; visually verify that valve/damper is closed and adjust output zero signal as required.
  4. Command valve/damper to open; verify position is full open and adjust output signal as required.
  5. Command valve/damper to a few intermediate positions.
  6. If actual valve/damper position does not reasonably correspond, replace actuator or add pilot positioner (for pneumatics).
- I. Isolation Valve or System Valve Leak Check: For valves not associated with coils.
1. With full pressure in the system, command valve closed.
  2. Use an ultra-sonic flow meter to detect flow or leakage.

### 3.07 TEST PROCEDURES - GENERAL

- A. Provide skilled technicians to execute starting of equipment and to execute the Functional Tests. Ensure that they are available and present during the agreed upon schedules and for sufficient duration to complete the necessary tests, adjustments and problem-solving.
- B. Provide all necessary materials and system modifications required to produce the flows, pressures, temperatures, and conditions necessary to execute the test according to the specified conditions. At completion of the test, return all affected equipment and systems to their pre-test condition.
- C. Sampling: Where Functional Testing of fewer than the total number of multiple identical or near-identical items is explicitly permitted, perform sampling as follows:
1. Identical Units: Defined as units with same application and sequence of operation; only minor size or capacity difference.

2. Sampling is not allowed for:
    - a. Major equipment.
    - b. Life-safety-critical equipment.
    - c. Prefunctional Checklist execution.
  3. XX = the percent of the group of identical equipment to be included in each sample; defined for specific type of equipment.
  4. YY = the percent of the sample that if failed will require another sample to be tested; defined for specific type of equipment.
  5. Randomly test at least XX percent of each group of identical equipment, but not less than three units. This constitutes the "first sample."
  6. If YY percent of the units in the first sample fail, test another XX percent of the remaining identical units.
  7. If YY percent of the units in the second sample fail, test all remaining identical units.
  8. If frequent failures occur, resulting in more troubleshooting than testing, the Commissioning Authority may stop the testing and require Contractor to perform and document a checkout of the remaining units prior to continuing testing.
- D. Manual Testing: Use hand-held instruments, immediate control system readouts, or direct observation to verify performance (contrasted to analyzing monitored data taken over time to make the "observation").
- E. Simulating Conditions: Artificially create the necessary condition for the purpose of testing the response of a system; for example apply hot air to a space sensor using a hair dryer to see the response in a VAV box.
- F. Simulating Signals: Disconnect the sensor and use a signal generator to send an amperage, resistance or pressure to the transducer and control system to simulate the sensor value.
- G. Over-Writing Values: Change the sensor value known to the control system in the control system to see the response of the system; for example, change the outside air temperature value from 50 degrees F to 75 degrees F to verify economizer operation.
- H. Indirect Indicators: Remote indicators of a response or condition, such as a reading from a control system screen reporting a damper to be 100 percent closed, are considered indirect indicators.
- I. Monitoring: Record parameters (flow, current, status, pressure, etc.) of equipment operation using dataloggers or the trending capabilities of the relevant control systems; where monitoring of specific points is called for in Functional Test Procedures:
1. All points that are monitored by the relevant control system shall be trended by Contractor; at the Commissioning Authority's request, Contractor shall trend up to 20 percent more points than specified at no extra charge.
  2. Other points will be monitored by the Commissioning Authority using dataloggers.
  3. At the option of the Commissioning Authority, some control system monitoring may be replaced with datalogger monitoring.
  4. Provide hard copies of monitored data in columnar format with time down left column and at least 5 columns of point values on same page.
  5. Graphical output is desirable and is required for all output if the system can produce it.
  6. Monitoring may be used to augment manual testing.

### **3.08 OPERATION AND MAINTENANCE MANUALS**

- A. Refer to Division 01 specifications for additional requirements.
- B. Add design intent documentation furnished by Engineer to manuals prior to submission to Owner.
- C. Submit manuals related to items that were commissioned to Commissioning Authority for review; make changes recommended by Commissioning Authority.
- D. Commissioning Authority will add commissioning records to manuals after submission to Owner.

**END OF SECTION 01 91 13**

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**SECTION 02 41 19 - SELECTIVE STRUCTURE DEMOLITION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions02 and other Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Demolition and removal of selected portions of building or structure.
  - 2. Patching and repairs
- B. Related Sections include the following:
  - 1. Division 00 Section "Special Conditions" for use of premises, and phasing, and Owner-occupancy requirements.

1.3 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner. Remove, clean, and pack items to protect against damage. Identify contents of containers and deliver to Owner's designated storage area.
- C. Remove and Reinstall: Detach items from existing construction; clean, service, and otherwise prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.4 MATERIALS OWNERSHIP

- A. Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain the Owner's property, demolished materials shall become the Contractor's property and shall be removed from the site with further disposition at the Contractor's option.
- B. Historic items, relics, and similar objects including, but not limited to, cornerstones and their contents, commemorative plaques and tablets, antiques, and other items of interest or value to Owner that may be encountered during selective demolition remain Owner's property. Carefully remove and salvage each item or object in a manner to prevent damage and deliver promptly to Owner.

1.5 SUBMITTALS

- A. Schedule of Selective Demolition Activities: Indicate the following:
  - 1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
  - 2. Interruption of utility services. Do not interrupt utility services unless interruption is coordinated with Owner.
  - 3. Coordination for shutoff, capping, and continuation of utility services.
  - 4. Use of elevator and stairs.
  - 5. Locations of proposed dust- and noise-control temporary partitions and means of egress.
  - 6. Coordination of Owner's continuing occupancy of existing building and of Owner's partial occupancy of completed Work.
  - 7. Means of protection for items to remain and items in path of waste removal from building.

- B. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- C. Pre-demolition Photographs: Show existing conditions of adjoining construction and site improvements, including finish surfaces, that might be misconstrued as damage caused by selective demolition operations. **Submit before Work begins.**
- D. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.

#### 1.6 QUALITY ASSURANCE

- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to selective demolition including, but not limited to, the following:
  - 1. Inspect and discuss condition of construction to be selectively demolished.
  - 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
  - 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
  - 4. Review areas where existing construction is to remain and requires protection.

#### 1.7 PROJECT CONDITIONS

- A. Owner will occupy portions of building immediately adjacent to selective demolition area. Conduct selective demolition so Owner's operations will not be disrupted.
  - 1. Comply with requirements specified in Division 01 Section "Summary."
- B. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- C. Notify Architect of discrepancies between existing conditions and Drawings before proceeding with selective demolition.
- D. Storage or sale of removed items or materials on-site is not permitted.
- E. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
  - 1. **Maintain fire-protection facilities in service during selective demolition operations.**

#### 1.8 WARRANTY

- A. Existing Warranties: Remove, replace, patch, and repair materials and surfaces cut or damaged during selective demolition, by methods and with materials so as not to void existing warranties.

### PART 2 - PRODUCTS

#### 2.1 REPAIR MATERIALS

- A. Use repair materials identical to existing materials. Where identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible. Use a material whose installed performance equals or surpasses that of existing materials.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Survey of Existing Conditions: Record existing conditions by use of preconstruction photographs.
  - 1. Before selective demolition or removal of existing building elements that will be reproduced or duplicated in final Work, make permanent record of measurements, materials, and construction details required to make exact reproduction.
- F. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

### 3.2 UTILITY SERVICES AND MECHANICAL/ELECTRICAL SYSTEMS

- A. Existing Services/Systems: Maintain services/systems indicated to remain and protect them against damage during selective demolition operations.
  - 1. Comply with requirements for existing services/systems interruptions specified in Division 01 Section "Summary."
- B. Service/System Requirements: Locate, identify, disconnect, and seal or cap off indicated utility services and mechanical/electrical systems serving areas to be selectively demolished.
  - 1. Owner will arrange to shut off indicated services/systems when requested by Contractor.
  - 2. Arrange to shut off indicated utilities with utility companies.
  - 3. If services/systems are required to be removed, relocated, or abandoned, before proceeding with selective demolition provide temporary services/systems that bypass area of selective demolition and that maintain continuity of services/systems to other parts of building.
  - 4. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit after bypassing.
    - a. Where entire wall is to be removed, existing services/systems may be removed with removal of the wall.

### 3.3 PREPARATION

- A. Site Access and Temporary Controls: Conduct selective demolition and debris-removal operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.
  - 1. Comply with requirements for access and protection specified in Division 01 Section "Temporary Facilities and Controls."
    - a. Do not close or obstruct streets, walks, walkways, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.
- A. Temporary Facilities: Provide temporary barricades and other protection required to prevent injury to people and damage to adjacent buildings and facilities to remain.
  - 1. Provide protection to ensure safe passage of people around selective demolition area and to and from occupied portions of building.
  - 2. Protect walls, ceilings, floors, and other existing finish work that are to remain or that are exposed during selective demolition operations.
  - 3. Cover and protect furniture, furnishings, and equipment that have not been removed.

4. Comply with requirements for temporary enclosures, dust control, heating, and cooling specified in Division 01 Section "Temporary Facilities and Controls."
  5. Erect and maintain dustproof partitions and temporary enclosures to limit dust and dirt migration and to separate areas from fumes and noise.
    - a. Construct dustproof partitions of not less than 2 separate layers or 6 mil polyethylene. Seal joints and perimeter. Protect air-handling equipment.
- B. Pollution Controls: Use water mist, temporary enclosures, and other suitable methods to limit the spread of dust and dirt. Comply with governing environmental protection regulations.
1. Do not use water when it may damage existing construction or create hazardous or objectionable conditions, such as ice, flooding, and pollution.
  2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  3. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before start of selective demolition.

### 3.4 SELECTIVE DEMOLITION, GENERAL

- A. General: Demolish and remove existing construction only to the extent required by new construction and as indicated. Use methods required to complete the Work within limitations of governing regulations and as follows:
1. Proceed with selective demolition systematically, from higher to lower level. Complete selective demolition operations above each floor or tier before disturbing supporting members on the next lower level.
  2. Neatly cut openings and holes plumb, square, and true to dimensions required. Use cutting methods least likely to damage construction to remain or adjoining construction. Use hand tools or small power tools designed for sawing or grinding, not hammering and chopping, to minimize disturbance of adjacent surfaces. Temporarily cover openings to remain.
  3. Cut or drill from the exposed or finished side into concealed surfaces to avoid marring existing finished surfaces.
  4. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable materials and promptly dispose of off-site.
  5. Remove structural framing members and lower to ground by method suitable to avoid free fall and to prevent ground impact or dust generation.
  6. Locate selective demolition equipment and remove debris and materials so as not to impose excessive loads on supporting walls, floors, or framing.
  7. Dispose of demolished items and materials promptly.
- B. Removed and Salvaged Items:
1. Clean salvaged items.
  2. Store items in a secure area until delivery to Owner.
  3. Protect items from damage during transport and storage.
- C. Removed and Reinstalled Items:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
  2. Protect items from damage during transport and storage.
  3. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- D. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition. When permitted by Architect, items may be removed to a suitable, protected storage location during selective demolition and cleaned and reinstalled in their original locations after selective demolition operations are complete.

3.5 PATCHING AND REPAIRING

- A. Patch and Repair holes and damaged surfaces caused to adjacent construction by selective demolition operations. Where repairs to existing surfaces are required, patch to produce surfaces suitable for new materials.
- B. Restore exposed finishes of patched areas and extend finish restoration into adjoining construction to remain in a manner that eliminates evidence of patching and refinishing.
- C. Patch and repair floor and wall surfaces in the new space where demolished walls or partitions extend one finished area into another. Provide a flush and even surface of uniform color and appearance. Closely match texture and finish of existing adjacent surface. Patch with durable seams that are as invisible as possible. Comply with specified tolerances. Where patching smooth painted surfaces, extend final paint coat over entire unbroken surface containing the patch after the surface has received primer and second coat. Remove existing floor and wall coverings and replace with new materials, if necessary, to achieve uniform color and appearance.
- D. Inspect and test patched areas to demonstrate integrity of the installation, where feasible.
- E. Patch, repair, or rehang existing ceilings as necessary to provide an even-plane surface of uniform appearance.

3.6 DISPOSAL OF DEMOLISHED MATERIALS

- A. General: Except for items or materials indicated to be reused, salvaged, reinstalled, or otherwise indicated to remain Owner's property, remove demolished materials from Project site and legally dispose of them in an EPA-approved landfill.
  - 1. Do not allow demolished materials to accumulate on-site.
  - 2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.
  - 3. Remove debris from elevated portions of building by chute, hoist, or other device that will convey debris to grade level in a controlled descent.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.

3.7 CLEANING

- A. Clean adjacent structures and improvements of dust, dirt, and debris caused by selective demolition operations. Return adjacent areas to condition existing before selective demolition operations began.

**END OF SECTION 02 41 19**

**SECTION 03 62 00 – NON-SHRINK GROUTING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. Supply and installation of a non-shrink, fast setting, non-metallic high strength cementitious grout for anchoring, patching, casting and repairing concrete substrates in structural and non-structural applications.
  - 1. Cementitious Grout
  - 2. Epoxy Grout

1.3 REFERENCES

- A. AST C78 Test Method for Flexural Strength of Concrete
- B. ASTM C109 Standard Test Method for Compressive Strength of Hydraulic Cement Mortars
- C. ASTM C150 Standard Specification for Portland Cement
- D. ASTM C191 Test Method for Time of Setting of Hydraulic Cement by Vicat Needle
- E. ASTM C266 Standard Test Method for Time of Setting of Hydraulic-Cement Paste by Gillmore Needles
- F. ASTM C348 Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars
- G. ASTM C939 Test Method for Flow of Grout for Preplaced Aggregate Concrete (Flow Cone Method)
- H. ASTM C1090 Standard Test Method for Measuring Changes in Height of Cylindrical Specimens of Hydraulic-Cement Grout
- I. ASTM C1107 Standard Specification for Packaged Dry, Hydraulic-Cement Grout (Non-shrink)
- J. ACI 301 Specification for Structural Concrete
- K. ACI 318 Building Code Requirements for Structural Concrete
- L. CRD-C 621 Corps of Engineers Specification for Non-Shrink Grout

1.4 SUBMITTALS

- A. General: Submit samples and manufacturer's product data sheets, installation instructions, etc. in accordance with Division 01 General Requirements Submittal Section.
- B. Test Data: Submit qualified testing data that confirms compliance with specified performance requirements.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Must be experienced and competent in installation of rapid hardening, non-shrink grouting materials and provide evidence of a minimum of five years' experience in work similar in size and scope to that required by this section.
- B. Manufacturer Qualifications: Must have marketed non-shrink grouting materials in the United States for at least five years and must have completed projects of the same general scope and complexity.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver products in original, unopened, undamaged packaging with manufacturer's identification (i.e., brand logo, product name, weight of packaged unit, lot number).
- B. Storage: Store products in a dry location, covered, out of direct sunlight, off the ground, and protected from moisture. Maintain storage temperature required by the manufacturer. Keep materials dry until used. Store bulk sand in a well-drained area on a clean, solid surface. Cover sand to prevent contamination.
- C. Handling: Handle products in accordance with manufacturer's published recommendations.

1.7 SITE / ENVIRONMENTAL CONDITIONS

- A. Temperature: Maintain ambient and surface temperatures between 45°F (7°C) to 90°F (32°C). Do not apply grout materials if ambient temperature falls below 45°F (7°C) within 24 hours of application. Protect grout from uneven and excessive evaporation during dry weather, windy conditions and strong blasts of dry air.
- B. Inclement Weather: Do not apply grout materials during inclement weather unless appropriate protection is employed.
- C. Sunlight Exposure: Avoid, whenever possible, installation of grout materials in direct sunlight which could adversely affect aesthetics.
- D. Substrate: Prior to installation, the substrates must be inspected for surface contamination or other conditions that may adversely affect the performance of the grouting materials and be free of residual moisture.

1.8 COORDINATION AND SCHEDULING

- A. Coordinate installation of grout materials with all other trades to avoid impeding other construction.
- B. Sufficient manpower must be provided to ensure continuous application and timely finishing.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 MATERIALS

- A. Fast Setting, Non-Shrink, Cementitious Grout
  - 1. A pre-packaged, high-performance, fast-setting, multi-purpose, non-metallic, cementitious, non-shrink grout and concrete repair material mixed with water on site. Suitable for use in wet environments and any application where high durability and rapid strength gain are desired. Structural strength is achieved in one (1) hour. Suitable for structural and non-structural applications.
  - 2. Additives and admixture materials must be approved for use by Manufacturer prior to use.
  - 3. Water: Clean, potable water free of deleterious amounts of silt and dissolved salts.

## 2.3 MATERIAL PROPERTIES

- A. Fast Setting, Non-Shrink, Cementitious Grout
  - 1. Compliance with: ASTM C1107 Grade B, ASTM C1090, Corps of Engineers CRD-C 621.
  - 2. Minimum performance requirements:
    - a. Set Time (ASTM C191 Modified)
      - 1) Initial Set – 15 minutes
      - 2) Final Set – 35 minutes
    - b. Compressive Strength (ASTM C109 Modified)
      - 1) 1 Hour\* - 3,000 psi
      - 2) 3 Hours – 5,000 psi
      - 3) 1 Day – 6,000 psi
      - 4) 7 Days – 7,000 psi
      - 5) 28 Days – 9,000 psi
    - c. Data obtained at flow consistency 102 by ASTM C1437 \*After final set

## 2.4 RELATED MATERIALS

- A. Admixtures: Do not add additional dry materials such as cement, sand, additives or admixtures. Mix only with water. All additives and admixture materials must be approved for use by Manufacturer prior to use.
- B. Concrete Cleaner: Citrus-based concrete cleaner to clean and strip dirt, grease and laitance from surfaces to receive grout.
- C. Curing: Prevent rapid water loss from grout during the first 48 hours by use of
  - 1. Wet Burlap Method.
  - 2. Curing Compound compliant with ASTM C309 Type I, Class B.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Verify project site conditions under provisions of Section 01 00 00.
- B. Compliance: Comply with manufacturer's instructions for installation of grouting materials.
- C. Coordinate installation with adjacent work to ensure proper sequencing of construction.
- D. Protect adjacent and surrounding surfaces not specified to receive grout with necessary means to ensure protection against overspray, water or other harmful debris.
- E. Advise Contractor of discrepancies preventing proper installation of grouting materials. Do not proceed with the work until unsatisfactory conditions are corrected.

### 3.2 PREPARATION

- A. Mechanically roughen surfaces and remove all loose, unsound, contaminated material.
- B. Bonding surfaces must be clean, sound, and free from any materials that may inhibit bond such as oil, dirt, asphalt, sealing compounds, acids, wax and loose dust and debris.
- C. Reinforcing steel must be free from rust and all other materials that may inhibit bond.
- D. Apply Cement All to a surface that is thoroughly saturated with no standing water.
- E. Minimum substrate temperature must be 45°F (7°C) and maximum substrate temperature 90°F (32°C).
- F. For formed grouting applications, construct watertight, non-absorbent forms. Build forms 1 inch higher than the bottom of the plate and 1 to 3 inches between the side of the plate and the form.
- G. Joints must be sealed with foam, caulk or putty.
- H. Provide vent holes to avoid air entrapment.
- I. Provide a head placement of a 45 degree angle to facilitate placement for grout pour.

### 3.3 MIXING

- A. Comply with manufacturer's printed instructions and the following:
1. Organize installation personnel and equipment before mixing begins.
  2. Cement All may be mixed using 3 to 3.75 quarts (2.8 L to 3.5 L) of water per 55-lb (25 kg) bag for Department of Transportation projects and other critical applications. For general purpose and high fluidity applications, a maximum of 5 quarts (4.7 L) may be used. Use less water to achieve higher strengths.
    - a. Additives: To extend working time, use Manufacturer approved retarding admixture or cold mix water. To increase fluidity and workability, use Manufacturer approved control plasticizing admixture. Any other additives or admixture materials must be approved by the Manufacturer prior to use
  3. Add water to the mixing container. While mixing in a power driven mechanical mixer, such as a mechanical mortar mixer or drill mounted mixer. Mix for the minimum time required to achieve a lump-free, uniform consistency (approximately 1 to 3 minutes). Do not retemper.
  4. Never mix by hand. Do not re-temper, add water, or remix after the grout stiffens. Grout that stiffens before use must be discarded.

### 3.4 APPLICATION

- A. Comply with manufacturer's printed instructions and the following:
1. Verify that all substrates and ambient temperatures are between 45°F (7°C) to 90°F (32°C) and will remain within range until the grout has reached final set.
  2. Have all required tools, equipment and materials organized and as close to the grouting area as possible.
  3. Place, consolidate and screed quickly to allow for maximum finishing time. Use a method of consolidation that eliminates air voids.
  4. Material may be troweled, floated or broom finished. On flat work, do not install in layers. Install in full-depth sections and progress horizontally.
  5. Do not wait for bleed water. Apply final finish as soon as possible.

### 3.5 CURING

- A. Wet cure grout materials by keeping all exposed surfaces wet for a minimum of one (1) hour. Begin curing as soon as the surface starts to lose its moist sheen.
1. OPTION: Apply curing compound in accordance with ASTM C309 immediately after finishing or upon final set. Apply curing compound to all exposed grout surfaces after forms are removed.

### 3.6 CLEAN-UP

- A. Remove and legally dispose of grouting debris material from job site.
- B. Clean excess material from surrounding areas and all tools immediately, before material cures. If materials have cured, remove using mechanical methods that will not damage the substrate.
- C. Clean adjacent surfaces as needed using materials and methods recommended by the manufacturer of the material being cleaned. Remove and replace work that cannot be cleaned to the satisfaction of the Project Designer/Owner.

**END OF SECTION 03 62 00**

SECTION 054000 - COLD-FORMED METAL FRAMING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Exterior non-load-bearing curtain wall and soffit framing.
2. Interior non-load bearing partition framing.

1.2 ACTION SUBMITTALS

A. Product Data: For each type of cold-formed steel framing product and accessory.

B. Shop Drawings:

1. Include layout, spacings, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
3. Include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.3 INFORMATIONAL SUBMITTALS

A. Qualification Data: For testing agency.

B. Welding certificates.

C. Product test reports.

D. Research reports.

1.4 QUALITY ASSURANCE

A. Engineering Responsibility: Preparation of Shop Drawings, design calculations and other structural data by a qualified professional engineer.

B. 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 cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.

C. Product Tests: Mill certificates or data from a qualified independent testing agency.

D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3/D1.3M, "Structural Welding Code - Sheet Steel."

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following

1. AllSteel & Gypsum Products, Inc.
2. California Expanded Metal Products Company.
3. ClarkWestern Building Systems, Inc.
4. Consolidated Fabricators Corp.; Building Products Division.
5. Craco Mfg., Inc.
6. Custom Stud Inc.
7. Design Shapes in Steel.
8. Dietrich Metal Framing; a Worthington Industries company.
9. Formetal Co. Inc. (The).
10. MarinoWARE.
11. MBA Building Supplies, Inc.
12. Nuconsteel; a Nucor Company.
13. Olmar Supply, Inc.
14. Quail Run Building Materials, Inc.
15. SCAFCO Corporation.
16. Southeastern Stud & Components, Inc.
17. State Building Products, Inc.
18. Steel Construction Systems.
19. Steel Network, Inc. (The).
20. Steel Structural Systems.
21. Steeler, Inc.
22. Super Stud Building Products, Inc.
23. Telling Industries, LLC.
24. United Metal Products, Inc.
25. United Steel Manufacturing.

### 2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal framing capable of withstanding design loads within limits and under conditions indicated.
1. Design Loads: NC Building Code
  2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
    - a. Exterior non-load bearing framing: Horizontal deflection of 1/600 of the wall height
    - b. Interior non-load bearing partition framing: Horizontal deflection of 1/360 of the wall height
- B. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.

### 2.3 COLD-FORMED STEEL FRAMING, GENERAL

- A. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
1. Grade: As required by structural performance

2. Coating: G90

- B. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
1. Grade: As required by structural performance.
  2. Coating: G90.

#### 2.4 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0538 inch
  2. Flange Width: 1-5/8 inches
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and matching minimum base-metal thickness of steel studs.
- C. Vertical Deflection Clips: Manufacturer's standard bypass or head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
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. AllSteel & Gypsum Products, Inc.
    - b. ClarkWestern Building Systems, Inc.
    - c. Dietrich Metal Framing; a Worthington Industries company.
    - d. MarinoWARE.
    - e. SCAFCO Corporation.
    - f. Steel Network, Inc. (The).
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure.
- E. Double Deflection Tracks: Manufacturer's double, deep-leg, U-shaped steel tracks, consisting of nested inner and outer tracks; unpunched, with unstiffened flanges.

#### 2.5 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration.

#### 2.6 ANCHORS, CLIPS, AND FASTENERS

- A. Steel Shapes and Clips: ASTM A 36/A 36M, zinc coated by hot-dip process according to ASTM A 123/A 123M.

- B. Anchor Bolts: ASTM F 1554, Grade 36 or Grade 55
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
  - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.

## 2.7 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multi-monomer plastic, and non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerance and other conditions affecting performance.

### 3.2 PREPARATION

- A. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

### 3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.

- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
- D. Install framing members in one-piece lengths.
- E. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- F. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- G. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- H. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- I. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:
  - 1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

#### 3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track unless otherwise indicated. Space studs as follows:
  - 1. Stud Spacing: As required by design, 16 inches
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar requirements.
- D. Isolate non-load-bearing steel framing from building structure to prevent transfer of vertical loads while providing lateral support.
  - 1. Connect vertical deflection clips to infill studs and anchor to building structure.
- E. Install horizontal bridging in wall studs, spaced vertically in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
  - 1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
  - 2. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
  - 3. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.

- F. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, and fasteners, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

- A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Field and shop welds will be subject to testing and inspecting.
- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed steel framing with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions, in a manner acceptable to manufacturer and Installer that ensure that cold-formed steel framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 054000

**SECTION 07 13 00 - COMPOSITE SHEET WATERPROOFING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Self-Adhering Waterproofing Membrane.
  - 2. Drainage Mat.
  - 3. Protection Board
  - 4. Related Auxiliary Materials
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  - 1. Division 03 Section "Cast-in-Place Concrete" for concrete placement, curing, and finishing.

1.3 PERFORMANCE REQUIREMENTS

- A. General: Provide waterproofing that prevents the passage of liquid water under hydrostatic pressure and complies with requirements as demonstrated by testing performed by an independent testing agency of manufacturer's current sheet membrane.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of waterproofing specified, including manufacturer's printed instructions for evaluating, preparing, and treating substrate, technical data, and tested physical and performance properties.
- C. Shop Drawings showing locations and extent of waterproofing, including details for substrate joints and cracks, sheet flashings, penetrations, tie-ins with adjoining construction, and other termination conditions.
- D. Samples, 3-by-6-inch minimum size, of each waterproofing material required for Project.
- E. Installer certificates signed by manufacturer certifying that Installers comply with requirements under the "Quality Assurance" Article.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an Installer who has completed waterproofing similar to that indicated for this Project and who is acceptable to waterproofing manufacturer.
- B. Single-Source Responsibility: Obtain waterproofing materials from a single manufacturer regularly engaged in manufacturing waterproofing.
- C. Preinstallation Conference: Conduct conference at Project site to comply with requirements of Division 01 Section "Project Meetings."
  - 1. Before installing waterproofing, meet with Owner, Architect, consultants, independent testing agency, waterproofing manufacturer, and other concerned entities.

2. Review requirements for waterproofing, including surface preparation specified under other Sections, substrate condition and pretreatment, minimum curing period, forecasted weather conditions, special details and sheet flashings, installation procedures, inspection and testing procedures, and protection and repairs.
3. Notify participants at least 7 days before conference.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original packages with seals unbroken, labeled with manufacturer's name, product, date of manufacture, and directions for storage.
- B. Store materials in their original undamaged packages in a clean, dry, protected location and within temperature range required by waterproofing manufacturer. Protect stored materials from direct sunlight.

#### 1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Apply waterproofing within range of ambient and substrate temperatures recommended by waterproofing manufacturer. Do not apply waterproofing to a damp or wet substrate.
  1. Do not apply waterproofing in snow, rain, fog, or mist.
- B. Maintain adequate ventilation during preparation and application of waterproofing materials.

#### 1.8 WARRANTY

- A. General Warranty: The special warranty specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- B. Special Warranty: Submit a non-prorated written warranty signed by waterproofing manufacturer and Installer agreeing to repair or replace waterproofing that does not meet requirements or that does not remain watertight during the specified warranty period.
  1. Warranty Period: 5 years after date of Final Acceptance.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Available Products:
  1. Self Adhering Waterproofing Membrane
    - a. Carlisle CCW MiraDRI 860/861 or equal.

#### 2.2 SELF-ADHERING COMPOSITE SHEET

- A. Rubberized-Asphalt Composite Sheet: 60-mil- thick self-adhering sheet consisting of 56 mils of rubberized asphalt laminated to a 4-mil- thick polyethylene film with release liner on adhesive side.
  1. Sheet Type: Manufacturer's standard composite sheet for use when ambient and substrate temperatures exceed 40 deg F.
  2. Physical Properties: Provide waterproofing complying with the following:
    - a. Tensile Strength: 250 psi minimum; ASTM D 412, Die C, modified.
    - b. Ultimate Elongation: 300 percent minimum; ASTM D 412, Die C, modified.

- c. Pliability: No cracks when bent 180 degrees over a 1-inch mandrel at minus 25 deg F; ASTM D 146.
- d. Crack Cycling: Unaffected after 100 cycles of 1/8-inch movement; ASTM C 836.
- e. Puncture Resistance: 40 lbf minimum; ASTM E 154.
- f. Hydrostatic-Head Resistance: 150 feet minimum; ASTM D 5385.
- g. Water Absorption: 0.15 percent weight-gain maximum after 48-hour immersion at 70 deg F; ASTM D 570.

### 2.3 AUXILIARY MATERIALS

- A. General: Furnish auxiliary materials recommended by waterproofing manufacturer for intended use and compatible with waterproofing sheet membrane.
  - 1. Furnish liquid-type auxiliary materials that meet VOC limits of authorities having jurisdiction.
- B. Primer: Liquid primer recommended by manufacturer of sheet waterproofing material for substrate.
- C. Liquid Membrane: Elastomeric, 2-component, liquid, cold fluid-applied, trowel grade or low viscosity as recommended by waterproofing manufacturer for application.
- D. Patching Membrane: Low-viscosity, 2-component, asphalt-modified coating.
- E. Mastic, Adhesives, and Tape: Liquid mastic and adhesives, and adhesive tapes recommended by waterproofing manufacturer.
- F. Penetration Seal: Self-adhering reinforced membrane, 2-1/2 inches wide, with a tack-free protective adhesive coating on 1 side and a release film on self-adhering side.
- G. Metal Termination Bars: Aluminum bars, approximately 1 by 1/8 inch thick, predrilled at 9-inch centers.
- H. Protection Course: As detailed in drawings.

### 2.4 MOLDED-SHEET DRAINAGE PANELS

- A. Composite drainage panels, 3-dimensional, nonbiodegradable, manufactured with a permeable geotextile bonded to molded-plastic-sheet drainage core and designed to effectively convey water.
  - 1. Geotextile: Nonwoven geotextile fabric of polypropylene or polyester fibers, or combination of both.
  - 2. Minimum Flow Rate: 7 gpm/foot at a hydraulic gradient of 1.0 and 3600-psf normal pressure when tested according to ASTM D 4716.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions under which waterproofing systems will be applied, with Installer present, for compliance with requirements. Do not proceed with installation until unsatisfactory conditions have been corrected.
  - 1. Do not proceed with installation until after minimum concrete curing period recommended by waterproofing manufacturer.
  - 2. Verify substrate is visibly dry and free of moisture. Test for capillary moisture by plastic sheet method according to ASTM D 4263.
  - 3. Notify Architect in writing of anticipated problems using waterproofing over substrate.

### 3.2 SURFACE PREPARATION

- A. Clean, prepare, and treat substrate according to manufacturer's written instructions. Provide clean, dust-free, and dry substrate for waterproofing application.
- B. Mask off adjoining surfaces not receiving waterproofing to prevent spillage affecting other construction.
- C. Remove grease, oil, form release agents, paints, and other penetrating contaminants from concrete.
- D. Remove fins, ridges, mortar, and other projections and fill honeycomb, aggregate pockets, holes, and other voids.
- E. Prepare, fill, prime, and treat joints and cracks in substrate. Remove dust and dirt from joints and cracks according to ASTM D 4258.
- F. Inside Corners: Prepare, prime, and treat inside corners according to waterproofing manufacturer's written instructions.
  - 1. Install membrane strip centered over vertical inside corners. Install 3/4-inch fillets of liquid membrane on horizontal inside corners and as follows:
    - a. At footing-to-wall intersections, extend liquid membrane each direction from corner or install membrane strip centered over corner.
    - b. At deck-to-wall intersections, extend liquid membrane or sheet membrane flashing onto deck waterproofing and to finished height of sheet flashing.
- G. Outside Corners: Prepare and treat outside corners according to waterproofing manufacturer's written instructions.
  - 1. Install strip of membrane 12 inches wide, centered over corner.
- H. Prepare, treat, and seal vertical and horizontal surfaces at terminations and penetrations through waterproofing and at drains and protrusions according to waterproofing manufacturer's written instructions.
  - 1. At expansion joints and discontinuous deck-to-wall or deck-to-deck joints, bridge and cover with sheet membrane strips.

### 3.3 PROTECTION COURSE INSTALLATION

- A. Install protection course over waterproofing membrane using tape or adhesive according to manufacturer's written instructions and before commencing subsequent construction operations. Minimize exposure of membrane.
  - 1. Molded-sheet drainage panels may be used in lieu of protection course to vertical applications when approved by waterproofing manufacturer.

### 3.4 DRAINAGE PANEL INSTALLATION

- A. Place and secure drainage panels according to manufacturer's written instructions. Use adhesives and mechanical fasteners recommended by manufacturer that do not penetrate waterproofing. Lap edges and ends of geotextile to maintain continuity. Protect installed panels during subsequent construction.
  - 1. For vertical applications, install insulation used as a protection course before installing drainage panel.

### 3.5 PROTECTING AND CLEANING

- A. Protect waterproofing from damage and wear during application and remainder of construction period, according to manufacturer's written instructions.
- B. Clean spillage and soiling from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

**END OF SECTION 07 13 00**

**SECTION 07 21 00 - THERMAL INSULATION**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Perimeter insulation under slabs-on-grade.
  - 2. Concealed building insulation.
  - 3. Roof Insulation
  - 4. Sound Attenuation Insulation
- B. Related Sections include the following:
  - 1. Division 04 Section "Unit Masonry" for installation of rigid insulation in cavity walls and masonry cells.
  - 2. Division 07 Section "Thermoplastic Membrane Roofing" for installation of insulation.
  - 3. Division 09 Section "**Gypsum Board**" for installation in metal-framed assemblies of insulation specified by referencing this Section.

1.3 DEFINITIONS

- A. Thermal Resistivity: Where the thermal resistivity of insulation products are designated by "r-values," they represent the reciprocal of thermal conductivity (k-values). Thermal conductivity is the rate of heat flow through a homogenous material exactly 1 inch thick. Thermal resistivities are expressed by the temperature difference in degrees F between the two exposed faces required to cause one BTU to flow through one square foot per hour at mean temperatures indicated.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Samples for Verification: Full-size units for each type of exposed insulation indicated.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.
- D. Research/Evaluation Reports: For foam-plastic insulation.

1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
  - 1. Surface-Burning Characteristics: ASTM E 84.

2. Fire-Resistance Ratings: ASTM E 119.
3. Combustion Characteristics: ASTM E 136.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect insulation materials from physical damage and from deterioration by moisture, soiling, and other sources. Store inside and in a dry location. Comply with manufacturer's written instructions for handling, storing, and protecting during installation.

### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
  1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.
  2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

#### 2.2 GLASS-FIBER BLANKET INSULATION

- A. Manufacturers:
  1. CertainTeed Corporation.
  2. Guardian Fiberglass, Inc.
  3. Johns Manville.
  4. Knauf Fiber Glass.
  5. Owens Corning.
- B. Unfaced, Glass-Fiber 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; passing ASTM E 136 for combustion characteristics.
- C. Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:
  1. **3-1/2 inches** thick with a thermal resistance of **13 deg F x h x sq. ft./Btu at 75 deg F.**
- D. For Sound Attenuation, provide Unfaced Glass-Fiber Blanket Insulation over suspended ceilings at partitions in a width that extends insulation **48 inches** on either side of partition and in interior wall partitions.
  1. Thickness:
    - a. **5-1/2 inches** thick above suspended ceiling
    - b. **3-1/2 inches** thick in interior wall partitions
  2. Provide sound attenuation over suspended ceilings and interior wall partitions in areas indicated in the Drawings.

#### 2.3 WALL INSULATION

- A. Extruded-Polystyrene Board Insulation with Increased R-Value: NA
- B. Adhesive: Type recommended by insulation board manufacturer for application indicated.

- 2.4 ROOF INSULATION
  - A. NA

### PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.
  - 2. Do not proceed with installation of spray applied polyurethane foam insulation until placement of masonry ties, clips, connectors and continuous air/vapor barrier Work has been completed and reviewed by the Architect or Consultant.

#### 3.2 PREPARATION

- A. Clean substrates of substances harmful to insulation, including removing projections capable of interfering with insulation attachment.
  - 1. Clean, prepare and treat substrate according to manufacturer's written instructions. Provide clean, dust-free and dry substrate for spray polyurethane foam building insulation application. Ensure installed air/vapor barrier membrane, transition and flashing membranes are fully adhered to all applicable surfaces and capable of receiving spray polyurethane foam.

#### 3.3 INSTALLATION, GENERAL

- A. Comply with insulation manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

#### 3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

- A. NA

#### 3.5 INSTALLATION OF GENERAL BUILDING INSULATION

- 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.

#### 3.6 INSTALLATION OF INSULATION IN WALLS FOR SOUND ATTENUATION

- A. NA

3.7 INSULATION SCHEDULE

<b>Location</b>	<b>Description/Location</b>	<b>Product/ Minimum Thickness</b>	<b>R-Value</b>	<b>Remarks</b>
Exterior Walls	Faced Batt Insulation	4" Fiberglass Batts, 2 layers	R-26	Exterior Walls
Sound Attenuation Batts (Ceiling)	Unfaced Batt Insulation	6" Fiberglass Batts	R-19	Provide at all new ceiling locations

**END OF SECTION 07 21 00**

**SECTION 07 46 46 – FIBER CEMENT SIDING**

PART 1 - GENERAL

1.1 SECTION INCLUDES

- A. Cementitious Fiber siding panels, fascia, molding, battens and accessories.

1.2 RELATED SECTIONS

- A. Refer to Division 06 Section “Rough Carpentry”.
- B. Refer to Division 06 Section “Sheathing” for Air Barrier.

1.3 SUBMITTALS

- A. Submit under provisions of Submittals Section.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
  - 1. Preparation instructions and recommendations.
  - 2. Storage and handling requirements and recommendations.
  - 3. Installation methods.
- C. Shop Drawings: Provide detailed drawings of atypical non-standard applications of cementitious siding materials which are outside the scope of the standard details and specifications provided by the manufacturer.
- D. Selection Samples: For each finish product specified, two complete sets of color chips representing manufacturer's full range of available colors and patterns.
- E. Verification Samples: For each finish product specified, two samples, minimum size 4 by 6 inches, representing actual product, color, and patterns.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Minimum of 2 years experience with installation of similar products.
- B. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
  - 1. Finish areas designated by Architect.
  - 2. Do not proceed with remaining work until workmanship, color, and sheen are approved by Architect.
  - 3. Refinish mock-up area as required to produce acceptable work.
- C. Code Compliance Requirement for Materials:
  - 1. Fiber-cement siding, complies with ASTM C 1186 Type A Grade II.
  - 2. Fiber-cement siding, complies with ASTM E 136 as a noncombustible material.
  - 3. Fiber-cement siding, complies with ASTM E 84 Flame Spread Index = 0, Smoke Developed Index = 5.
  - 4. Fiber-cement siding, complies with ASTM E 119 1 hour and 2 hour fire resistive assemblies listed with Warnock Hersey.
  - 5. Fiber-cement siding, tested to ASTM E330 for Transverse Loads.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store siding on edge or lay flat on a smooth level surface. Protect edges and corners from chipping. Store sheets under cover and keep dry prior to installing.
- C. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.6 PROJECT CONDITIONS

- A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

1.7 WARRANTY

- A. Product Warranty: Unlimited product warranty against manufacturing defects.
  - 1. Panel siding for 30 years.
- B. Workmanship Warranty: Application limited warranty for 2 years.
- C. Finish Warranty: Limited product warranty against manufacturing finish defects.
  - 1. 15 years for warranty that the finish will not peel, will not crack, and will not chip.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Acceptable Manufacturer: Included but not limited too,
  - 1. James Hardie Building Products, Inc;
  - 2. CSR
  - 3. BGC
  - 4. Georgia-Pacific

2.2 SIDING

- A. Panel Siding
  - 1. Basis of Design: Hardie Panel sheet siding as manufactured by James Hardie Building Products, Inc.
    - a. Provide at locations indicated on the drawings.
    - b. Type: Smooth Siding, 7/16" thick
- B. Trim: Hardietrim Fascia and Moulding as manufactured by James Hardie Building Products, Inc.
  - 1. Dimensions as indicated on drawings and to suit specific field conditions.
- C. Air Barrier:
  - 1. Located air barrier between sheathing and siding.

2.3 FASTENERS

- A. Wood Framing Fasteners (all nails shall be hot dip galvanized)
- B. Use nail or screw size as recommended by the manufacturer and as necessary to resist all wind loads and loading combinations:

1. Wood framing: 4d common corrosion resistant nails.
2. Wood framing: 6d common corrosion resistant nails.
3. Wood framing: 0.089 inch shank by 0.221 inch head by 2 inches corrosion resistant siding nails.
4. Wood framing: 0.093 inch shank by 0.222 inch head by 2 inches corrosion resistant siding nails.
5. Wood framing: 0.091 inch shank by 0.221 inch head by 1-1/2 inches corrosion resistant siding nails.
6. Wood framing: 0.091 inch shank by 0.225 inch head by 1-1/2 inches corrosion resistant siding nails.

## 2.4 FINISHES

- A. Factory Primer: Provide factory applied universal primer.
  1. Primer: PrimePlus by James Hardie.
- B. Factory Finish:
  1. Product: ColorPlus Technology by James Hardie.
  2. Definition: Factory applied finish; defined as a finish applied in the same facility and company that manufactures the siding substrate.
  3. Process:
    - a. Factory applied finish by fiber cement manufacturer in a controlled environment within the fiber cement manufacturer's own facility utilizing a multi-coat, heat cured finish within one manufacturing process.
    - b. Each finish color must have documented color match to delta E of 0.5 or better between product lines, manufacturing lots or production runs as measured by photospectrometer and verified by third party.
  4. Protection: Factory applied finish protection such as plastic laminate that is removed once siding is installed
  5. Accessories: Complete finishing system includes pre-packaged touch-up kit provided by fiber cement manufacturer. Provide quantities as recommended by manufacturer.
  6. Factory Finish Color for Trim, Soffit and Siding Colors: Color Selected by Architect from Manufacturer's full range of available colors.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Do not begin installation until substrates have been properly prepared.
- B. Notify Architect of unsatisfactory preparation before proceeding.

### 3.2 PREPARATION

- A. Clean surfaces thoroughly prior to installation.
- B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

### 3.3 INSTALLATION - HARDIE PANEL SIDING

- A. Install materials in strict accordance with manufacturer's installation instructions.
- B. Block framing between studs where HardiePanel siding horizontal joints occur.
- C. Install metal Z flashing and provide a 1/4 inch (6 mm) gap at horizontal panel joints.

- D. Place fasteners no closer than 3/8 inch (9.5 mm) from panel edges and 2 inches (51 mm) from panel corners.
- E. Allow minimum vertical clearance between the edge of siding and any other material in strict accordance with the manufacturer's installation instructions.
- F. Maintain clearance between siding and adjacent finished grade.
- G. Specific framing and fastener requirements refer to Tables 2 and 3 in National Evaluation Service Report No. NER-405.
- H. Factory Finish Touch Up: Apply touch up paint to cut edges in accordance with manufacturer's printed instructions.
  - 1. Touch-up nicks, scrapes, and nail heads in pre-finished siding using the manufacturer's touch-up kit pen.
  - 2. Touch-up of nails shall be performed after application, but before plastic protection wrap is removed to prevent spotting of touch-up finish.
  - 3. Use touch-up paint sparingly. If large areas require touch-up, replace the damaged area with new pre-finished siding. Match touch up color to siding color through use of manufacturer's branded touch-up kits.

### 3.4 INSTALLATION - HARDIETRIM FASCIA AND MOULDING

- A. Install materials in strict accordance with manufacturer's installation instructions. Install flashing around all wall openings.
- B. Fasten through trim into structural framing or code complying sheathing. Fasteners must penetrate minimum 3/4 inch or full thickness of sheathing. Additional fasteners may be required to ensure adequate security.
- C. Place fasteners no closer than 3/4 inch and no further than 2 inches from side edge of trim board and no closer than 1 inch from end. Fasten maximum 16 inches on center.
- D. Maintain clearance between trim and adjacent finished grade.
- E. Trim inside corner with single board.
- F. Outside Corner Board: For 3/4 inch trim only. Install single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten Hardietrim board to Hardietrim board.
- G. Outside Corner Board: For 1 inch and 1-1/2 inches trim only. Pre Build corners by fastening trim together with 16 ga. corrosion resistant finish nail 1/2 inch from edge spaced 16 inches apart, weather cut each end spaced minimum 12 inches apart.
- H. Allow 1/8 inch gap between trim and siding.
- I. Seal gap with high quality, paint-able caulk.
- J. Shim frieze board as required to align with corner trim.
- K. Install Hardietrim fascia over structural subfascia.
- L. Overlay siding with Hardietrim molding at windows, doors and inside corners.
- M. Fasten through overlapping boards. Do not nail between lap joints.
- N. Overlay siding with single board of outside corner board then align second corner board to outside edge of first corner board. Do not fasten Hardietrim boards to Hardietrim boards.
- O. Shim frieze board as required to align with corner trim.
- P. Install Hardietrim fascia over structural subfascia.

### 3.5 FINISHING

- A. Finish factory primed siding with a minimum of two coats of high quality 100 percent acrylic exterior grade paint within 180 days of installation. Follow paint manufacturer's written product recommendation and written application instructions.

3.6 PROTECTION

- A. Protect installed products until completion of project.
- B. Touch-up, repair or replace damaged products before Substantial Completion.
- C. Adjusting: Eliminate functional or visual defects. Where not possible to repair, replace finish work. Adjust joinery for uniform appearance.
- D. Clean exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas

**END OF SECTION 07 46 46**



**SECTION 07 62 00 - SHEET METAL FLASHING AND TRIM**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes sheet metal flashing and trim in the following categories:
  - 1. Metal flashing and counterflashing.

1.3 RELATED SECTIONS

- A. The following Sections contain requirements that relate to this Section:
  - 1. Division 07 Section "Joint Sealants" for elastomeric sealants.

1.4 SUBMITTALS

- A. Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data including manufacturer's material and finish data, installation instructions, and general recommendations for each specified flashing material and fabricated product.
- C. Shop Drawings of each item specified showing layout, profiles, methods of joining, and anchorage details.
- D. Samples of sheet metal flashing, trim, and accessory items, in the specified finish. Where finish involves normal color and texture variations, include Sample sets composed of 2 or more units showing the full range of variations expected.
  - 1. 8-inch- square Samples of specified sheet materials to be exposed as finished surfaces.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experience Installer who has completed sheet metal flashing and trim work similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Mockups: Prior to installing sheet metal flashing and trim, construct mockups indicated to verify selections made under Sample submittals and to demonstrate aesthetic effects as well as qualities of materials and execution. Build mockups to comply with the following requirements, using materials indicated for final unit of Work.
  - 1. Locate mockups on-site in the location and of the size indicated or, if not indicated, as directed by Architect.
  - 2. Notify Architect one week in advance of the 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 start of final unit of Work.

## 1.6 PROJECT CONDITIONS

- A. Coordinate Work of this Section with interfacing and adjoining Work for proper sequencing of each installation. Ensure best possible weather resistance, durability of Work, and protection of materials and finishes.

## PART 2 - PRODUCTS

### 2.1 METALS

- A. Aluminum: Alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated and with not less than the strength and durability of alloy and temper designated below unless otherwise indicated.

### 2.2 MISCELLANEOUS MATERIALS AND ACCESSORIES

- A. Fasteners: Same metal as sheet metal flashing or other noncorrosive metal as recommended by sheet metal manufacturer. Match finish of exposed heads with material being fastened.
  1. Fasteners for Stainless-Steel Sheet: Series 316 stainless steel.
  2. Fasteners for Aluminum-Zinc Alloy-Coated Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 316 stainless steel.
- B. Mastic Sealant: Polyisobutylene; nonhardening, nonskinning, nondrying, nonmigrating sealant.
- C. Elastomeric Sealant: Generic type recommended by sheet metal manufacturer and fabricator of components being sealed and complying with requirements for joint sealants as specified in Division 7 Section "Joint Sealants."
- D. Paper Slip Sheet: **5-lb/square** red rosin, sized building paper conforming to FS UU-B-790, Type I, Style 1b.
- E. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar accessory units as required for installation of Work, matching or compatible with material being installed; noncorrosive; size and thickness required for performance.

### 2.3 FABRICATION, GENERAL

- A. Sheet Metal Fabrication Standard: Fabricate sheet metal flashing and trim to comply with recommendations of SMACNA's "Architectural Sheet Metal Manual" 7<sup>th</sup> edition, 2012 that apply to the design, dimensions, metal, and other characteristics of the item indicated.
- B. Comply with details shown to fabricate sheet metal flashing and trim that fit substrates and result in waterproof and weather-resistant performance once installed. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Form exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems.
- D. Lapped or bayonet-type expansion joints are not permitted.
- E. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards and as follows:
- F. Fabricate sealed joints in prefinished sheet metal with butt joints and concealed splice plates. Install silicone elastomeric sealant between exposed metal work and splice plates, and rivet one side of fabricated unit to splice plate for strength.

1. Do not use lapped or bayonet-type (nested) joints for sheet metal fabrications.
  2. Fabricate concealed splice plates of specific size and profile to maintain lines and form of fabricated work.
  3. Provide a 1/8" gap between fabricated units at butt joints.
- G. Separate metal from noncompatible metal or corrosive substrates by coating concealed surfaces at locations of contact with asphalt mastic or other permanent separation as recommended by manufacturer.
- H. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces of sheet metal exposed to public view.
- I. Size: As recommended by SMACNA manual or sheet metal manufacturer for application but never less than thickness of metal being secured.

## 2.4 SHEET METAL FABRICATIONS

- A. General: Fabricate sheet metal items in thickness or weight needed to comply with performance requirements but not less than that listed below for each application and metal.
- B. Base Flashing: Fabricate from the following material:
1. .040, Aluminum Sheet
- C. Counterflashing: Fabricate from the following material:
1. .040, Aluminum Sheet

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions under which sheet metal flashing and trim are to be installed and verify that Work may properly commence. Do not proceed with installation until unsatisfactory conditions have been corrected.

### 3.2 INSTALLATION

- A. General: Unless otherwise indicated, install sheet metal flashing and trim to comply with performance requirements, manufacturer's installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Anchor units of Work securely in place by methods indicated, providing for thermal expansion of metal units; conceal 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 weatherproof.
- B. Install exposed sheet metal Work that is without excessive oil canning, buckling, and tool marks and that is true to line and levels indicated, with exposed edges folded back to form hems. Install sheet metal flashing and trim to fit substrates and to result in waterproof and weather-resistant performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
- C. Sealed Joints: Form nonexpansion, but movable, joints in metal to accommodate elastomeric sealant to comply with SMACNA standards and as follows:
1. Fabricate sealed joints in prefinished sheet metal with butt joints and concealed splice plates. Install silicone elastomeric sealant between exposed metal work and splice plates, and rivet one side of fabricated unit to splice plate for strength.
    - a. Do not use lapped or bayonet-type (nested) joints for sheet metal fabrications.
  2. Fabricate concealed splice plates of specific size and profile to maintain lines and form of fabricated work.
  3. Provide a 1/8" gap between fabricated units at butt joints.
- D. Separations: Separate metal from non-compatible metal or corrosive substrates by coating concealed surfaces, at locations of contact, with asphalt mastic or other permanent separation as recommended by manufacturer.

- E. Counterflashings: Coordinate installation of counterflashings with installation of assemblies to be protected by counterflashing. Install counterflashings in reglets or receivers. Secure in a waterproof manner by means of snap-in installation and sealant, lead wedges and sealant, interlocking folded seam, or blind rivets and sealant. Lap counterflashing joints a minimum of **2 inches** and bed with sealant.

### 3.3 CLEANING AND PROTECTION

- A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or deterioration of finishes.
  - 1. Provide final protection and maintain conditions that ensure sheet metal flashing and trim Work during construction is without damage or deterioration other than natural weathering at the time of Final Acceptance.

**END OF SECTION 07 62 00**

**SECTION 07 92 00 - JOINT SEALANTS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary General Conditions and Division 01 Specification sections, apply to work of this section.

1.2 SUMMARY

- A. This Section includes joint sealants for the following locations:
- B. Exterior joints in vertical surfaces and non-traffic horizontal surfaces as indicated below.
  - 1. Control and expansion joints in unit masonry.
  - 2. Perimeter of all doors and windows including aluminum window and doors frames.
  - 3. Existing perimeter of all doors and windows including aluminum window and doors frames.
  - 4. Perimeter of all aluminum storefront and curtain wall units.
  - 5. Existing perimeter of all aluminum storefront and curtain wall units.
  - 6. Between all dissimilar materials unless otherwise shown.
  - 7. Control joints and expansion joints in gypsum board ceilings.
  - 8. Other locations as required to keep the building watertight.
  - 9. Other joints as indicated.
- C. Exterior joints in horizontal traffic surfaces as indicated below:
  - 1. Control, expansion, and isolation joints in cast-in-place concrete slabs for walks and paving.
  - 2. At all locations where concrete walks abut vertical surfaces including building surfaces and back of curb.
  - 3. Between all dissimilar materials unless otherwise shown.
- D. Interior joints in vertical surfaces and horizontal nontraffic surfaces as indicated below:
  - 1. Control and expansion joints on exposed interior surfaces of exterior walls.
  - 2. Perimeter joints of exterior openings.
  - 3. Vertical control joints on exposed surfaces of interior unit masonry walls and partitions.
  - 4. Perimeter joints between interior wall surfaces and frames of interior doors and windows.
  - 5. Tile control and expansion joints.
  - 6. Perimeter joints of toilet fixtures.
  - 7. Joints between dissimilar materials.
  - 8. Other joints as indicated.
- E. Interior joints in horizontal traffic surfaces as indicated below:
  - 1. Control and expansion joints in cast-in-place concrete slabs.
  - 2. Control and expansion joints in stone flooring
  - 3. Other joints as indicated.
  - 4. Between all dissimilar materials unless otherwise shown.
- F. Fire-rated joints in vertical and horizontal non-traffic surfaces.
- G. Sealants for glazing purposes are specified in Division 08 Section "Aluminum Framed Entrances and Storefronts."

1.3 RELATED SECTIONS

- A. The following Sections contain requirements that relate to this Section:
  - 1. Division 07 Section "Sheet Metal Flashing and Trim" for sealing joints related to flashing and sheet metal for roofing.

2. Division 08 Section "Glazing" for sealants used in glazing.

#### 1.4 SYSTEM PERFORMANCES

- A. Provide joint sealants that have been produced and installed to establish and maintain watertight and airtight continuous seals.

#### 1.5 SUBMITTALS

- A. **Product Data:** From manufacturers for each joint sealer product required, including instructions for joint preparation and joint sealer application.
- B. **Samples:** For verification purposes of each type and color of joint sealer required. Install joint sealer samples in ½ inch wide joints formed between two 6 inch long strips of material matching the appearance of exposed surfaces adjacent to joint sealants.
- C. **Certificates:** From manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.

#### 1.6 QUALITY ASSURANCE

- A. **Installer Qualifications:** Engage an Installer who has successfully completed within the last 3 years at least 3 joint sealer applications similar in type and size to that of this Project.
- B. **Single Source Responsibility for Joint Sealer Materials:** Obtain joint sealer materials from a single manufacturer for each different product required.
- C. **Product Testing:** Provide comprehensive test data for each type of joint sealer based on tests conducted by a qualified independent testing laboratory on current product formulations within a 24-month period preceding date of Contractor's submittal of test results to Architect.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to Project site in original unopened containers or bundles with labels informing about manufacturer, product name and designation, color, expiration period for use, pot life, curing time, and mixing instructions for multicomponent materials.
- B. Store and handle materials in compliance with manufacturers' recommendations to prevent their deterioration or damage due to moisture, high or low temperatures, contaminants, or other causes.

#### 1.8 PROJECT CONDITIONS

- A. **Environmental Conditions:** Do not proceed with installation of joint sealants under the following conditions:
  1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealer manufacturer or below 40 deg F.
  2. When joint substrates are wet due to rain, frost, condensation or other causes.
  3. When conditions are such that wind borne dust, dirt and other debris will contaminate the sealants before they are set and capable of resisting such contamination, unless specific and successful measures can be taken to prohibit such contamination.
- B. **Joint Width Conditions:** Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealer manufacturer for application indicated.
- C. **Joint Substrate Conditions:** Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

- D. **General Warranty:** The warranties specified in this Article shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and shall be in addition to, and run concurrent with, other warranties made by the Contractor under requirements of the Contract Documents.
- E. **Special Installer's Warranty:** Submit a written, non-prorated full warranty, countersigned by the Contractor and the elastomeric sealant Installer agreeing to promptly repair and replace those that leak do not otherwise comply with performance and other requirements specified in this section for the following warranty period:
  - 1. Warranty Period: Two (2) years from date of Final Acceptance.
- F. **Special Manufacturer's Warranty:** Submit a written, non-prorated full warranty, signed by the elastomeric sealant manufacturer agreeing to promptly furnish joint sealants to repair and replace those that leak do not otherwise comply with performance and other requirements specified in this section for the following warranty period:
  - 1. Warranty Period: Ten (10) years from date of Final Acceptance.

## PART 2 - PRODUCTS

### 2.1 MATERIALS, GENERAL

- A. **Compatibility:** Provide joint sealants, joint fillers and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. **Colors:** Provide color of exposed joint sealants as selected by Architect from manufacturer's standard colors.

### 2.2 ELASTOMERIC JOINT SEALANTS

- A. **Elastomeric Sealant Standard:** Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated which complies with ASTM C 920 requirements, including those referenced for Type, Grade, Class, and Uses.
- B. **Multi-Part Nonsag Urethane Sealant for Use NT:** Type M, Grade NS, Class 25, and complying with the following requirements for Uses:
  - 1. Uses NT, M, A, and as applicable to joint substrates indicated.
    - a. Provide as the general building sealant for all exterior and interior vertical and non-traffic horizontal joints, unless otherwise indicated.
  - 2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Chem-Calk 500; Bostik Construction Products Div.
    - b. Vulkem 922; Mameco International, Inc.
    - c. Dualthane; W.R. Meadows, Inc.
    - d. Dynatrol II; Pecora Corp.
    - e. Permapol RC-2; Products Research and Chemical Corp.
    - f. Sikaflex-2c NS; Sika Corp.
    - g. Sonolastic NP-2; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
    - h. Dymeric; Tremco Inc.
- C. **One-Part Nonsag Urethane Sealant for Use T:** Type S, Grade NS, Class 25, and complying with the following requirements for Uses:
  - 1. Uses T, NT, M, G, A, and, as applicable to joint substrates indicated.
    - a. Provide for exterior concrete paving joints, and for exposed interior concrete slab joints, subject to foot or vehicular traffic; and equipment and isolation joints.
  - 2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Chem-Calk 900; Bostik Construction Products Div.
    - b. Permapal RC-1; Products Research and Chemical Corp.
    - c. Sikaflex-1a; Sika Corp.

- d. Sikaflex-15LM; Sika Corp.
- D. **One-Part Pourable Urethane Sealant for Use T:** Type S, Grade P, Class 25, and complying with the following requirements for Uses:
  1. Uses T, M, A, and, as applicable to joint substrates indicated.
    - a. Provide for interior concrete slab joints to receive floor finishes.
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Chem-Calk 950; Bostik Construction Products Div.
    - b. Vulkem 45; Mameco International, Inc.
    - c. NR-201 Urexpam; Pecora Corp.
    - d. Sonolastic SL-1; Sonneborn Building Products Div., Rexnord Chemical Products Inc.
- E. **One-Part Nonacid-Curing Silicone Sealant:** Type S, Grade NS, Class 25, and complying with the following requirements for Uses and additional joint movement capability:
  1. Uses NT, G, A, and, as applicable to joint substrates indicated.
    - a. Additional capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the following percentage changes in joint width as measured at time of application and remain in compliance with other requirements of ASTM C 920 for Uses indicated:
      - b. 50% movement in both extension and compression for a total of 100% movement.
      - c. Provide for flashing and sheet metal joints as required, and elsewhere as indicated.
  2. Products: Subject to compliance with requirements, provide one of the following:
    - a. Chem-Calk N-Cure 2000; Bostik Construction Products Div.
    - b. Dow Corning 790; Dow Corning Corp.
    - c. Siliglaze N SCS 2501; General Electric Co.
    - d. Silipruf SCS 2000; General Electric Co.
    - e. 864; Pecora Corp.
    - f. Rhodorsil 5C; Rhone-Poulenc Inc.
    - g. Spectrum 1; Tremco Inc.
    - h. Spectrum 2; Tremco Inc.

### 2.3 JOINT SEALANT BACKING

- A. **General:** Provide sealant backings of material and type which are nonstaining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. **Sealant Backer Rod:** Provide compressible rod stock of polyethylene foam, polyurethane foam, polyethylene jacketed polyurethane foam, butyl rubber foam, neoprene foam or other flexible, permanent, durable nonabsorptive material as recommended by sealant manufacturer for back-up of and compatibility with sealant. Where used with hot-applied sealant, provide heat-resistant type which will not be deteriorated by sealant application temperature as indicated.
- C. **Bond Breaker Tape:** Provide polyethylene tape or other plastic tape as recommended by sealant manufacturer, to be applied to sealant-contact surfaces where bond to substrate or joint filler must be avoided for proper performance of sealant. Provide self-adhesive tape where applicable.

### 2.4 MISCELLANEOUS MATERIALS

- A. **Joint Primer/Sealer:** Provide type of joint primer/sealer recommended by sealant manufacturer for joint surfaces to be primed or sealed.
- B. **Cleaners for Nonporous Surfaces:** Provide nonstaining, chemical cleaners of type which are acceptable to manufacturers of sealants and sealant backing materials, which are not harmful to substrates and adjacent nonporous materials, and which do not leave oily residues or otherwise have a detrimental effect on sealant adhesion or in-service performance.
- C. **Masking Tape:** Provide nonstaining, nonabsorbent type compatible with joint sealants and to surfaces adjacent to joints.

## 2.5 JOINT FILLERS FOR CONCRETE PAVING

- A. **General:** Provide joint fillers of thickness and widths indicated.
- B. **Bituminous and Fiber Joint Filler:** Provide resilient and non-extruding type premolded bituminous-impregnated fiberboard units complying with ASTM D 1751; FS HH-F-341, Type I; or AASHTO M 213.
  - 1. Where joints are to receive sealant, provide joint fillers with removable plastic top strips.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances and other conditions affecting joint sealer performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. **Surface Cleaning of Joints:** Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealer manufacturers and the following requirements:
  - 1. Remove all foreign material from joint substrates which could interfere with adhesion of joint sealer, including dust; paints, except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer; old joint sealants; oil; grease; waterproofing; water repellants; water; surface dirt; and frost.
  - 2. Clean concrete, masonry, unglazed surfaces of ceramic tile and similar porous joint substrate surfaces, by brushing, grinding, blast cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
  - 3. Remove laitance and form release agents from concrete.
  - 4. Clean metal, glass, porcelain enamel, glazed surfaces of ceramic tile; and other nonporous surfaces by chemical cleaners or other means which are not harmful to substrates or leave residues capable of interfering with adhesion of joint sealants.
- B. **Joint Priming:** Prime joint substrates where indicated or where recommended by joint sealer manufacturer based on preconstruction joint sealer-substrate tests or prior experience. Apply primer to comply with joint sealer manufacturer's recommendations. Confine primers to areas of joint sealer bond, do not allow spillage or migration onto adjoining surfaces.
- C. **Masking Tape:** Use masking tape where required to prevent contact of sealant with adjoining surfaces which otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

### 3.3 INSTALLATION OF JOINT SEALANTS

- A. **General:** Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. **Elastomeric Sealant Installation Standard:** Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.
- C. **Installation of Sealant Backings:** Install sealant backings to comply with the following requirements:
  - 1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.

- a. Do not leave gaps between ends of joint fillers. Bond ends of gaskets together with adhesive of "weld" by other means as recommended by manufacturer to ensure continuous watertight and airtight performance. Miter-cut and bond ends at corners unless molded corner units are provided.
  - b. Do not stretch, twist, puncture, or tear joint fillers.
  - c. Remove absorbent joint fillers which have become wet prior to sealant application and replace with dry material.
  2. Install bond breaker tape between sealants and joint fillers, compression seals, or back of joints where adhesion of sealant to surfaces at back of joints would result in sealant failure.
  3. Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.
  - D. **Installation of Sealants:** Install sealants by techniques, that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.
    1. For sidewalks, pavements and similar joints sealed with elastomeric sealants and subject to traffic and other abrasion and indentation exposures, fill joints to a depth equal to 75% of joint width, but neither more than 5/8" deep nor less than 3/8" deep.
    2. For normal moving joints sealed with elastomeric sealants but not subject to traffic, fill joints to a depth equal to 50% of joint width, but neither more than 1/2" deep nor less than 1/4" deep.
    3. Install fire-rated sealants or sealants used in fire-rated joints or assemblies in accordance with manufacturer's recommendations and as acceptable to Code authorities to achieve the required rating.
  - E. **Tooling of Non-sag Sealants:** Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
    1. Provide concave joint configurations per Figure 6A in ASTM C 962, unless otherwise indicated.
- 3.4 CLEANING
- A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealants and of products in which joints occur.
- 3.5 PROTECTION
- A. Protect joint sealants during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of Final Acceptance. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

**END OF SECTION 07 92 00**

**SECTION 09 29 00 - GYPSUM BOARD**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes the following:
  - 1. Interior gypsum board
  - 2. Cement board panels.
  - 3. Interior wall and ceiling framing
- B. Related Sections include the following:
  - 1. Division 06 Section "Rough Carpentry" for wood framing and furring that supports gypsum board.
  - 2. Division 07 Section "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
  - 3. Division 09 Section "Tiling" for cementitious backer units installed as substrates for ceramic tile.

1.3 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Delegated-Design Submittal: For framing systems indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Specify stud sizes, spacing, bracing, and fastening conditions required for each wall type. Provide a plan indicating location of wall type.
  - 2. Include design calculations.

1.4 QUALITY ASSURANCE

- 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. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are indicated, provide gypsum board assemblies that comply with the following requirements:
  - 1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing of another testing and inspecting agency acceptable to authorities having jurisdiction.
  - 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance according to ASTM E 119 by an independent testing and inspecting agency acceptable to authorities having jurisdiction.
  - 3. Deflection and Firestop Track: Top runner provided in fire-resistance-rated assemblies indicated is labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.

- C. **Above-Ceiling Observation:** Architect will conduct an above-ceiling observation prior to installation of gypsum board ceilings and report any deficiencies in the Work observed. Do not proceed with installation of gypsum board to ceiling support framing until deficiencies have been corrected.
  - 1. Notify Architect one week in advance of the date and the time when the Project, or part of the Project, will be ready for an above-ceiling observation.

#### 1.5 STORAGE AND HANDLING

- A. Store materials inside under cover and keep them dry and protected against damage from weather, condensation, direct sunlight, construction traffic, and other causes. Stack panels flat to prevent sagging.

#### 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.
- B. Do not install interior products until installation areas are enclosed and conditioned.
- C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
  - 1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  - 2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

### PART 2 - PRODUCTS

#### 2.1 PANELS, GENERAL

- A. Size: Provide in maximum lengths and widths available that will minimize joints in each area and that correspond with support system indicated.

#### 2.2 STEEL FRAMING AND FURRING

- A. Refer to Division 5

#### 2.3 INTERIOR GYPSUM BOARD

- A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent. Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
  - 1. Widths: Provide gypsum board in widths of 48 inches.
  - 2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
  - 3. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - a. American Gypsum Co.
    - b. BPB America Inc.
    - c. G-P Gypsum.
    - d. Lafarge North America Inc.
    - e. National Gypsum Company.

- f. PABCO Gypsum.
  - g. Temple.
  - h. USG Corporation.
- B. Regular Type:
- 1. Thickness: **5/8 inch**.
  - 2. Long Edges: Tapered.
- C. Type C:
- 1. Thickness: As required by fire-resistance-rated assembly indicated on Drawings.
  - 2. Long Edges: Tapered
- D. Type X:
- 1. Thickness: **5/8 inch**.
  - 2. Long Edges: Tapered.
  - 3. Core: 5/8" inch,
  - 4. Long Edges: Tapered

## 2.4 TRIM ACCESSORIES

- A. Interior Trim: ASTM C 1047.
- 1. Material: Galvanized or aluminum-coated steel sheet or rolled zinc.
  - 2. Shapes:
    - a. Cornerbead on outside corners.
    - b. L-Bead: L-shaped; exposed long flange receives joint compound. Use L-bead unless otherwise indicated. Provide at all locations where gypsum board abuts dissimilar materials.
    - c. Expansion (control) joint.
- B. Exterior Trim: ASTM C 1047.
- 1. Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc.
  - 2. Shapes:
    - a. Cornerbead.

## 2.5 JOINT TREATMENT MATERIALS

- A. General: Comply with ASTM C 475/C 475M.
- B. Joint Tape:
- 1. Interior Gypsum Wallboard: Paper.
  - 2. Glass-Mat Gypsum Sheathing Board: 10-by-10 glass mesh.
  - 3. Tile Backing Panels: As recommended by panel manufacturer.
- C. Joint Compound for Interior Gypsum Wallboard (EXCEPT SHOWER ROOMS): For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.
- 1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
  - 2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
    - a. Use setting-type compound for installing paper-faced metal trim accessories.
  - 3. Fill Coat: For second coat, use drying-type, all-purpose compound.
  - 4. Finish Coat: For third coat, use drying-type, all-purpose compound.
  - 5. Skim Coat: For final coat of Level 5 finish, use drying-type, all-purpose compound.
- D. Joint Compound for Shower Room Applications:
- 1. Shower Room Ceilings: Use setting-type taping compound and setting-type, sandable topping compound.
- E. Joint Compound for Cementitious Backer Units panels:
- 1. Cementitious Backer Units: As recommended by backer unit manufacturer.

## 2.6 AUXILIARY MATERIALS

- A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.
- B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.
  - 1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
  - 2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.
- C. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."
  - 1. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834 and the following requirements:
    - a. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
  - 2. Available Products: Subject to compliance with requirements, acoustical sealants that may be incorporated in the Work include, but are not limited to, the following:
    - a. Acoustical Sealant for Exposed and Concealed Joints:
      - 1) PL Acoustical Sealant; ChemRex, Inc.; Contech Brands.
      - 2) AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
      - 3) SHEETROCK Acoustical Sealant; United States Gypsum Co.
- D. Thermal Insulation and Sound Attenuation Blankets: As specified in Division 07 Section "Thermal Insulation."
- E. Vapor Retarder: As specified in Division 07 Section "Thermal Insulation."

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.
- B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 INSTALLING STEEL FRAMING GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."
- C. Do not bridge building control and expansion joints with steel framing or furring members. Independently frame both sides of joints with framing or furring members as indicated.

### 3.3 INSTALLING STEEL FRAMING FOR SUSPENDED AND FURRED CEILINGS

- A. Suspend ceiling hangers from building structural members and as follows:
  - 1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structural or ceiling suspension system. Splay hangers only where

- required to miss obstructions and offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
2. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with the location of hangers required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards.
  3. Secure wire hangers by looping and wire-tying, either directly to structures or to inserts, eye screws, or other devices and fasteners that are secure and appropriate for substrate, and in a manner that will not cause them to deteriorate or otherwise fail.
  4. Secure flat, angle, and rod hangers to structure, including intermediate framing members, by attaching to inserts, eye screws, or other devices and fasteners that are secure and appropriate for structure as well as for type of hanger involved, and in a manner that will not cause them to deteriorate or otherwise fail.
  5. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  6. Do not connect or suspend steel framing from ducts, pipes, or conduit.
- B. Sway-brace suspended steel framing with hangers used for support.
- C. Install suspended steel framing components in sizes and at spacings indicated, but not less than that required by the referenced steel framing installation standard.
1. Wire Hangers: 48 inches o.c.
  2. Carrying Channels (Main Runners): 48 inches o.c.
  3. Furring Channels (Furring Members): 16 inches o.c.
- D. Installation Tolerances: Install steel framing components for suspended ceilings so that cross-furring or grid suspension members are level to within 1/8 inch in 12 feet as measured both lengthwise on each member and transversely between parallel members.
- E. Wire-tie or clip furring members to main runners and to other structural supports as indicated.

#### 3.4 INSTALLING STEEL FRAMING FOR WALLS AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings, except where partitions are indicated to terminate at suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
1. Cut studs 1/2 inch short of full height to provide perimeter relief.
  2. For STC-rated and fire-resistance-rated partitions that extend to the underside of floor/roof slabs and decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below floor/roof slabs and decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
- D. Install steel studs and furring in sizes and at spacings indicated.
1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.
  2. Multilayer Construction: Space studs 16 inches o.c., unless otherwise indicated.
- E. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- F. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
1. Install double 20-gage studs at each jamb, unless otherwise indicated.

2. Install cripple studs at head adjacent to each jamb stud, with a minimum ½-inch clearance from jamb stud to allow for installation of control joint.
- G. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

### 3.5 APPLYING AND FINISHING PANELS, GENERAL

- A. Comply with ASTM C 840.
- B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- C. Install sound-attenuation blankets, where indicated, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- D. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- E. Attach gypsum panels to framing provided at openings and cutouts.
- F. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more than **1/16 inch** of open space between panels. Do not force into place.
- G. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.
- H. Form control and expansion joints with space between edges of adjoining gypsum panels.
- I. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
  1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than **8 sq. ft.** in area.
  2. Fit gypsum panels around ducts, pipes, and conduits.
  3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow **1/4- to 3/8-inch-** wide joints to install sealant.
- J. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide **1/4- to 1/2-inch-** 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.
- K. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.
- L. Space fasteners in gypsum panels according to referenced gypsum board application and finishing standard and manufacturer's recommendations.
  1. Space screws a maximum of 12 inches o.c. for vertical applications.

### 3.6 APPLYING INTERIOR GYPSUM BOARD

- A. Install interior gypsum board in the following locations:
  1. Regular Type: As indicated on Drawings.
  2. Type X: Install in Shower Rooms.
  3. Type C: Where required for specific fire-resistance-rated assembly indicated.
- B. Single-Layer Application:
  1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
  2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.

- a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

### 3.7 APPLYING CEMENTITIOUS BACKER PANELS

- A. Cementitious Backer Units: ANSI A108.11, at locations indicated.

### 3.8 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Exterior Trim: Install in the following locations:
  1. Cornerbead: Use at outside corners.

### 3.9 FINISHING GYPSUM BOARD

- A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.
- B. Prefill open joints, rounded or beveled edges, and damaged surface areas.
- C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.
- D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:
  1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
  2. Level 5: Gypsum board surfaces, unless otherwise indicated
    - a. Primer and its application to surfaces are specified in other Division 09 Sections.
  3. Level 5: Provide at all Projection and Magnetic Wall Paint Areas.
- E. Glass-Mat Gypsum Sheathing Board: Finish according to manufacturer's written instructions for use as exposed soffit board.
- F. Cementitious Backer Units: Finish according to manufacturer's written instructions.
- G. Use the following joint compound combination as applicable to the finish levels specified:
  1. Embedding and First Coat: Ready-mixed, drying-type, all-purpose or taping compound. Fill (Second) Coat: Ready-mixed, drying-type, all-purpose or topping compound. Finish (Third) Coat: Ready-mixed, drying-type, all-purpose or topping compound.
- H. For Level 4 gypsum board finish, embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface free of visual defects and ready for decoration. Install Level 5 finish in Corridors.
  1. Where Level 1 gypsum board finish is indicated, embed tape in joint compound.

### 3.10 PROTECTION

- A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.
- B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
  1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
  2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

**END OF SECTION 09 29 00**

**SECTION 09 51 23 - ACOUSTICAL TILE CEILINGS**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.

1.2 SUMMARY

- A. This Section includes acoustical tiles for ceilings and the following:
  - 1. 2'x2' Acoustical Tile Lay-in Ceiling
  - 2. Suspended ceiling grid
- B. Products furnished, but not installed under this Section, include anchors, clips, and other ceiling attachment devices to be cast in concrete at ceilings.
- C. Related Section:
  - 1. Division 01 Section "Allowances" for additional quantities
  - 2. Division 01 Section "Unit Prices"

1.3 DEFINITIONS

- A. AC: Articulation Class.
- B. CAC: Ceiling Attenuation Class.
- C. LR: Light-Reflectance coefficient.
- D. NRC: Noise Reduction Coefficient.

1.4 SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which the following items are shown and coordinated with each other, based on input from installers of the items involved:
  - 1. Ceiling suspension system members.
  - 2. Method of attaching hangers to building structure.
- C. Samples for Initial Selection: For components with factory-applied color finishes.
- D. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each acoustical tile ceiling.
- E. Maintenance Data: For finishes to include in maintenance manuals.
- F. Certificates: Submit certificates from manufacturers of acoustical ceiling units and suspension systems attesting that their products comply with specification requirements.

1.5 QUALITY ASSURANCE

- A. Source Limitations:
  - 1. Acoustical Ceiling Tile: Obtain each type through one source from a single manufacturer.
  - 2. Suspension System: Obtain each type through one source from a single manufacturer.
- B. Fire-Test-Response Characteristics: Provide acoustical tile ceilings that comply with the following requirements:

1. Surface-Burning Characteristics: Provide acoustical tiles with the following surface-burning characteristics complying with ASTM E 1264 for Class A materials as determined by testing identical products per ASTM E 84:
  - a. Smoke-Developed Index: 450 or less.
- C. Seismic Standard: Provide acoustical tile ceilings designed and installed to withstand the effects of earthquake motions according to the following:
  - a. CISCA's Recommendations for Acoustical Ceilings: Comply with CISCA's "Recommendations for Direct-Hung Acoustical Tile and Lay-in Panel Ceilings--Seismic Zones 0-2."

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver acoustical tiles, suspension system components, and accessories to Project site in original, unopened packages and store them in a fully enclosed, conditioned space where they will be protected against damage from moisture, humidity, temperature extremes, direct sunlight, surface contamination, and other causes.
- B. Before installing acoustical tiles, permit them to reach room temperature and a stabilized moisture content.
- C. Handle acoustical tiles carefully to avoid chipping edges or damaging units in any way.

#### 1.7 PROJECT CONDITIONS

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

#### 1.8 COORDINATION

- A. Coordinate layout and installation of acoustical tiles and suspension system with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, fire-suppression system, and partition assemblies.

#### 1.9 EXTRA MATERIALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
  1. Acoustical Ceiling Units: Full-size tiles equal to 2.0 percent of quantity installed.
  2. Suspension System Components: Quantity of each concealed grid and exposed component equal to 2.0 percent of quantity installed.

## PART 2 - PRODUCTS

### 2.1 ACOUSTICAL TILES, GENERAL

- A. Acoustical Tile Standard: Provide manufacturer's standard tiles of configuration indicated that comply with ASTM E 1264 classifications as designated by types, patterns, acoustical ratings, and light reflectances, unless otherwise indicated.
- B. Acoustical Tile Colors and Patterns: Match appearance characteristics indicated for each product type.
  - 1. Where appearance characteristics of acoustical tiles are indicated by referencing pattern designations in ASTM E 1264 and not manufacturers' proprietary product designations, provide products selected by Architect from each manufacturer's full range that comply with requirements indicated for type, pattern, color, light reflectance, acoustical performance, edge detail, and size.
- C. Sound Attenuation Performance: Provide acoustical ceiling units with ratings for ceiling sound transmission class (STC) of range indicated as determined according to AMA 1-II "Ceiling Sound Transmission Test by Two-Room Method" with ceilings continuous at partitions and supported by a metal suspension system of type appropriate for ceiling unit of configuration indicated (concealed for tile, exposed for panels).
- D. Rating: 1-hour rated ceiling and suspension system assembly.
- E. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical tiles treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

### 2.2 ACOUSTICAL TILES FOR ACOUSTICAL TILE CEILING

- A. Refer to drawings for locations of ceiling finish.
- B. Basis-of-Design Product (as listed below): Subject to compliance with requirements, provide Armstrong product as specified or a comparable product by one of the following:
  - 1. CertainTeed
  - 2. USG Interiors, Inc
  - 3. Armstrong World Industries, Inc.
- C. Lay-in Ceiling "A" Armstrong 1713 School Zone , USG 22421 Radar Education or equal by CertainTeed HHH-454-HNR. Match Existing Ceiling Tile.
  - 1. Color: White.
  - 2. LR: Not less than 0.83.
  - 3. NRC: Not less than 0.70.
  - 4. CAC: Not less than 35.
  - 5. Edge/Joint Detail: Square Edge
  - 6. Thickness: min. 3/4 inch.
  - 7. Modular Size: 24 by 24 inches.
  - 8. Antimicrobial Treatment: Broad spectrum fungicide and bactericide based.
  - 9. 15 Year No-Sag Resistance: Provide 15 year no-sag warranty.

### 2.3 METAL SUSPENSION SYSTEMS, GENERAL

- A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems of types, structural classifications, and finishes indicated that comply with applicable requirements in ASTM C 635.
- B. Finishes and Colors, General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes. Provide manufacturer's standard factory-applied finish for type of system indicated.
- C. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:

1. Galvanized, Carbon-Steel Wire: ASTM A 641/A 641M, Class 1 zinc coating, soft temper.
  2. Size: Select wire diameter so its stress at 3 times hanger design load (ASTM C 635, Table 1, "Direct Hung" ) will be less than yield stress of wire, but provide not less than 12 gauge diameter wire.
- D. Hanger Rods: Mild steel, zinc coated or protected with rust-inhibitive paint.
- E. Angle Hangers: Angles with legs not less than 7/8 inch wide; formed with 0.04-inch- thick, galvanized steel sheet complying with ASTM A 653/A 653M, G90 coating designation; with bolted connections and 5/16-inch- diameter bolts.
- F. Seismic Struts: Manufacturer's standard compression struts designed to accommodate lateral forces.
- G. Seismic Clips: Manufacturer's standard seismic clips designed and spaced to secure acoustical tiles in-place.

#### 2.4 METAL SUSPENSION SYSTEM FOR ACOUSTICAL TILE CEILING

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Products: Subject to compliance with requirements, provide one of the following:
1. Armstrong World Industries, Inc.
  2. USG Interiors, Inc.
  3. Chicago Metallic
  4. CertainTeed
- C. Intermediate Duty, Direct-Hung, Double-Web, Suspension System: Main and cross runners roll formed from and capped with cold-rolled steel sheet, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 coating designation.
1. Structural Classification: Intermediate-duty system.
  2. Access: Upward and end or side pivoted, with initial access openings of size indicated below and located throughout ceiling within each module formed by main and cross runners, with additional access available by progressively removing remaining acoustical tiles.
- D. Indirect-Hung, Fire-Rated Suspension System: Main and cross runners roll formed from cold-rolled steel sheet with 15/16" wide exposed faces on structural members, prepainted, electrolytically zinc coated, or hot-dip galvanized according to ASTM A 653/A 653M, G30 coating designation.
1. Structural Classification: Intermediate-duty system.
  2. Carrying Channels: Cold-rolled steel, 0.059850-inch- minimum base (uncoated) metal thickness, not less than 3/16-inch- wide flanges by 1-1/2-inch- deep steel channels, 475 lb/1000 feet, with rust-inhibitive paint finish.
  3. Access: Where access is indicated, provide special cross runners or split splines to allow for removal of acoustical units in indicated access areas. Identify access tile with manufacturer's standard unobtrusive markers for each access unit.

#### 2.5 METAL EDGE MOLDINGS AND TRIM

- A. Products: Subject to compliance with requirements, provide one of the following:
1. Armstrong World Industries, Inc.
  2. Chicago Metallic Corporation
  3. USG Interiors, Inc.
- B. Roll-Formed, Sheet-Metal Edge Moldings and Trim: Type and profile indicated or, if not indicated, manufacturer's standard moldings for edges and penetrations that comply with seismic design requirements; formed from sheet metal of same material, finish, and color as that used for exposed flanges of suspension system runners.
1. Provide manufacturer's standard edge moldings that fit acoustical tile edge details and suspension systems indicated and that match width and configuration of exposed runners, unless otherwise indicated.
  2. For circular penetrations of ceiling, provide edge moldings fabricated to diameter required to fit penetration exactly.

## 2.6 ACOUSTICAL SEALANT

- A. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Acoustical Sealant for Exposed and Concealed Joints:
    - a. Pecora Corporation; AC-20 FTR Acoustical and Insulation Sealant.
    - b. USG Corporation; SHEETROCK Acoustical Sealant.
  - 2. Acoustical Sealant for Concealed Joints:
    - a. OSI Sealants, Inc.; Pro-Series SC-175 Rubber Base Sound Sealant.
    - b. Pecora Corporation; BA-98.
    - c. Tremco, Inc.; Tremco Acoustical Sealant.
- C. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, nonstaining latex sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), complying with ASTM C 834 and effective in reducing airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.
- D. Acoustical Sealant for Concealed Joints: Manufacturer's standard nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic-rubber sealant, with a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24), recommended for sealing interior concealed joints to reduce airborne sound transmission.

## 2.7 MISCELLANEOUS MATERIALS

- A. Hold-Down Clips for Non-Fire-Rated Ceilings: For interior ceilings composed of lay-in panels weighing less than 1 lb per sq.ft., provide hold-down clips spaced 2'-0" o.c. on all cross tees.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, including structural framing and substrates to which acoustical tile ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage and with requirements for installation tolerances and other conditions affecting performance of acoustical tile ceilings.
  - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

### 3.2 PREPARATION

- A. Testing Substrates: Before installing adhesively applied tiles on wet-placed substrates such as cast-in-place concrete or plaster, test and verify that moisture level is below tile manufacturer's recommended limits.
- B. Measure each ceiling area and establish layout of acoustical tiles to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width tiles at borders, and comply with layout shown on reflected ceiling plans.

### 3.3 INSTALLATION, SUSPENDED ACOUSTICAL TILE CEILINGS

- A. General: Install acoustical tile ceilings to comply with ASTM C 636 and seismic design requirements indicated, per manufacturer's written instructions and CISCA's "Ceiling Systems Handbook."

- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of supporting structure or of ceiling suspension system.
  2. Splay hangers only where required to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  3. Splay hangers only where required and, if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, countersplaying, or other equally effective means.
  4. Where width of ducts and other construction within ceiling plenum produces hanger spacings that interfere with location of hangers at spacings required to support standard suspension system members, install supplemental suspension members and hangers in form of trapezes or equivalent devices.
  5. Secure wire hangers to ceiling suspension members and to supports above with a minimum of three tight turns. Connect hangers directly either to structures or to inserts, eye screws, or other devices that are secure and appropriate for substrate and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
  6. Do not support ceilings directly from permanent metal forms or floor deck. Fasten hangers to cast-in-place hanger inserts, postinstalled mechanical or adhesive anchors, or power-actuated fasteners that extend through forms into concrete.
  7. When steel framing does not permit installation of hanger wires at spacing required, install carrying channels or other supplemental support for attachment of hanger wires.
  8. Do not attach hangers to steel deck tabs.
  9. Do not attach hangers to steel roof deck. Attach hangers to structural members.
  10. Space hangers not more than **48 inches** o.c. along each member supported directly from hangers, unless otherwise indicated; provide hangers not more than **8 inches** from ends of each member.
  11. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
- C. Secure bracing wires to ceiling suspension members and to supports with a minimum of four tight turns. Suspend bracing from building's structural members as required for hangers, without attaching to permanent metal forms, steel deck, or steel deck tabs. Fasten bracing wires into concrete with cast-in-place or postinstalled anchors.
- D. Install edge moldings and trim of type indicated at perimeter of acoustical tile ceiling area and where necessary to conceal edges of acoustical tiles.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
  2. Screw attach moldings to substrate at intervals not more than **16 inches** o.c. and not more than **3 inches** from ends, leveling with ceiling suspension system to a tolerance of **1/8 inch in 12 feet**. Miter corners accurately and connect securely.
  3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- E. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- F. Arrange directionally patterned acoustical tiles as follows:
1. Install tiles with pattern running in one direction parallel to long axis of space.

### 3.4 CLEANING

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

**END OF SECTION 09 51 23**





**SECTION 09 91 00 - PAINTING**

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes surface preparation, painting, and finishing of exposed interior and exterior items and surfaces.
  - 1. Surface preparation, priming, and finish coats specified in this Section are in addition to shop-priming and surface treatment specified under other Sections.
  - 2. Paint exposed surfaces whether or not colors are designated in schedules, except where a surface or material is specifically indicated not to be painted or is to remain natural. Where an item or surface is not specifically mentioned, paint the same as similar adjacent materials or surfaces. If color or finish is not designated, the Architect will select from standard colors or finishes available.
    - a. Painting includes field-painting exposed bare and covered pipes and ducts (including color coding), hangers, exposed steel and iron work, and primed metal surfaces of mechanical and electrical equipment.
    - b. Painting includes all exposed metal excepted as noted by this specification as metal surfaces not to be painted.
    - c. In the event of a conflict between this Section and painting requirements in the Mechanical and Electrical Sections of these specifications, the requirements of this Section shall govern. It is the intention of this specification to insure that one painting subcontractor will accomplish all exposed painting work in occupied areas of this project. This does not relieve contractors of responsibility for corrective work required by damages to completed or existing work.
  - 3. Painting is not required on prefinished items, finished metal surfaces, concealed surfaces, operating parts, and labels.
    - a. Prefinished items not to be painted include the following factory-finished components:
      - 1) Acoustical Ceiling Tile
      - 2) Plastic toilet enclosures.
      - 3) Pre-finished wood doors
      - 4) Pre-finished interior architectural woodwork.
      - 5) Architectural laminate-clad casework.
      - 6) Metal lockers
      - 7) Finished mechanical and electrical equipment.
      - 8) Light fixtures.
      - 9) Switchgear.
      - 10) Distribution cabinets.
  - 4. Concealed surfaces include walls or ceilings in the following generally inaccessible spaces:
    - a. Foundation spaces.
    - b. Furred areas.
    - c. Ceiling plenums.
  - 5. Finished metal surfaces not to be painted include:
    - a. Anodized aluminum.
    - b. Stainless steel.

- c. Copper.
6. Operating parts not to be painted include moving parts of operating equipment, such as the following:
  - a. Valve and damper operators.
  - b. Linkages.
  - c. Sensing devices.
  - d. Motor and fan shafts.
7. Labels: Do not paint over Underwriters Laboratories, Factory Mutual or other code-required labels or equipment name, identification, performance rating, or nomenclature plates.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
  1. Division 05 Section "Structural Steel" for shop-priming structural steel.
  2. Division 05 Section "Metal Fabrications" for shop-priming ferrous metal.
- C. Definitions:
  1. General: Standard coating terms defined in ASTM D 16 apply to this Section.
  2. Flat refers to a lusterless or matte finish with a gloss range below 15 when measured at an 85-degree meter.
  3. Eggshell refers to low-sheen finish with a gloss range between 20 and 35 when measured at a 60-degree meter.
  4. Semigloss refers to medium-sheen finish with a gloss range between 35 and 70 when measured at a 60-degree meter.
  5. Full gloss refers to high-sheen finish with a gloss range more than 70 when measured at a 60-degree meter.

### 1.3 SUBMITTALS

- A. General: Submit the following according to Conditions of the Contract and Division 01 Specification Sections.
- B. Product data for each paint system specified, including block fillers and primers.
  1. Provide the manufacturer's technical information including label analysis and instructions for handling, storage, and application of each material proposed for use.
  2. List each material and cross-reference the specific coating, finish system, and application. Identify each material by the manufacturer's catalog number and general classification.
  3. Certification by the manufacturer that products supplied comply with local regulations controlling use of volatile organic compounds (VOCs).
- C. Samples for initial color selection in the form of manufacturer's color charts.
  1. After color selection, the Architect will furnish color chips for surfaces to be coated.
- D. Samples for Verification Purposes: Provide samples of each color and material to be applied, with texture to simulate actual conditions, on representative samples of the actual substrate.
  1. Provide stepped samples, defining each separate coat, including block fillers and primers. Use representative colors when preparing samples for review. Resubmit until required sheen, color, and texture are achieved.
  2. Provide a list of material and application for each coat of each sample. Label each sample as to location and application.
  3. Submit samples on the following substrates for the Architect's review of color and texture only:
    - a. Painted Wood: Provide two 12-inch-square samples of each color and material on hardboard.
    - b. Stained or Natural Wood: Provide two 4-by-8-inch samples of natural and stained wood finish on actual wood surfaces.
    - c. Ferrous Metal: Provide two 4-inch-square samples of flat metal and two 8-inch-long samples of solid metal for each color and finish.

#### 1.4 QUALITY ASSURANCE

- A. **Applicator Qualifications:** Engage an experienced applicator who has completed painting system applications similar in material and extent to those indicated for the Project that have resulted in a construction record of successful in-service performance.
- B. **Single-Source Responsibility:** Provide primers and undercoat paint produced by the same manufacturer as the finish coats.
- C. **Field Samples:** On wall surfaces and other exterior and interior components, duplicate finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface until required sheen, color, and texture are obtained; simulate finished lighting conditions for review of in-place work.
  - 1. Final acceptance of colors will be from job-applied samples.
  - 2. The Architect will select one room or surface to represent surfaces and conditions for each type of coating and substrate to be painted. Apply coatings in this room or surface according to the schedule or as specified.
  - 3. After finishes are accepted, this room or surface will be used to evaluate coating systems of a similar nature.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the job site in the manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
  - 1. Product name or title of material.
  - 2. Product description (generic classification or binder type).
  - 3. Manufacturer's stock number and date of manufacture.
  - 4. Contents by volume, for pigment and vehicle constituents.
  - 5. Thinning instructions.
  - 6. Application instructions.
  - 7. Color name and number.
  - 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F (7 deg C). Maintain containers used in storage in a clean condition, free of foreign materials and residue. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

#### 1.6 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 deg F (10 deg C) and 90 deg F (32 deg C).
- B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 45 deg F (7 deg C) and 95 deg F (35 deg C).
- C. Do not apply paint in snow, rain, fog, or mist; or when the relative humidity exceeds 85 percent; or at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.
  - 1. Painting may continue during inclement weather if surfaces and areas to be painted are enclosed and heated within temperature limits specified by the manufacturer during application and drying periods.

## PART 2 - PRODUCTS

### 2.1 MANUFACTURERS

- A. Manufacturer: Subject to compliance with requirements, provide products of one of the following:
  - 1. Benjamin Moore & Co. (BM).
  - 2. Glidden-"ICI" Paint Stores, Inc. (ICI).
  - 3. M. A. Bruder & Sons, Inc. (MAB).
  - 4. PPG Industries, Inc. (PPG).
  - 5. Sherwin-Williams Company (SW).

### 2.2 PAINT, GENERAL

- A. Material Compatibility: Provide block fillers, primers, finish coat materials, and related materials that are compatible with one another and the substrates indicated under conditions of service and application, as demonstrated by the manufacturer based on testing and field experience.
- B. Material Quality: Provide the manufacturer's best-quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.
  - 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors or materials is not intended to imply that products named are required to be used to the exclusion of equivalent products of other manufacturers. Furnish the manufacturer's material data and certificates of performance for proposed substitutions.
- C. Colors: Provide color selections made by the Architect from the manufacturer's full range of standard colors.

### 2.3 INTERIOR CONCRETE FLOOR SEALER

- A. Sealer: Provide the manufacturer's recommended factory-formulated, water-based clear penetrating silane sealer that are compatible with the concrete floor indicated.
  - 1. Concrete Floor Sealer:
    - a. "Hydrozo 100" (2 coats min) by Sonneborne or approved equal by Tremco or Pecora. 100% silane solution

### 2.4 MASONRY BLOCK FILLER:

- A. Filler Coat Materials: Provide the manufacturer's recommended factory-formulated, latex-type concrete masonry block fillers that are compatible with the finish materials indicated.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. High-Performance Latex Block Filler:
    - a. Glidden - "ICI" Bloxfil 4000-1000 Interior/Exterior Heavy Duty Acrylic block filler applied at dry film thickness of not less than 10 to 14 mils or approved equal by BM, PPG, MAB, or SW.

### 2.5 PRIMERS

- A. Primers: Provide the manufacturer's recommended factory-formulated primers that are compatible with the substrate and finish coats indicated.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Gypsum Drywall Primer: White, interior, latex-based primer.

- a. Glidden - "ICI" 1030-1200 Ultra-hide PVA Primer Sealer.
- b. Sherwin-Williams - ProMar 200 Latex Wall Primer, B28W8200.
- c. Approved equal by BM, MAB, PPG.
2. Ferrous Metal Primers: Alkyd-type primers.
  - a. Glidden - "ICI" 4160-XXXX Devguard Multi-purpose Primer not less than 2 mil thickness.
  - b. Sherwin-Williams- Pro industrial Pro-Cryl Acrylic Metal Primer, B66-310.
  - c. Approved equal by BM, MAB, PPG.
3. Galvanized Metal Primers:
  - a. Glidden - "ICI" 4160-XXXX Devguard Multi-purpose Primer not less than 2 mil thickness.
  - b. Sherwin-Williams- Pro industrial Pro-Cryl Acrylic Metal Primer, B66-310.
  - c. Approved equal by BM, MAB, PPG.

## 2.6 UNDERCOAT MATERIALS

- A. Undercoat Materials: Provide the manufacturer's recommended factory-formulated undercoat materials that are compatible with the substrate and finish coats indicated.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. Glidden - "ICI" 1120-1200 Ultra-Hide undercoater.
  2. Sherwin-Williams- Premium Wall & Wood Primer B28W8111.
  3. Approved equal by BM, MAB, PPG.

## 2.7 EXTERIOR FINISH PAINT MATERIAL

- A. Finish Paint: Provide the manufacturer's recommended factory-formulated finish-coat materials that are compatible with the substrate and undercoats indicated.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. Gloss Enamel: Weather-resistant, high-gloss enamel:
    - a. Glidden - "ICI" 4216-XXXX Devlex Acrylic Enamel.
    - b. Sherwin-Williams- DTM Acrylic Gloss B66 Series.
    - c. Approved equal by BM, MAB, PPG.
- C. Products: Subject to compliance with requirements, provide one of the following:
  1. Latex Systems: Low Sheen Finish for Existing Exterior Metal Building Panels:
    - a. Sherwin-Williams- Pro Industrial Pro-Cryl Primer B66-310 Series & Bond-Plex Waterbased Acrylic B71-200 Series.
    - b. Approved equal by Glidden, BM, MAB, PPG.

## 2.8 INTERIOR FINISH PAINT MATERIAL

- A. Finish Paint: Provide the manufacturer's recommended factory-formulated finish-coat materials that are compatible with the substrate and undercoats indicated.
- B. Products: Subject to compliance with requirements, provide one of the following:
  1. Interior, Semigloss and Satin acrylic latex
    - a. Glidden - "ICI" Ultrahide-1412XXXX Dulux Professional Eggshell interior wall and trim enamel.
    - b. Sherwin-Williams- ProGreen 200 Eg-Shel, B20-600 Series.
    - c. Sherwin-Williams- ProGreen 200 Semi-Gloss, B31-600 Series.
    - d. Approved equal by BM, MAB, PPG.

## 2.9 CHALKBOARD PAINT MATERIAL

- A. Finish Paint: Provide the manufacturer's recommended factory-formulated finish-coat materials that are compatible with the substrate and undercoats indicated. Gypsum substrate shall have a Level 5 Finish.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Interior, Chalkboard Finish – Black
    - a. Flat Finish
      - 1) 1st Coat: S-W Premium Wall & Wood Primer, B28W8111 (4.0 mils wet, 1.3 mils dry)
      - 2) 2nd Coat: Krylon Chalkboard Paint
      - 3) 3rd Coat: Krylon Chalkboard Paint
    - b. Approved equal by ICI, BM, MAB, PPG.
    - c. For best results, allow the painted area to cure for 3 days before using it as a chalkboard. Then, prior to initial use, rub the entire surface with a piece of white chalk.

## 2.10 MISCELLANEOUS WOOD-FINISHING MATERIALS

- A. Wood-Finishing Materials: Provide the manufacturer's recommended factory-formulated, wood-finishing materials that are compatible with the substrate and undercoats indicated.
- B. Products: Subject to compliance with requirements, provide one of the following:
  - 1. Oil-Type Interior Wood Stain: Slow-penetrating, oil-type wood stain.
    - a. Glidden – “ICI” 1700-XXX Woodpride interior solventborne wood finishing stain.
    - b. Sherwin-Williams- WoodClassics 250 VOC Oil Stain, A49-200.
    - c. Approved equal by BM, MAB, PPG.
  - 2. Interior Polyurethane clear satin varnish.
    - a. Glidden - “ICI” 1902-0000 Woodpride interior satin polyurethane varnish
    - b. Sherwin-Williams- WoodClassics Waterborne Polyurethane, A68 Series.
    - c. Approved Equal BM, MAB, PPG.

## PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Examine substrates and conditions under which painting will be performed for compliance with paint application requirements. Surfaces receiving paint must be thoroughly dry before paint is applied.
  - 1. Do not begin to apply paint until unsatisfactory conditions have been corrected.
  - 2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.
- B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.
  - 1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

### 3.2 PREPARATION

- A. General: Remove hardware and hardware accessories, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted, or provide surface-applied protection prior to surface preparation and painting. Remove these items, if necessary, to completely paint the items and adjacent surfaces. Following completion of painting operations in each space or area, have items reinstalled by workers skilled in the trades involved.

- B. **Cleaning:** Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease prior to cleaning. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.
- C. **Surface Preparation:** Clean and prepare surfaces to be painted according to the manufacturer's instructions for each particular substrate condition and as specified.
  - 1. Provide barrier coats over incompatible primers or remove and reprime. Notify Architect in writing about anticipated problems using the specified finish-coat material with substrates primed by others.
  - 2. **Cementitious Materials:** Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen, as required, to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.
  - 3. Use abrasive blast-cleaning methods if recommended by the paint manufacturer.
  - 4. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's printed directions.
  - 5. **Wood:** Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.
    - a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.
    - b. Prime, stain, or seal wood to be painted immediately upon delivery. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, counters, cases, and paneling.
    - c. When transparent finish is required, backprime with spar varnish.
    - d. Backprime paneling on interior partitions where masonry, plaster, or other wet wall construction occurs on backside.
    - e. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately upon delivery.
  - 6. **Ferrous Metals:** Clean ungalvanized ferrous metal surfaces that have not been shop-coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with recommendations of the Steel Structures Painting Council (SSPC).
    - a. Blast steel surfaces clean as recommended by the paint system manufacturer and according to requirements of SSPC specification SSPC-SP 10.
    - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
    - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by the paint manufacturer, and touch up with the same primer as the shop coat.
  - 7. **Galvanized Surfaces:** Clean galvanized surfaces with nonpetroleum-based solvents so that the surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.

### 3.3 PREPARATION OF EXISTING SURFACES

- A. **Existing Painted Gypsum Board:** Touch up all holes, dents, etc with drywall patching components approved by the paint manufacturer for the intended purpose. Scrape all loose paint off. Sand and taper smooth all rough spots and blemishes. Provide same number of finish c
- B. **Existing Ferrous Metals to Remain:** Grind and sand all loose and peeling paint. Sand and feather all edges smooth. Prime bare metal before painting
- C. **Materials Preparation:** Carefully mix and prepare paint materials according to manufacturer's directions.
  - 1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.

2. Stir material before application to produce a mixture of uniform density; stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.
  3. Use only thinners approved by the paint manufacturer and only within recommended limits.
- D. Tinting: Tint each undercoat a lighter shade to facilitate identification of each coat where multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.

### 3.4 APPLICATION

- A. General: Apply paint according to manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
  2. Paint colors, surface treatments, and finishes are indicated in the schedules.
  3. Provide finish coats that are compatible with primers used.
  4. The number of coats and the film thickness required are the same regardless of the application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. Sand between applications where sanding is required to produce a smooth even surface according to the manufacturer's directions.
  5. Apply additional coats if undercoats, stains, or other conditions show through final coat of paint until paint film is of uniform finish, color, and appearance. Give special attention to ensure that surfaces, including edges, corners, crevices, welds, and exposed fasteners, receive a dry film thickness equivalent to that of flat surfaces.
  6. The term exposed surfaces includes areas visible when permanent or built-in fixtures, convactor covers, covers for finned tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
  7. Paint surfaces behind movable equipment and furniture the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
  8. Paint interior surfaces of ducts, where visible through registers or grilles, with a flat, nonspecular black paint.
  9. Paint back sides of access panels and removable or hinged covers to match exposed surfaces.
  10. Finish exterior doors on tops, bottoms, and side edges same as exterior faces. Sand lightly between each succeeding enamel or varnish coat. Omit primer on metal surfaces that have been shop-primed and touch-up painted.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. Allow sufficient time between successive coats to permit proper drying. Do not recoat until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.

### 3.5 PROCEDURES

- A. Apply paints and coatings by brush, roller, spray, or other applicators according to the manufacturer's directions.
1. Brushes: Use brushes best suited for the material applied.
  2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
  3. Spray Equipment: Use airless spray equipment with orifice size as recommended by the manufacturer for the material and texture required.

- B. Minimum Coating Thickness: Apply materials no thinner than the manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- C. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to items exposed in occupied spaces.
  - 1. Mechanical items to be painted include, but are not limited to, the following:
    - a. Piping, pipe hangers, and supports.
    - b. Heat exchangers.
    - c. Tanks.
    - d. Ductwork.
    - e. Insulation.
    - f. Supports.
    - g. Accessory items.
  - 2. Electrical items to be painted include, but are not limited to, the following:
    - a. Conduit and fittings, including hangers.
    - b. Switchgear.
- D. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- E. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime-coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn-through or other defects due to insufficient sealing.
- F. Pigmented (Opaque) Finishes: Completely cover to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.
- G. Transparent (Clear) Finishes: Use multiple coats to produce a glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.
  - 1. Provide satin finish for final coats.
- H. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with specified requirements.

### 3.6 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
- B. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
- C. Testing agency will perform appropriate tests for the following characteristics as required by the Owner:
  - 1. Quantitative materials analysis.
  - 2. Abrasion resistance.
  - 3. Apparent reflectivity.
  - 4. Flexibility.
  - 5. Washability.
  - 6. Absorption.
  - 7. Accelerated weathering.
  - 8. Dry opacity.
  - 9. Accelerated yellowness.
  - 10. Recoating.
  - 11. Skinning.
  - 12. Color retention.
  - 13. Alkali and mildew resistance.
  - 14. If test results show material being used does not comply with specified requirements, the Contractor may be directed to stop painting, remove noncomplying paint, pay for testing, repaint

surfaces coated with rejected paint, and remove rejected paint from previously painted surfaces if, upon repainting with specified paint, the two coatings are incompatible.

### 3.7 CLEANING AND PROTECTION

- A. Cleanup: At the end of each work day, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
  - 1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to scratch or damage adjacent finished surfaces.
- B. Protection:
  - 1. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.
  - 2. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
    - a. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

### 3.8 PAINT SCHEDULE

- A. Exterior Paint Schedule: PT4, PT5
  - 1. General: Provide the following paint systems for the various substrates indicated.
  - 2. Ferrous Metal: Primer is not required on shop-primed items.
    - a. Full-Gloss Enamel: Two finish coats over primer.
      - 1) Primer: Synthetic rust-inhibiting primer.
      - 2) First and Second Coats: Gloss acrylic enamel.
  - 3. Zinc-Coated Metal:
    - a. High-Gloss Enamel: Two finish coats over primer.
      - 1) Primer: Galvanized metal primer.
      - 2) First and Second Coats: Gloss acrylic enamel.
  - 4. Concrete Masonry Units:
    - a. Eggshell Enamel Finish: 2 coats over filled surface with total dry film thickness not less than 3.5 mils, excluding filler coat.
      - 1) Block Filler: High-performance latex block filler.
      - 2) Undercoat: Interior enamel undercoat.
      - 3) Finish Coat: Interior, semigloss enamel.
- B. Interior Paint Schedule: PT1, PT2, PT3,
  - 1. General: Provide the following paint systems for the various substrates, as indicated. Refer to Division 09 Section "Special Coatings" for epoxy coating systems scheduled.
  - 2. Primers: Provide Color-Prime Primers as specified by and required by manufacturer for bold and vivid hue colors.
  - 3. Concrete Masonry Units:
    - a. Eggshell Enamel Finish: 2 coats over filled surface with total dry film thickness not less than 3.5 mils, excluding filler coat.
      - 1) Block Filler: High-performance latex block filler.
      - 2) Undercoat: Interior enamel undercoat.
      - 3) Finish Coat: Interior, semigloss enamel.
  - 4. Gypsum Drywall Systems:
    - a. Odorless Eggshell Enamel Finish: 3 coats with total dry film thickness not less than 2.5 mils.
      - 1) Primer: White, interior, latex-based primer.
      - 2) First and Second Coats: Interior, semigloss, odorless enamel.
  - 5. Ferrous Metal:
    - a. Semigloss Enamel Finish: 2 coats over primer with total dry film thickness not less than 2.5 mils.

- 1) Primer: Synthetic, quick-drying, rust-inhibiting primer.
  - 2) Undercoat: Interior enamel undercoat.
  - 3) Finish Coat: Interior, semigloss, odorless, enamel.
6. Zinc-Coated Metal:
- a. Semigloss Finish: 2 coats over primer, with total dry film thickness not less than 2.5 mils.
    - 1) Primer: Galvanized metal primer.
    - 2) Undercoat: Interior enamel undercoat.
    - 3) Finish Coat: Interior, semigloss, odorless, enamel.
- C. Exposed Structural Ceilings:
1. "Dry Fog" method. Prime galvanized decks and paint as follows
    - a. Glidden-"ICI" 5207 primer and use Glidden-"ICI" Alkyd Eggshell 1180.
    - b. SW ProIndustrial Pro-Cryl Acrylic Metal Primer, B66-310 and use Sherwin-Williams Waterborne Acrylic Dry Fall Eg-Shel, B42W2.
    - c. Approved equal all in strict accordance with manufacturer's installation instructions by BM, MAB, PPG.
- D. Special Note: General
1. Use satin (eggshell) finish in lieu of semigloss in locations approved in the field by the Architect.

**END OF SECTION 09 91 00**



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**SECTION 23 00 00**  
**MECHANICAL ALTERNATES**

**PART 1 GENERAL**

**1.01 LIST OF ALTERNATES**

- A Refer to Division 01 Specification and Bid Form for Alternates.

**END OF SECTION 23 00 00 23 00 00**

**SECTION 23 01 00**  
**HVAC GENERAL PROVISIONS**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A The Contractor shall provide all materials, equipment and labor necessary to install and set into operation the heating and air conditioning equipment as shown on the Engineering Drawings and as contained herein.
- B Intent of the drawings and specifications is to obtain complete systems, tested, adjusted, and ready for operation.
- C Include incidental details not usually indicated or specified, but necessary for proper installation and operation.

**1.02 QUALITY ASSURANCE**

- A Refer to the General and Supplementary General Conditions and Division 01.
- B Check, verify, and coordinate work with drawings and specifications of other trades. Include modifications, relocations, and adjustments necessary to complete work or to avoid interference with other trades.
- C All work shall be in accordance with local, state and federal regulations. Minimum requirements shall be the North Carolina State Building Code.
- D The Contractor shall be responsible for obtaining all permits and shall notify inspection departments as work progresses.
- E Whenever the words "Approval", "Approved", or "Approved Equal" appear, it is intended that items other than the model number specified shall be subject to the approval of the engineer.
- F Where a submitted product has electrical requirements that differ from the Basis of Design specified product, it is the Mechanical Contractor's responsibility to coordinate the electrical requirements of the equipment with the Electrical Engineer and Electrical Contractor at no additional cost to the project.
- G All material and equipment that the Contractor proposed to substitute in lieu of those specified in the Specifications, shall be submitted to the Engineer ten (10) days prior to the bid date for evaluation. The submittal shall include a full description of the material or equipment and all pertinent engineering data required to substantiate the equality of the proposed item to that specified. Items that are submitted for approval after this date will not be accepted.
- H "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- I Boiler Inspection Certificate - It shall be the responsibility of the Contractor to complete the installation of fired or unfired pressure vessels and their safety devices in accordance with the requirements of the latest edition of the North Carolina Department of Labor, "Boiler Inspection Law, Rules and Regulations".
  - 1. The Contractor shall be responsible for notifying the Bureau of Boiler Inspection in writing at least two weeks prior to the date of completion of all equipment requiring inspection. Certificates furnished by the Bureau of Boiler Inspection shall be installed in a frame having a removable glass cover and posted near the pressure vessel. Certificates shall be installed before requesting final inspection of the completed project. The pressure vessel is NOT to be operated before it is inspected and approved.

**1.03 REQUIREMENT OF REGULATORY AGENCIES**

- A Rules and regulations of Federal, State, and local authorities having jurisdiction, and utility companies, in force at time of execution of contract shall become part of this specification.

**1.04 SUBSTITUTIONS**

- A Products are specified for use on this project by one of the following:
  - 1. Reference Standards and Description: Any products meeting the Reference Standards and Description will be acceptable (i.e., piping).
  - 2. Naming of a product as an example to denote the quality standard of the product desired, in which case three or more brands will be denoted (where applicable) to establish equivalent designs. Naming of a product does not restrict Bidders to a specific brand (i.e., fixtures, valves, etc.).

3. Requests for approval of manufacturer's or substitutions which have not been preapproved shall be made by using the forms at the end of this section.
- B During bidding period: Submitted written requests from Bidders Only, using the forms herein, will be considered if received ten (10) calendar days prior to the date of receipt of bids to allow for proper evaluation. Requests from suppliers or subcontractors will not be considered. Substitutions will be considered when a product becomes unavailable through no fault of the Contractor. A request constitutes a representation that the Bidder/Contractor:
1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product and is suitable for use in the Work.
  2. Will provide the same warranty for the substitution as for the specified product.
  3. Will coordinate installation and make changes to other work which may be required for the work to be complete with no additional cost to the Owner.
  4. Waives claims for additional cost or time extension which may subsequently become apparent.
  5. Has included a list of similar projects on which this product has been used with names and telephone numbers for verification.
  6. Has written verification from the product manufacturer that this product has been in use a minimum of two (2) years on a project similar to this work.
  7. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.
- C Architect/Engineer Review
1. Review and approval will rely on manufacturer's literature and other data as outlined herein.
  2. Inadequacies in such submittals that fail to identify unsuitability are the responsibility of the parties making submittal.
- D Substitution Procedure
1. Submit three copies of request for substitution for consideration. Limit each request to one proposed substitution.
  2. Submit shop drawings, product data, and certified test results attesting to the proposed product equivalence.
  3. Submit listing of similar projects.
  4. Submit manufacturer's written verification that product has been in use a minimum of two (2) years at similar projects.
  5. The Architect/Engineer will notify Contractor, in writing, of decision to accept or reject request.
  6. Products bid or incorporated in the work that are not specified and without written approval of the Architect/Engineer may not be acceptable, and if not, the Contractor will be required to furnish and install the products specified.
  7. The Architect/Engineer will issue written approvals of product substitutions to all Bidders. Substitutions are not approved without written approval.
  8. FORMS: Copy forms incorporated at the end of this section and use for all product substitution requests.

**1.05 SUBMITTALS**

- A Refer to General and Supplementary General Conditions and Division 01.
- B For satisfying submittal requirements for Division 23, "Product Data" is usually more appropriate than true "Shop Drawings" as defined in Division 01. However, the term "Shop Drawings" may be used throughout the specifications.
- C Within ten days after notification of the award of the Contract and written notice to begin work, the Contractor shall submit to the Architect/Engineer for approval a detailed list of equipment and material which he proposes to use. Items requiring submittal data for approval will be noted at this time.
- D Mark general catalog sheets and drawings to indicate specific items submitted and their correlation to specific tagged equipment on the drawings. Cross out all nonapplicable or extraneous information that does not apply to the submitted equipment. Circle or otherwise clearly indicate applicable options.

- E Contractor shall clearly indicate deviations (if any) from the project specifications on each submittal. Shop drawings accepted by the Engineer shall not relieve the Contractor of their responsibility to construct the work in accordance with the Contract Documents.
- F Include proper identification of equipment or item by name and/or number, as indicated on the Drawings.
- G Where manufacturer's reference numbers differ from those specified, clearly indicate such on the submittal.
- H Where equipment or items specified include accessories, parts, and additional items under one designation, submittals shall be complete and include all required components.
- I Equipment requiring electrical connections shall include composite wiring diagrams, motor efficiency, and power factor data. Wiring diagrams submitted shall be specific to project conditions.
- J Where submittals cover products containing non-metallic materials, include MSDS sheets from the manufacturer stating physical and chemical properties of components and precautionary steps to be taken.
- K The Contractor shall provide an electronic PDF copy of submittal data. The pdf shall contain complete submittal data on all products, methods, etc. proposed for use on the project.
- L Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number, and all necessary performance and fabrication data.
- M The Contractor shall submit to the Engineer a set of accurately marked up plans indicating all changes encountered during the construction. Final payment will be contingent on receipt of these as-built plans.
- N The Contractor shall furnish an electronic PDF copy of maintenance and operating instructions as outlined in Paragraph C (Execution), of this specification section.
- O The Contractor shall submit to the Owner all certificates required for operating system in compliance with local, state and federal regulations.

**1.06 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
- B The Contractor shall protect all material and equipment from breakage, theft, or weather damage. No material or equipment shall be stored on the ground.
- C The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

**1.07 WORK CONDITIONS AND COORDINATION**

- A The Contractor shall review the electrical plans to establish points of connection and the extent of electrical work to be provided in his Contract. All electrical work shall be performed by a licensed electrical contracting firm.
- B This Contractor shall be responsible for the final electrical connections to all equipment installed as part of his contract.
- C Electrical work shall be in accordance with all local, state and national codes and as specified in Division 26.
- D Where architectural features and elements govern location of work, refer to Architectural drawings prior to fabrication of materials or system components.
- E Refer to the Structural Drawings to become familiar with structural member sizes, framing type and configuration, opening sizes, and other details that could impact the work. Failure to coordinate with the Work of other trades, resulting in relocation of installed work to coordinate with architectural and/or structural elements, shall NOT be allowed as a basis for extra compensation by the contractor.
- F Where piping, ductwork, or other items are indicated to be routed in the webbing of joists or trusses, the mechanical contractor shall confirm with the General Contractor/Construction Manager and steel supplier the final joist/truss profile prior to fabricating or order materials. The actual final joist/truss profile shall be used in the BIM coordination effort.
- G Openings for insulated piping shall be based on the outside diameter of the insulation with continuous insulation through the opening.
- H Seal non-fire rated floor penetrations with non-shrink grout or urethane caulk, as appropriate.
- I Seal non-rated wall openings with urethane caulk.

- J Duct/pipe/conduit penetrations through floor slabs of mechanical platforms or slabs above the bottom floor shall have water stopped curb surrounding the pipe/duct/conduit opening. Coordinate with Construction Manager/General Contractor to confirm openings based on Coordination Drawings.
- K Pipe, conduit and duct chases required for installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.
- L All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be at the Contractor's expense at no extra cost to the Owner.
- M Contractor shall review the complete construction document package and determine, prior to the bid, which portions of the above grade structural slabs are hard rock concrete and/or light weight insulating concrete. Contractor shall review the Structural Engineer's requirements for attachment of loads to slabs, joists, trusses, and other structural members. DO NOT exceed point loads on Structural Engineer's drawings and details. Unistrut and/or other support apparatus required to span multiple joists or beams shall be included in the Contractor's bid. No additional monies will be given for support steel or other components required to support Mechanical piping, duct, equipment, or other items.

**1.08 GUARANTEE**

- A See the General and Supplementary General Conditions
- B Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary contract documents to validate these warranties as required by the manufacturer and present them to the Architect/Engineer.
- C The Contractor shall include in his bid a full warranty and guarantee for a five (5) year period on the compressors for the refrigeration equipment, including all chillers. This warranty does not include labor following the first year's Labor and Material Warranty.

**PART 2 PRODUCT****2.01 GENERAL REQUIREMENTS**

- A Materials and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Materials and equipment found defective shall be removed and replaced at the contractor's expense.
- B The contractor shall provide name plates for identification of all equipment, switches, panels, etc.
- C The name plates shall be laminated phenolic plastic, black front and back with white core, white engraved letters (1/4" minimum) etched into the white core. Name plates shall be fastened with sheet metal screws.

**PART 3 EXECUTION****3.01 INSPECTION**

- A This Contractor shall examine the areas of completed work and shall insure that no defects or errors are present which would result in the poor application or installation of subsequent work.

**3.02 TEMPORARY SERVICES**

- A Refer to Division 01

**3.03 INSTALLATION**

- A All work shall be performed in a manner indicating proficiency in the trade.
- B Contractor may install additional piping, fittings, valves, etc., not indicated on the drawings, for testing purposes or for convenience to facilitate installation of the work. Where such materials are installed, they shall comply with the specifications and shall be sizes to be compatible with system design. Remove such materials when they interfere with design conditions or as directed by the Engineer.
- C Use of access panels in inaccessible ceilings for access to equipment, valves, dampers, etc., is not permitted, unless access panels are indicated on the Architectural reflected ceiling plans. Review any locations where additional access panels may be required with the Architect prior to incorporating into Work.
- D This Contractor shall be responsible for completely cleaning the fireproofing from ALL materials or equipment installed as part of this Contract. This includes, but is not limited to, ductwork, piping, conduit, equipment, faceplates, boxes, disconnects, control panels, and cabling.
- E All conduit, pipes, ducts, etc. shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.

- F Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- G All patching shall be done in such a manner as to restore the areas or surfaces to match existing finishes.
- H The Contractor shall lay out and install his work in advance of pouring concrete floors or walls. He shall furnish all sleeves to the General Contractor for openings through poured masonry floors or walls, above grade, required for passage of all conduits, pipes, or ducts installed by him. The Contractor shall provide all inserts and hangers required to support his equipment.
- I The annular space around ALL wall and floor penetrations shall be properly sealed. For rated assemblies, a UL listed method shall be used. For non-rated wall and floors, the annular space shall be packed with mineral wool, or another suitable non-combustible material, and caulked air tight.
- J Installation of piping and ductwork shall not interfere with walkways or service access.
- K All trapeze hanger rods shall be cut to within 1" of the bottom nut.
- L Provide minimum 1/2" thick closed cell elastomeric foam insulation, applied with adhesive, on lower edges of equipment and mechanical duct and pipe supporting elements suspended less than 7 ft above finished floors, platforms, or roofs.

**3.04 PERFORMANCE**

- A The Contractor shall perform all excavation and backfill operations necessary for installation of his work.

**3.05 ERECTION**

- A All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.

**3.06 FIELD QUALITY CONTROL**

- A The Contractor shall conform to the requirements of Division 3 for concrete testing.
- B All testing required for compliance with the Contract shall be as stated in subsequent sections.

**3.07 ADJUST AND CLEAN**

- A All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
- B Clean piping and ductwork both internally and externally to remove dirt, dust, debris, and other foreign matter. When external surfaces of piping are rusted, clean and restore surface to original condition.
- C Clean all equipment as recommended by the manufacturer.
- D Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for intended service. In no event shall name plates be painted.
- E Dirt, dust, and other foreign matter shall be blown and/or cleaned from coils, terminal devices, diffusers, registers, and grilles. Inspect all coils and comb coil fins where damaged to as-new condition prior to test and balance work.
- F If the Owner has doubts or concerns about the cleanliness of the ductwork or air handling systems, the Owner reserves the right to have a third-party assessment performed by a board certified indoor environmental consultant to determine if the installation meets requirements as stipulated in the National Air Duct Cleaners Association (NADCA) Assessment, Cleaning, and Restoration of HVAC Systems. If duct systems or air handling units are found to have accumulated dirt or foreign matter on interior surfaces in violation of NADCA guidelines, the Contractor shall be responsible for all costs required to restore the air distribution system to new condition to the satisfaction of the Owner. This shall include payment for all costs associated with third party testing of the systems.
- G At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract (in the presence of the Engineer).
- H Equipment with filter media shall be run for a period of two (2) weeks after completion of work at which time a new filter media shall be installed with one change of filter media provided the Owner for future replacement. (Provide a total of three (3) sets).
- I The Contractor shall adjust the tension on all belts six months after the final inspection.

**3.08 TESTING AND BALANCING**

- A Tests for equipment, ductwork, piping, and other systems shall be performed as specified in their respective sections in accordance with technical requirements indicated.

- B Provide equipment and devices required for testing, including fittings for additional openings as required for the test apparatus.
- C All ductwork and piping inspections and testing shall be successfully completed with test reports reviewed and approved by the Engineer before concealment or application of covering materials.
- D Testing shall be witnessed by the Engineer, unless otherwise indicated. Notify Engineer, Owner, Commission Authority, and other parties at least 72 hours in advance of testing date. Engineer, at his discretion, may opt not to witness a given test. In this case, The Construction Manager/General Contractor and/or CxA shall witness the test and forward results to Engineer for review.
- E Contractor shall be responsible for certifying in writing all equipment and system test results. Certification shall include identification of portion of system tested, date, time, weather conditions, test criteria, testing medium, and pressure used, duration of test, and name and title of person signing test certification document. Results shall be submitted to Engineer within three (3) days of test completion.

**3.09 MAINTENANCE AND OPERATING MANUAL**

- A The Contractor shall prepare a PDF version of the manual describing the proper maintenance and system operation. This manual shall not consist of standard factory printed data intended for dimension or design purposes (although these may be included), but shall be prepared to describe this particular job. This manual shall include the following:
  - 1. A check list for periodic maintenance of all equipment.
  - 2. Suggested setting of all controls and switches for normal operation, with description of control and its location.
  - 3. A check list for seasonal shutdown.
  - 4. Maintenance and spare parts data for each major piece of equipment.
  - 5. As-built wiring, interlock and control diagrams for equipment with color coding shown on wiring and interlock diagrams.
  - 6. Air and Water Balance Report.
- B The PDF shall be indexed, bookmarked, dated and signed by the Contractor when completed.
- C The operating and maintenance manuals shall be submitted to the Engineer for approval. When the manuals are considered complete by the Engineer, they will be turned over to the Owner for their permanent use.
- D For each major piece of equipment, the Contractor shall organize and record on video the on-site training sessions. A copy of the video shall be turned over to the Owner at the completion of the project.

**END OF SECTION 23 01 00**

**SECTION 23 05 12**  
**ELECTRICAL WORK**

**PART 1 GENERAL**

**1.01 DIVISION OF WORK**

- A This Contractor shall be responsible for the final electrical and the entire control connections and wiring to all equipment installed as part of his contract.
- B Contractor shall review the electrical plans, where applicable, to establish points of connection and the extent of his electrical work to be provided in his contract.
- C Unless otherwise noted, this Contractor shall wire from his equipment to disconnect switches, junction boxes, or panelboard circuit breakers as provided by the Electrical Contractor or as required by the existing conditions.
- D All power and control wiring shall be in conduits. Refer to electrical specifications for conduit and conduit fittings.
- E All electrical work shall be performed by a licensed electrician.
- F All electrical work shall be in accordance with the State Building Code and all its supplements, the latest edition of the National Electrical Code and the electrical specifications.

**PART 2 PRODUCT**

**2.01 GENERAL REQUIREMENTS**

- A All motor starters, disconnects, switches, relays, conduits, conductors, etc. that are required for a complete electrical power and/or control system shall conform to the requirements set forth by NEC.
- B Refer to the plans for the type, size and electrical characteristics of the starters, disconnects, switches, relays, conductor and conduits.
- C All conductors and conduits shall be sized as noted on the plans or As required per NEC.
- D All individual motor starters for mechanical equipment (i.e., fans, pumps, etc.) shall be furnished and installed under Division 23.
- E All relays, actuators, timers, seven-day clocks, alternators, pressure, vacuum, float, flow, pneumatic-electric, and electric-pneumatic switches, aquastats, freezestats, line and low voltage thermostats, thermals, remote selector switches, remote push-button stations, emergency break-glass stations, interlocking, disconnect switches beyond termination point, and other appurtenances associated with equipment under Division 23 shall be furnished, installed and wired under Division 23.

**PART 3 EXECUTION**

**3.01 GENERAL REQUIREMENTS**

- A All motor starters, disconnects, and switches shall be installed on or as close to the equipment they are serving as possible, or where shown on the plans.
- B Electrical connection to equipment subject to vibration which develops objectionable noises shall be made from the conduit system with short lengths of flexible "Liquid-Tite" conduit. Connection to other equipment shall be made with rigid conduit.
- C Conduits shall be run in a concealed space such as wall cavities, ceiling cavities, etc. except in the mechanical rooms where conduit may be run exposed.

**END OF SECTION 23 05 12 23 05 12**

**SECTION 23 05 13**

**COMMON MOTOR REQUIREMENTS FOR HVAC EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A General construction and requirements.
- B Applications.
- C Single phase electric motors.
- D Three phase electric motors.
- E Electronically Commutated Motors (ECM).

**1.02 REFERENCE STANDARDS**

- A ABMA STD 9 - Load Ratings and Fatigue Life for Ball Bearings 2015 (Reaffirmed 2020).
- B IEEE 112 - IEEE Standard Test Procedure for Polyphase Induction Motors and Generators 2017.
- C NEMA MG 1 - Motors and Generators 2021.
- D NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 SUBMITTALS**

- A Product Data: Provide wiring diagrams with electrical characteristics and connection requirements.
- B Manufacturer's Installation Instructions: Indicate setting, mechanical connections, lubrication, and wiring instructions.
- C Maintenance Data: Include assembly drawings, bearing data including replacement sizes, and lubrication instructions.

**1.04 QUALITY ASSURANCE**

- A Comply with NFPA 70.
- B Provide certificate of compliance from Authority Having Jurisdiction indicating approval of high efficiency motors.
- C Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A Protect motors stored on site from weather and moisture by maintaining factory covers and suitable weather-proof covering. For extended outdoor storage, remove motors from equipment and store separately.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A Baldor Electric Company/ABB Group
- B General Electric
- C Leeson Electric Corporation
- D Marathon
- E Regal-Beloit Corporation (Century)
- F Or Approved Equal

**2.02 GENERAL CONSTRUCTION AND REQUIREMENTS**

- A Electrical Service:
  - 1. Motors 3/4 HP and Smaller: 115 volts, single phase, 60 Hz.
  - 2. Motors Larger than 3/4 Horsepower: 208/480 volts, three phase, 60 Hz as indicated on the Drawings.
- B Nominal Efficiency:
  - 1. All motors shall be premium efficiency and meet or exceed the requirements of ASHRAE Standard 90.1-2013 and the North Carolina Energy Code.
  - 2. All motors shall conform to the efficiency standard for integral horsepower motors known as 10 CFR Part 431 Subpart B published by the US Department of Energy.
- C Construction:
  - 1. Open drip-proof type except where specifically noted otherwise.
  - 2. Design for continuous operation in 104 degrees F environment.

3. Design for temperature rise in accordance with NEMA MG 1 limits for insulation class, service factor, and motor enclosure type.
- D Explosion-Proof Motors: UL approved and labelled for hazard classification, with over temperature protection.
- E Motors driven by variable frequency drives (VFDs) shall be inverter duty and have a shaft grounding ring.
- F Visible Nameplate: Indicating motor horsepower, voltage, phase, cycles, RPM, full load amps, locked rotor amps, frame size, manufacturer's name and model number, service factor, power factor, efficiency.
- G Wiring Terminations:
  1. Provide terminal lugs to match branch circuit conductor quantities, sizes, and materials indicated. Enclose terminal lugs in terminal box sized to NFPA 70, threaded for conduit.
  2. For fractional horsepower motors where connection is made directly, provide threaded conduit connection in end frame.

**2.03 APPLICATIONS**

- A Exception: Motors less than 250 watts, for intermittent service may be the equipment manufacturer's standard and need not comply with these specifications.
- B Motors located in exterior locations, air cooled condensers, humidifiers, direct drive axial fans, and explosion proof environments: Totally enclosed type.

**2.04 SINGLE PHASE POWER - SPLIT PHASE MOTORS**

- A Starting Torque: Less than 150 percent of full load torque.
- B Starting Current: Up to seven times full load current.
- C Breakdown Torque: Approximately 200 percent of full load torque.

**2.05 THREE PHASE POWER - SQUIRREL CAGE MOTORS**

- A Starting Torque: Between 1 and 1-1/2 times full load torque.
- B Starting Current: Six times full load current.
- C Power Output, Locked Rotor Torque, Breakdown or Pull Out Torque: NEMA Design B characteristics.
- D Insulation System: NEMA Class B or better.
- E Testing Procedure: In accordance with IEEE 112. Load test motors to determine free from electrical or mechanical defects in compliance with performance data.
- F Motor Frames: NEMA Standard T-Frames of steel, aluminum, or cast iron with end brackets of cast iron or aluminum with steel inserts.
- G Bearings: Grease lubricated anti-friction ball bearings with housings equipped with plugged provision for relubrication, rated for minimum ABMA STD 9, L-10 life of 20,000 hours. Calculate bearing load with NEMA minimum V-belt pulley with belt center line at end of NEMA standard shaft extension. Stamp bearing sizes on nameplate.
- H Weatherproof Epoxy Sealed Motors: Epoxy seal windings using vacuum and pressure with rotor and starter surfaces protected with epoxy enamel; bearings double shielded with waterproof non-washing grease.
- I Nominal Efficiency: As indicated at full load and rated voltage when tested in accordance with IEEE 112.
- J Nominal Power Factor: As indicated at full load and rated voltage when tested in accordance with IEEE 112.

**2.06 ELECTRONICALLY COMMUTATED MOTORS (ECM)**

- A Applications:
  1. Commercial:
    - a. Roof Top Unit:
      - 1) Operating Mode: Constant speed.
      - 2) Input: Motor manufacturer to coordinate control requirements with the control board of the roof top unit and/or specified sequence of operation.
      - 3) Shaft Extension: Single.
      - 4) RPM: 300 through 1200.
    - b. Power Roof Ventilator (PRV):
      - 1) Operating Mode: Constant cfm.

- 2) Input: Motor manufacturer to coordinate control requirements with the control board of the PRV and/or specified sequence of operation.
- 3) Shaft Extension: Single.
- 4) Options: Remote mount control.
- c. Energy Recovery Ventilator:
  - 1) Operating Mode: Constant cfm.
  - 2) Input: Motor manufacturer to coordinate control requirements with the control board of the energy recovery ventilator and/or specified sequence of operation.
  - 3) Shaft Extension: Single.
  - 4) Options: Remote mount control.
- d. Hydronic Pump:
  - 1) Operating Mode: Constant speed.
  - 2) Input: Motor manufacturer to coordinate control requirements with the control board of the hydronic pump and/or specified sequence of operation.
  - 3) Flange Configuration: "C".

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A Install in accordance with manufacturer's instructions.
- B Install securely on firm foundation. Mount ball bearing motors with shaft in any position.
- C Check line voltage and phase and ensure agreement with nameplate.
- D Motors with belt drives shall have adjustable motor mountings. Motor mounts shall have adjustable locking device for fixing motor position.
- E Motor starters shall be installed as close to the motors they are serving as possible.
- F Motor starters shall be installed at locations and heights to meet all State requirements and National Electric Code.

**END OF SECTION 23 05 13**

**SECTION 23 05 17**  
**SLEEVES AND SLEEVE SEALS FOR HVAC PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Pipe sleeves.
- B Pipe-sleeve seals.

**1.02 REFERENCE STANDARDS**

- A ASTM C592 - Standard Specification for Mineral Fiber Blanket Insulation and Blanket-Type Pipe Insulation (Metal-Mesh Covered) (Industrial Type) 2022a.
- B ASTM E814 - Standard Test Method for Fire Tests of Penetration Firestop Systems 2023a.

**1.03 SUBMITTALS**

- A Shop Drawings: Indicate pipe materials used, jointing methods, supports, floor and wall penetration seals. Indicate installation, layout, weights, mounting and support details, and piping connections.

**1.04 QUALITY ASSURANCE**

- A Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B Clean equipment, pipes, valves, and fittings of grease, metal cuttings, and sludge that may have accumulated from the installation and testing of the system.

**1.05 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.01 PIPE SLEEVES**

- A Non-manufactured sleeves:
  - 1. Cast iron or Schedule 40 steel
- B Vertical Piping:
  - 1. Sleeve Length: 2 inch above finished floor.
  - 2. Provide sealant for watertight joint.
  - 3. Drilled Penetrations: Provide 1-1/2 inch angle ring or square set in silicone adhesive around penetration.
- C Pipe Passing Through Below Grade Foundation Walls or Exterior Walls:
  - 1. Manufactured sleeve-seal system
  - 2. Provide watertight space with link rubber or modular seal between sleeve and pipe on both pipe ends.
- D Non-rated interior stud wall Penetrations:
  - 1. Pack annular space with mineral wool and seal tight with caulk
- E Non-rated interior CMU wall Penetrations:
  - 1. Pack annual space with mineral wool and seal with non-shrink grout.
- F Clearances:
  - 1. Provide allowance for insulated piping.
  - 2. All Rated Openings: Caulked tight with fire stopping material in compliance with ASTM E814 to prevent the spread of fire, smoke, and gases.

**2.02 PIPE-SLEEVE SEALS**

- A Manufacturers:
  - 1. Advance Products & Systems, LLC
  - 2. Flexicraft Industries
  - 3. GPT Industries
  - 4. Or Approved Equal
- B Modular Mechanical Sleeve-Seal:
  - 1. Elastomer-based interlocking links continuously fill annular space between pipe and wall-sleeve, wall or casing opening.
  - 2. Watertight seal between pipe and wall-sleeve, wall or casing opening.

3. Size and select seal component materials in accordance with service requirements.
  4. Service Requirements:
    - a. Corrosion resistant.
    - b. Oil, fuel, gas, and solvent resistant.
    - c. Underground, buried, and wet conditions.
    - d. High Temperature, up to 400 degrees F.
    - e. Low temperature, down to minus 67 degrees F.
  5. Glass-reinforced plastic pressure end plates.
- C Sealing Compounds:
1. Provide packing and sealing compound to fill pipe to sleeve thickness.
  2. Combined packing and seal compound is to match partition fire-resistance hourly rating.

**PART 3 EXECUTION**

**3.01 PREPARATION**

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

**3.02 INSTALLATION**

- A Route piping in orderly manner, plumb and parallel to building structure. Maintain gradient.
- B Install piping to conserve building space, to not interfere with use of space and other work.
- C Install piping and pipe sleeves to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- D Structural Considerations:
1. Do not penetrate building structural members unless approved by the Structural Engineer.
- E Provide sleeves when penetrating footings, floors, and walls. Seal pipe including sleeve penetrations to achieve fire resistance equivalent to fire separation required.
1. Aboveground Piping:
    - a. Pack solid using mineral fiber in compliance with ASTM C592.
    - b. Fill space with an elastomer caulk to a depth of 0.50 inch where penetrations occur between conditioned and unconditioned spaces.
  2. Caulk exterior wall sleeves watertight with lead and oakum or mechanically expandable chloroprene inserts with mastic-sealed components.
- F Manufactured Sleeve-Seal Systems:
1. Install manufactured sleeve-seal systems in sleeves located in grade slabs and exterior walls at piping entrances into building.
  2. Provide sealing elements of the size, quantity, and type required for the piping and sleeve inner diameter or penetration diameter.
  3. Locate piping in center of sleeve or penetration.
  4. Install field assembled sleeve-seal system components in annular space between sleeve and piping.
  5. Tighten bolting for a water-tight seal.
  6. Install in accordance with manufacturer's recommendations.
- G When installing more than one piping system material, ensure system components are compatible and joined to ensure the integrity of the system. Provide necessary joining fittings. Ensure flanges, union, and couplings for servicing are consistently provided.

**3.03 CLEANING**

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

**END OF SECTION 23 05 17**

**SECTION 23 05 53**  
**IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Nameplates.
- B Tags.
- C Stencils.

**1.02 REFERENCE STANDARDS**

- A ASTM D709 - Standard Specification for Laminated Thermosetting Materials 2017.

**1.03 SUBMITTALS**

- A List: Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- B Chart and Schedule: Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C Product Data: Provide manufacturers catalog literature for each product required.
- D Manufacturer's Installation Instructions: Indicate special procedures, and installation.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION APPLICATIONS**

- A Air Handling Units: Nameplates.
- B Air Terminal Units: Nameplates.
- C Automatic Controls: Tags. Key to control schematic.
- D Control Panels: Nameplates.
- E Dampers: Ceiling tacks, where located above lay-in ceiling.
- F Ductwork: Stencilled painting.
- G Heat Transfer Equipment: Nameplates.
- H Instrumentation: Tags.
- I Major Control Components: Nameplates.
- J Piping: Stencilled painting.
- K Relays: Tags.
- L Small-sized Equipment: Tags.
- M Thermostats: Nameplates.
- N Valves: Tags and ceiling tacks where located above lay-in ceiling.

**2.02 NAMEPLATES**

- A Manufacturers:
  - 1. Advanced Graphic Engraving, LLC
  - 2. Brimar Industries, Inc
  - 3. Craftmark Pipe Markers
  - 4. Kolbi Pipe Marker Co
  - 5. Seton Identification Products, a Tricor Direct Company
  - 6. Or Approved Equal
- B Letter Color: Black.
- C Letter Height: 1/4 inch.
- D Background Color: White.
- E Phenolic: Conform to ASTM D709.

**2.03 TAGS**

- A Manufacturers:
  - 1. Advanced Graphic Engraving
  - 2. Brady Corporation
  - 3. Brimar Industries, Inc
  - 4. Craftmark Pipe Markers
  - 5. Kolbi Pipe Marker Co
  - 6. Seton Identification Products, a Tricor Company

7. Or Approved Equal

B Metal Tags: Aluminum with stamped letters; tag size minimum 1-1/2 inch diameter with smooth edges. Use metal tags in return air plenums.

C Valve Tag Chart: Typewritten letter size list in anodized aluminum frame.

**2.04 STENCILS**

A Manufacturers:

1. Brady Corporation
2. Craftmark Pipe Markers
3. Kolbi Pipe Marker Co
4. Seton Identification Products, a Tricor Company
5. Or Approved Equal

B Stencils: With clean cut symbols and letters of following size:

1. 3/4 to 1-1/4 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 1/2 inch high letters.
2. 1-1/2 to 2 inch Outside Diameter of Insulation or Pipe: 8 inch long color field, 3/4 inch high letters.
3. 2-1/2 to 6 inch Outside Diameter of Insulation or Pipe: 12 inch long color field, 1-1/4 inch high letters.
4. 8 to 10 inch Outside Diameter of Insulation or Pipe: 24 inch long color field, 2-1/2 inch high letters.
5. Over 10 inch Outside Diameter of Insulation or Pipe: 32 inch long color field, 3-1/2 inch high letters.
6. Ductwork and Equipment: 2-1/2 inch high letters.
7. Stencil Paint: Semi-gloss enamel, colors conforming to ASME A13.1.

**2.05 CEILING GRID LABELS**

A Label each device or valve above the ceiling and label the ceiling grid below each. Indicate the type of device or valve and its associated service (e.g. “Shutoff Valve – HW”, “VAV-21”).

B Provide custom printed labels for each device, either vinyl or polypropylene, suitable for indoor / outdoor applications. Use portable printer equal to Brady HandiMark Portable Industrial Labeling System.

C Labels shall be no more than 1-inch in height. Lettering shall be minimum 18-point font. Lettering shall be black on white tape.

D Provide a list of devices and valves labeled with the identical information in the O&M Manuals.

E Submit samples of markings on three different devices for approval of the Owner and Engineer.

F Ceiling grid markers shall be the color listed below:

1. Electrical - Pull Box/Disconnects/Future - Neon Red
2. Mechanical Equipment/Fan/Dampers, etc. - Neon Yellow
3. Gas valves/regulators/etc. - Yellow
4. Fire Alarm/Sprinklers/Life Safety - Red

**PART 3 EXECUTION**

**3.01 PREPARATION**

A Degrease and clean surfaces to receive adhesive for identification materials.

**3.02 INSTALLATION**

A Install nameplates with corrosive-resistant mechanical fasteners, or adhesive. Apply with sufficient adhesive to ensure permanent adhesion and seal with clear lacquer.

B Install tags with corrosion resistant chain.

C All piping and duct shall be labeled at least once in EVERY room. Piping and ductwork shall be labeled every 15 ft and at every change of direction.

D All exposed mechanical piping in mechanical rooms, boiler rooms, on and above mezzanine levels, both insulated and uninsulated, shall be color coded with 30 mil PVC jacketing per the following schedule:

1. Fuel Gas Paint piping Yellow
2. Refrigerant Gray

E Install ductwork with stencilled painting. Identify with air handling unit identification number and area served. Identify service (supply, return, exhaust, outside air, etc.) Locate identification at air handling unit, at each side of penetration of structure or enclosure, and at each obstruction.

F Provide ceiling grid labels to locate valves or dampers above lay-in panel ceilings. Locate in corner of panel closest to equipment.

- G Identify control panels, manual motor starters, combination motor starters, disconnects, variable frequency drives, and major control components outside panels with plastic nameplates.
- H Identify thermostats or temperature sensors relating to air handling units or valves with labels.
- I Identify valves in main and branch piping with valve labels.
- J Tag automatic controls, instruments, and relays. Key to control schematic.
- K Identify air handling units with plastic nameplates indicating unit number, area served, OEM and external static pressure, based on actual equipment submittal data, number and size of filters, and number and size of belts (where applicable).
- L Provide ceiling track markers to locate valves or dampers above T-bar type panel ceilings. Locate in corner of panel closest to equipment. Markers shall be installed prior to request for above ceiling inspection.

**3.03 SCHEDULE**

A Standard Color Identification for Mechanical Piping (all labels shall be provided with flow arrows):

- 1. Hot Water Supply/Return    HWS/HWR    Black Lettering
- 2. Fuel Gas Piping                    GAS            Black Lettering/Yellow Background
- 3. Condensate Drain                    COND            Black Lettering
- 4. Refrigerant                            REF            Black Lettering

B Standard Color Identification for Ductwork (all labels shall be provided with flow arrows):

- 1. Supply Air                            SUPPLY            Black Lettering
- 2. Return                                    RETURN            Black Lettering
- 3. Outside Air                            OUTSIDE AIR    Black Lettering
- 4. General Exhaust                    EXHAUST            Black Lettering

**END OF SECTION 23 05 53**

**SECTION 23 05 93**  
**TESTING, ADJUSTING, AND BALANCING FOR HVAC**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Testing, adjustment, and balancing of air systems.
- B Measurement of final operating condition of HVAC systems.

**1.02 REFERENCE STANDARDS**

- A AABC (NSTSB) - AABC National Standards for Total System Balance, 7th Edition 2016.
- B ASHRAE Std 111 - Measurement, Testing, Adjusting, and Balancing of Building HVAC Systems 2008, with Errata (2019).
- C NEBB (TAB) - Procedural Standard for Testing Adjusting and Balancing of Environmental Systems 2019.

**1.03 SUBMITTALS**

- A TAB Plan: Submit a written plan indicating the testing, adjusting, and balancing standard to be followed and the specific approach for each system and component.
  - 1. Submit to Architect.
  - 2. Submit to the Commissioning Authority.
- B Include at least the following in the plan:
  - 1. Indicate standard to be followed (AABC or NEBB)
  - 2. List of all airflow and system capacity and efficiency measurements to be performed and a description of specific test procedures, parameters, formulas to be used.
  - 3. Copy of field checkout sheets and logs to be used, listing each piece of equipment to be tested, adjusted and balanced with the data cells to be gathered for each.
  - 4. Identification and types of measurement instruments to be used and their most recent calibration date.
  - 5. Discussion of what notations and markings will be made on the duct and piping drawings during the process.
  - 6. Final test report forms to be used.
  - 7. Detailed step-by-step procedures for TAB work for each system and issue, including:
    - a. Terminal flow calibration (for each terminal type).
    - b. Diffuser proportioning.
    - c. Branch/submain proportioning.
    - d. Total flow calculations.
    - e. Rechecking.
    - f. Diversity issues.
  - 8. Details of how TOTAL flow will be determined; for example:
    - a. Air: Sum of terminal flows via control system calibrated readings or via hood readings of all terminals, supply (SA) and return air (RA) pitot traverse, SA or RA flow stations.
  - 9. Specific procedures that will ensure that systems are operating at the lowest possible pressures and methods to verify this.
  - 10. Confirmation of understanding of the outside air ventilation criteria under all conditions.
  - 11. Method of verifying and setting minimum outside air flow rate will be verified and set and for what level (total building, zone, etc.).
  - 12. Method of checking building static and exhaust fan and/or relief damper capacity.
  - 13. Methods for making coil or other system plant capacity measurements, if specified.
  - 14. Time schedule for TAB work to be done in phases (by floor, etc.).
  - 15. Description of TAB work for areas to be built out later, if any.
  - 16. Time schedule for deferred or seasonal TAB work, if specified.
  - 17. False loading of systems to complete TAB work, if specified.
  - 18. Exhaust fan balancing and capacity verifications, including any required room pressure differentials.
  - 19. Interstitial cavity differential pressure measurements and calculations, if specified.
  - 20. Procedures for formal deficiency reports, including scope, frequency and distribution.

- C Control System Coordination Reports: Communicate in writing to the controls installer all setpoint and parameter changes made or problems and discrepancies identified during TAB that affect, or could affect, the control system setup and operation.
- D Final Report: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.
  - 1. Revise TAB plan to reflect actual procedures and submit as part of final report.
  - 2. Submit draft copies of report for review prior to final acceptance of Project. Provide final copies for Architect and for inclusion in operating and maintenance manuals.
  - 3. Provide final reports in soft cover, letter size, 3-ring binder manuals, complete with index page and indexing tabs, with cover identification at front and side. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets, and indicating thermostat locations. The Final Report shall be placed in and become a part of the Maintenance and Operations Manuals (4 copies).
  - 4. Include actual instrument list, with manufacturer name, serial number, and date of calibration.
  - 5. Form of Test Reports: Where the TAB standard being followed recommends a report format use that; otherwise, follow ASHRAE Std 111.
  - 6. Units of Measure: Report data in I-P (inch-pound) units only.
  - 7. Include the following on the title page of each report:
    - a. Name of Testing, Adjusting, and Balancing Agency.
    - b. Address of Testing, Adjusting, and Balancing Agency.
    - c. Telephone number of Testing, Adjusting, and Balancing Agency.
    - d. Also include a certification sheet containing the seal and name, address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instruments used for the procedures along with proof of calibration.
- E Project Record Documents: Record actual locations of flow measuring stations and balancing valves and rough setting.

**1.04 QUALITY ASSURANCE**

- A The TAB agency shall be a subcontractor of the General Contractor (or Construction Manager) and shall report directly to and be paid by the General Contractor.
- B The TAB agency shall be either a certified member of AABC or NEBB to perform TAB service for HVAC, water balancing and vibrations and sound testing of equipment. The certification shall be maintained for the entire duration of duties specified herein.
- C Any agency that has been the subject of disciplinary action by either the AABC or NEBB within the five years preceding Contract Award shall not be eligible to perform any work related to the TAB. All work performed in this Section and in other related Sections by the TAB agency shall be considered invalid if the TAB agency loses its certification prior to Contract completion, and the successor agency's review shows unsatisfactory work performed by the predecessor agency.
- D TAB Specialist: The TAB specialist shall be either a member of AABC or an experienced technician of the Agency certified by NEBB. The certification shall be maintained for the entire duration of duties specified herein. If, for any reason, the Specialist loses subject certification during this period, the General Contractor shall immediately notify the Engineer and submit another TAB Specialist for approval. Any individual that has been the subject of disciplinary action by either the AABC or NEBB within the five years preceding Contract Award shall not be eligible to perform any duties related to the HVAC systems, including TAB. All work specified in this Section and in other related Sections performed by the TAB specialist shall be considered invalid if the TAB Specialist loses its certification prior to Contract completion and must be performed by an approved successor.
- E TAB Specialist shall be identified by the General Contractor within 60 days after the notice to proceed. The TAB specialist will be coordinating, scheduling and reporting all TAB work and related activities and will provide necessary information as required by the Resident Engineer. The responsibilities would specifically include:
  - 1. Shall directly supervise all TAB work.

2. Shall sign the TAB reports that bear the seal of the TAB standard. The reports shall be accompanied by report forms and schematic drawings required by the TAB standard, AABC, TABB or NEBB.
  3. Would follow all TAB work through its satisfactory completion.
  4. Shall provide final markings of settings of all HVAC adjustment devices.
  5. Permanently mark location of duct test ports.
  6. Shall document critical paths from the fan or pump. These critical paths are ones in which are 100% open from the fan or pump to the terminal device. This will show the least amount of restriction is being imposed on the system by the TAB firm.
- F All TAB technicians performing actual TAB work shall be experienced and must have done satisfactory work on a minimum of 3 projects comparable in size and complexity to this project. Qualifications must be certified by the TAB agency in writing. The lead technician shall be certified by AABC or NEBB

**1.05 WARRANTY**

- A National Project Performance Guarantee: Provide a guarantee AABC or NEBB will assist in completing requirements of the Contract Documents if TAB firm fails to comply with the Contract Documents. Guarantee includes the following provisions:
1. The certified TAB firm has tested and balanced systems according to the Contract Documents.
  2. Systems are balanced to optimum performance capabilities within design and installation limits.
  3. Warranty Period: Five (5) years.

**PART 2 PRODUCTS**

**2.01 PLUGS**

- A Provide plastic plugs to seal holes drilled in ductwork for test purposes.

**2.02 INSULATION REPAIR MATERIAL**

- A Refer to individual insulation sections for repair of insulation removed or damaged during TAB work.

**PART 3 EXECUTION**

**3.01 GENERAL REQUIREMENTS**

- A Perform total system balance in accordance with one of the following:
1. AABC (NSTSB), AABC National Standards for Total System Balance.
- B Begin work after completion of systems to be tested, adjusted, or balanced and complete work prior to Substantial Completion of the project.
- C Where HVAC systems and/or components interface with life safety systems, including fire and smoke detection, alarm, and control, coordinate scheduling and testing and inspection procedures with the authorities having jurisdiction.
- D TAB Agency Qualifications:
1. Company specializing in the testing, adjusting, and balancing of systems specified in this section.
  2. Having minimum of three years documented experience.
  3. Certified by one of the following:
    - a. AABC, Associated Air Balance Council: [www.aabc.com/#sle](http://www.aabc.com/#sle); upon completion submit AABC National Performance Guaranty.
    - b. NEBB, National Environmental Balancing Bureau: [www.nebb.org/#sle](http://www.nebb.org/#sle).
- E TAB Supervisor and Technician Qualifications: Certified by same organization as TAB agency.
- F For each air handling system, provide a graphical static pressure profile indicating the pressure drop across each component of the air handling unit (filter, coils, dampers, wheel, etc).

**3.02 EXAMINATION**

- A Verify that systems are complete and operable before commencing work. Ensure the following conditions:
1. Systems are started and operating in a safe and normal condition.
  2. Temperature control systems are installed complete and operable.
  3. Proper thermal overload protection is in place for electrical equipment.
  4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
  5. Duct systems are clean of debris.
  6. Fans are rotating correctly.
  7. Fire and volume dampers are in place and open.

- 8. Air coil fins are cleaned and combed.
- 9. Access doors are closed and duct end caps are in place.
- 10. Air outlets are installed and connected.
- 11. Duct system leakage is minimized.

- B Submit field reports. Report defects and deficiencies that will or could prevent proper system balance.
- C Beginning of work means acceptance of existing conditions.

**3.03 PREPARATION**

- A Hold a pre-balancing meeting at least one week prior to starting TAB work.
  - 1. Require attendance by all installers whose work will be tested, adjusted, or balanced.
- B Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
- C Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
- D Compare design to installed equipment and field installations.
- E Walk the system to determine variations of installation from design.
- F Check filters for cleanliness.
- G Lubricate all motors and bearings.

**3.04 ADJUSTMENT TOLERANCES**

A Air Systems Tolerances

Systems - Air	Tolerances of Drawing Design	Remarks
Air Handling Units, Fans (Supply, Return, Exhaust)	-5% to + 10%	Systems with Filters must be tested at dirty conditions
Outdoor Air	100% to 110%	To obtain this accuracy requires ductwork be traversed
Terminal Units	+/- 5%	Calibrate all boxes at minimum of two points. Single point calibration is not acceptable.
Diffusers and Grilles	+/-10%	If design is less than 100 CFM, tolerance can be +/- 10 CFM
Pressurized Rooms - Positive	Supply +100-105% Exhaust or Return 100-95%	Room offset tolerance to design 100% to +110%
Pressurized rooms - Negative	Supply 95% to 100% Exhaust or Return 100% to 105%	Room offset tolerance to design 100% to 105%

**3.05 RECORDING AND ADJUSTING**

- A Field Logs: Maintain written logs including:
  - 1. Running log of events and issues.
  - 2. Discrepancies, deficient or uncompleted work by others.
  - 3. Contract interpretation requests.
  - 4. Lists of completed tests.
- B Ensure recorded data represents actual measured or observed conditions.
- C Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.
- D Apply instrument as recommended by the manufacturer.
- E When averaging values, take a sufficient quantity of readings that will result in a repeatability error of less than 5 percent. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.
- F Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

- G Mark on drawings the locations where traverse and other critical measurements were taken and cross reference the location in the final report.
- H After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.
- I Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.
- J Seal ducts and piping, and test for and repair leaks.
- K Seal insulation to re-establish integrity of vapor barrier.
- L Retest, adjust, and balance systems subsequent to significant system modifications and resubmit test results.

**3.06 AIR SYSTEM PROCEDURE**

- A Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities at site altitude.
- B Test, adjust, and balance the air systems before the hydronic systems.
- C Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.
- D Measure air quantities at air inlets and outlets.
- E Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise. This includes adjusting the deflection of all diffuser and grilles.
- F Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.
- G Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.
- H Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50 percent loading of filters.
  - 1. Artificially load filters by partially blanking to produce static pressure air drop of filter manufacturer's recommended "dirty" pressure drop.
- I Coordinate with Controls Contractor on adjusting static pressure setpoints of VAV systems and differential pressure setpoints of VFD controlled pumps.
- J Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.
- K Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

**3.07 CRITICAL FLOW PATH**

- A Provide a documented critical path for all fluid flows. There shall be at least one terminal device that can be traced back to the fan or pump where there is no damper or valves that are less than 100% open.

**3.08 DEMONSTRATION**

- A Training
  - 1. Train the Owner's maintenance personnel on troubleshooting procedures and testing, adjusting, and balancing procedures. Provide four (4) hours on site training. Review with the Owner's personnel the information contained in the Operating and Maintenance Data specified in Division 1 and Section 23 01 00.
  - 2. Schedule training with the Owner through the Engineer with at least 7 days prior notice.

**3.09 SCOPE**

- A Test, adjust, and balance the following:
  - 1. Packaged Air Conditioning Units.
  - 2. Air Coils.
  - 3. Air Handling Units.
  - 4. Fans.
  - 5. Air Filters.
  - 6. Air Inlets and Outlets.
- B This Section does NOT include:
  - 1. Testing boilers and pressure vessels for compliance with safety codes.
  - 2. Specifications for materials for patching mechanical systems.

3. Specifications for materials and installation of adjusting and balancing; refer to the respective system sections for materials and installation requirements.
4. Requirements and procedures for piping and ductwork systems leakage tests.

**3.10 MINIMUM DATA TO BE REPORTED**

**A Electric Motors:**

1. Manufacturer.
2. Model/Frame.
3. HP/BHP.
4. Phase, voltage, amperage; nameplate, actual, no load.
5. RPM.
6. Service factor.
7. Starter size, rating, heater elements.
8. Sheave Make/Size/Bore.

**B V-Belt Drives:**

1. Identification/location.
2. Required driven RPM.
3. Driven sheave, diameter and RPM.
4. Belt, size and quantity.
5. Motor sheave diameter and RPM.
6. Center to center distance, maximum, minimum, and actual.

**C Combustion Equipment:**

1. Boiler manufacturer.
2. Model number.
3. Firing rate.
4. Gas pressure at meter outlet.
5. Gas flow rate.
6. Heat input.
7. Flue gas temperature at outlet.
8. Ambient temperature.
9. Net stack temperature.
10. Heat output.

**D Air Cooled Condensers:**

1. Identification/number.
2. Location.
3. Manufacturer.
4. Model number.
5. Entering DB air temperature, design and actual.
6. Leaving DB air temperature, design and actual.

**E Cooling Coils:**

1. Identification/number.
2. Location.
3. Manufacturer.
4. Air flow, design and actual.
5. Entering air DB temperature, design and actual.
6. Entering air WB temperature, design and actual.
7. Leaving air DB temperature, design and actual.
8. Leaving air WB temperature, design and actual.
9. Air pressure drop, design and actual.

**F Heating Coils:**

1. Identification/number.
2. Location.

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3. Manufacturer.
  4. Air flow, design and actual.
  5. Water flow, design and actual.
  6. Water pressure drop, design and actual.
  7. Air pressure drop, design and actual.
- G Air Moving Equipment:
1. Location.
  2. Manufacturer.
  3. Model number.
  4. Air flow, specified and actual.
  5. Return air flow, specified and actual.
  6. Outside air flow, specified and actual.
  7. Total static pressure (total external), specified and actual.
  8. Inlet pressure.
  9. Discharge pressure.
  10. Fan RPM.
- H Exhaust Fans:
1. Location.
  2. Manufacturer.
  3. Model number.
  4. Air flow, specified and actual.
  5. Total static pressure (total external), specified and actual.
  6. Inlet pressure.
  7. Discharge pressure.
  8. Fan RPM.
- I Duct Traverses:
1. System zone/branch.
  2. Duct size.
  3. Design air flow.
  4. Test velocity.
  5. Test air flow.
  6. Duct static pressure.
  7. Air temperature.
- J Air Distribution Tests:
1. Air terminal number.
  2. Room number/location.
  3. Terminal type.
  4. Terminal size.
  5. Design air flow.
  6. Test (final) air flow.
  7. Percent of design air flow.

**END OF SECTION 23 05 93**

**SECTION 23 07 13**  
**DUCT INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Duct insulation.
- B Duct liner.
- C Jacketing and accessories.

**1.02 REFERENCE STANDARDS**

- A ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2021a.
- B ASTM C518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus 2021.
- C ASTM C553 - Standard Specification for Mineral Fiber Blanket Thermal Insulation for Commercial and Industrial Applications 2013 (Reapproved 2019).
- D ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation 2014 (Reapproved 2019).
- E ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023b.
- F ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).
- G UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations. Include the following information:
  - 1. Schedule indicating insulation type, thickness, and location for each service
  - 2. Density
  - 3. Compressive Strength
  - 4. "k" value at 75 deg F
  - 5. Nominal "R" value
  - 6. Flame spread rating
- B Manufacturer's Instructions: Indicate installation procedures necessary to ensure acceptable workmanship and that installation standards will be achieved.

**1.04 QUALITY ASSURANCE**

- A Manufacturer Qualifications: Company specializing in manufacturing products of the type specified in this section with not less than three years of documented experience.
- B Applicator Qualifications: Company specializing in performing the type of work specified in this section, documented experience and approved by manufacturer.
- C Before installing insulation, build mockups for each type of insulation and finish listed below to demonstrate quality of insulation application and finishes. Build mockups in the location indicated or, if not indicated, as directed by Owner. Use materials indicated for the completed Work. Mockups shall include piping insulation, ductwork insulation and equipment insulation.
- D All the ductwork and piping in pump rooms, mechanical rooms and equipment rooms including areas without ceilings is to be considered as exposed piping or ductwork. This also includes penthouses, interstitial spaces, and crawl spaces, where applicable.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A Accept materials on site in original factory packaging, labelled with manufacturer's identification, including product density and thickness.
- B Protect insulation from weather and construction traffic, dirt, water, chemical, and mechanical damage, by storing in original wrapping.

**1.06 FIELD CONDITIONS**

- A Maintain ambient temperatures and conditions required by manufacturers of adhesives, mastics, and insulation cements.

- B Maintain temperature during and after installation for minimum period of 24 hours.
- C Insulation shall not be installed until all testing and inspection of pipe, duct, vessel, etc. has been completed and approved by Engineer/Owner's representative.

**PART 2 PRODUCTS**

**2.01 REGULATORY REQUIREMENTS**

- A Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723. These ratings must be as tested on composite of insulation, jacket or facing, and adhesive. Components such as adhesives, mastics, and cements must meet the same individual ratings as minimum requirements.

**2.02 GLASS FIBER, FLEXIBLE**

- A Manufacturer:
  - 1. CertainTeed Corporation
  - 2. Johns Manville
  - 3. Knauf Insulation
  - 4. Owens Corning Corporation
  - 5. Or Approved Equal
- B Insulation: ASTM C553; flexible, noncombustible blanket.
  - 1. K value: 0.36 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 1,200 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent by weight.
- C Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure-sensitive tape.
- D Vapor Barrier Tape:
  - 1. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E Indoor Vapor Barrier Mastic:
  - 1. Manufacturers:
    - a. Childers CP-35
    - b. Harcast Seal-Tack AF
- F Tie Wire: Annealed steel, 16 gauge, 0.0508 inch diameter.

**2.03 GLASS FIBER, RIGID**

- A Manufacturer:
  - 1. CertainTeed Corporation
  - 2. Johns Manville
  - 3. Knauf Insulation
  - 4. Owens Corning Corporation
  - 5. Or Approved Equal
- B Insulation: ASTM C612; rigid, noncombustible blanket.
  - 1. K Value: 0.24 at 75 degrees F, when tested in accordance with ASTM C518.
  - 2. Maximum Service Temperature: 450 degrees F.
  - 3. Maximum Water Vapor Absorption: 5.0 percent.
  - 4. Maximum Density: 8.0 pcf.
- C Vapor Barrier Jacket:
  - 1. Kraft paper with glass fiber yarn and bonded to aluminized film.
  - 2. Moisture Vapor Permeability: 0.02 perm inch, when tested in accordance with ASTM E96/E96M.
  - 3. Secure with pressure-sensitive tape.
- D Vapor Barrier Tape:
  - 1. Manufacturers:
    - a. 3M

- b. Polyguard
- c. Shurtape
- 2. Kraft paper reinforced with glass fiber yarn and bonded to aluminized film, with pressure-sensitive rubber-based adhesive.
- E Protective Coating:
  - 1. Manufacturers:
    - a. Design Polymerics; DP 2510 Water Based, Low VOC, Duct Liner Protective Coating:
- F Indoor Vapor Barrier Finish:
  - 1. Cloth: Untreated; 9 oz/sq yd weight, glass fabric.
  - 2. Vinyl emulsion type acrylic, compatible with insulation, white color.

#### **2.04 JACKETING AND ACCESSORIES**

- A Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.
  - 1. Lagging Adhesive:
    - a. Manufacturers:
      - 1) Design Polymerics; DP 3050 Water Based, Zero VOC, Premium Quality, Lagging Adhesive, and Vapor Retarder
      - 2) Childers CP-35
    - b. Compatible with insulation.
- B Mineral Fiber (Outdoor) Jacket: Asphalt impregnated and coated sheet, 50 lb/square.
- C Aluminum Jacket:
  - 1. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
  - 2. Thickness: 0.016 inch sheet.
  - 3. Finish: Embossed.
  - 4. Joining: Longitudinal slip joints and 2 inch laps.
  - 5. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
  - 6. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

#### **2.05 FIRE BARRIER DUCT WRAP**

- A Two-layer wrap for grease ducts rated as a shaft alternative per ASTM E 2336. Zero clearance to combustible throughout the entire enclosure system.
- B High-temperature fibrous thermal insulation blanket encapsulated in a fiberglass-reinforced aluminized polyester foil. Duct Wrap density shall be nominal 6 pcf and have a nominal 1-1/2" thickness. The fiber blanket shall have a continuous use limit of 1000°C.
- C When installed in two layers, shall meet the criteria of ASTM E 2336 Standard Test Methods for Fire Resistive Grease Duct Enclosure Systems.
- D Smoke Developed Index and Flame Spread Index of the bare blanket, and of the foil encapsulated blanket shall be 0/0 per ASTM E 84. The foil encapsulation shall be bonded to the core blanket material.
- E Manufacturers:
  - 1. 3M Fire Barrier Duct Wrap 615+
  - 2. Unifrax Fyrewrap
  - 3. Or Approved Equal

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A Test ductwork for design pressure prior to applying insulation materials.
- B Verify that surfaces are clean, foreign material removed, and dry.

#### **3.02 INSTALLATION**

- A Install in accordance with manufacturer's instructions.
- B Insulate all supply diffusers and ducted return grilles with 2" R6 Duct Wrap. Cut diffusers so there is a folder 2" lap on all four sides. Tape with FSK tape where insulated flex meets duct insulation so there are no raw edges of fiberglass.

- C Install multiple layers of insulation with longitudinal and end seams staggered.
- D Install insulation with least number of joints practical.
- E Insulated Ducts Conveying Air Below Ambient Temperature:
  - 1. Insulation on all pipes or ducts conveying air or liquids below the ambient temperature is required to have a continuous vapor barrier. On all insulation with a vapor barrier, seal the joints, duct wrap seams, vapor retarder (ASJ) film seams and penetrations in insulation at hangers, supports, anchors, and other projections with a vapor-barrier coating/mastic as specified in the individual insulation sections.
  - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier coating/mastic.
  - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
  - 5. Continue insulation through walls, sleeves, hangers, and other duct penetrations.
- F Ducts Exposed in Mechanical Equipment Rooms or Finished Spaces: Provide rigid fiberglass board insulation and finish with canvas jacket sized for finish painting.
- G Exterior Applications: Provide rigid polyisocyanurate board insulation with vapor barrier jacket. Provide rigid polyiso board insulation and cover with with calked aluminum jacket with seams located on bottom side of horizontal duct section.
- H Duct Wrap Insulation Application:
  - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  - 2. Install without sag on underside of duct. Use adhesive or mechanical fasteners where necessary to prevent sagging. Lift duct off trapeze hangers and insert spacers. Spacers shall be heavy density insulation board material. Refer to MICA 8th edition Plate 3-640.
  - 3. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
  - 4. Stop and point insulation around access doors and damper operators to allow operation without disturbing wrapping.

**3.03 SCHEDULES**

- A All supply, outside air, and return air ductwork shall be completely insulated, unless otherwise noted on the plans. Insulation shall completely cover flexible connections. Insulation shall be minimum 2.5 inch thick or the thickness required to meet the R-values below.
- B All insulation within the building envelope, except in the attic (where applicable), shall have a minimum R-value of 6.0 based on installed thickness. Any insulation wrap or board installed outside the building envelope or in an attic, shall have a minimum R-value of 8.0 based on installed thickness.
- C All exhaust duct associated with any unit having energy recovery (enthalpy wheel, enthalpy plate, run around loop, etc.) shall be insulated to R6.0 inside the building and R8.0 outside the building.
- D Exhaust and Relief Ducts Within 10 ft of Exterior Openings or Building Envelope Penetrations: minimum R-value of 6.0 based on installed thickness.

**END OF SECTION 23 07 13**

**SECTION 23 07 19**  
**HVAC PIPING INSULATION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

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

**1.02 RELATED REQUIREMENTS**

- A Section 07 84 00 - Firestopping.

**1.03 REFERENCE STANDARDS**

- A ASTM B209/B209M - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate 2021a.
- B ASTM C177 - Standard Test Method for Steady-State Heat Flux Measurements and Thermal Transmission Properties by Means of the Guarded-Hot-Plate Apparatus 2019, with Editorial Revision (2023).
- C ASTM C195 - Standard Specification for Mineral Fiber Thermal Insulating Cement 2007 (Reapproved 2019).
- D ASTM C449 - Standard Specification for Mineral Fiber Hydraulic-Setting Thermal Insulating and Finishing Cement 2007 (Reapproved 2019).
- E ASTM C534/C534M - Standard Specification for Preformed Flexible Elastomeric Cellular Thermal Insulation in Sheet and Tubular Form 2023.
- F ASTM C547 - Standard Specification for Mineral Fiber Pipe Insulation 2022a.
- G ASTM C795 - Standard Specification for Thermal Insulation for Use in Contact with Austenitic Stainless Steel 2008 (Reapproved 2023).
- H ASTM C1136 - Standard Specification for Flexible, Low Permeance Vapor Retarders for Thermal Insulation 2023.
- I ASTM C1423 - Standard Guide for Selecting Jacketing Materials for Thermal Insulation 2021.
- J ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023b.
- K ASTM E96/E96M - Standard Test Methods for Gravimetric Determination of Water Vapor Transmission Rate of Materials 2022a, with Editorial Revision (2023).
- L ASTM G153 - Standard Practice for Operating Enclosed Carbon Arc Light Apparatus for Exposure of Nonmetallic Materials 2013 (Reapproved 2021).
- M SAE AMS3779 - Tape, Adhesive, Pressure-Sensitive Thermal Radiation Resistant, Aluminum Coated Glass Cloth 2016b.
- N MICA - Midwest Insulation Contractors Association National Commercial & Industrial Insulation Standards; 8th Edition.
- O UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials Current Edition, Including All Revisions.

**1.04 SUBMITTALS**

- A Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations. Provide the following information:
  - 1. Schedule indicating insulation type, thickness, and location for each service (equipment, duct, and pipe with size).
  - 2. Density
  - 3. Compressive Strength
  - 4. "k" value at 75 deg F
  - 5. Nominal "R" value
  - 6. Mean temperature range
  - 7. Flame spread rating
- B Shop Drawings: Show details for the following:
  - 1. Application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
  - 2. Attachment and covering of heat tracing inside insulation.
  - 3. Insulation application at pipe expansion joints for each type of insulation.

4. Insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Application of field-applied jackets.

- C Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.
- D Provide plates from MICA 8th edition manual for each insulation system on the project as part of the submittals. The plates for each system shall be filled out by the insulating contractor for each product being used.

**1.05 QUALITY ASSURANCE**

- A Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with not less than three years of documented experience.
- B Applicator Qualifications: Company specializing in performing the type of work specified in this section with minimum five years of experience.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A Accept materials on site, labeled with manufacturer's identification, product density, and thickness.
- B Store insulation in original wrapping and protect from weather and construction traffic. Protect insulation against dirt, water, chemical, and mechanical damage.

**1.07 FIELD CONDITIONS**

- A Maintain ambient conditions required by manufacturers of each product.
- B Maintain temperature before, during, and after installation for minimum of 24 hours.
- C Insulation shall not be installed until all testing and inspection of pipe, duct, vessel, etc. has been completed and approved by Engineer/Owner's representative.
- D Replace insulation damaged by either moisture or other means. Insulation which has been wet, whether dried or not, is considered damaged. Make repairs where condensation is caused by improper installation of insulation. Also replace any materials damaged by the condensation.

**PART 2 PRODUCTS**

**2.01 REGULATORY REQUIREMENTS**

- A Surface Burning Characteristics: Flame spread index/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84, UL 723, ASTM E84, or UL 723.

**2.02 GLASS FIBER, RIGID**

- A Manufacturers:
  1. CertainTeed Corporation
  2. Johns Manville Corporation
  3. Knauf Insulation
  4. Owens Corning Corporation
  5. Manson Insulation
  6. Or Approved Equal
- B Insulation: ASTM C547 and ASTM C795; rigid molded, noncombustible.
  1. K Value: ASTM C177, 0.24 at 75 degrees F.
  2. Maximum Service Temperature: 850 degrees F.
  3. Maximum Moisture Absorption: 0.2 percent by volume.
- C Vapor Barrier Jacket: White kraft paper with glass fiber yarn, bonded to aluminized film; moisture vapor transmission when tested in accordance with ASTM E96/E96M of 0.02 perm-inches.
- D Tie Wire: 0.048 inch stainless steel with twisted ends on maximum 12 inch centers.
- E Vapor Barrier Lap Adhesive: Compatible with insulation.
- F Insulating Cement/Mastic: ASTM C195; hydraulic setting on mineral wool.
- G Fibrous Glass Fabric:
  1. Cloth: Untreated; 9 oz/sq yd weight.
  2. Blanket: 1.0 pcf density.
  3. Weave: 5 by 5.
- H Indoor Vapor Barrier Finish:
  1. Cloth: Untreated; 9 oz/sq yd weight.

2. Vinyl emulsion type acrylic, compatible with insulation, white color.

I Outdoor Vapor Barrier Mastic: Vinyl emulsion type acrylic or mastic, compatible with insulation, black color.

J Insulating Cement: ASTM C449.

**2.03 FLEXIBLE ELASTOMERIC CELLULAR INSULATION**

A Manufacturers:

1. Aeroflex USA, Inc
2. Armacell LLC
3. K-Flex USA LLC
4. Or Approved Equal

B Insulation: Preformed flexible elastomeric cellular rubber insulation complying with ASTM C534/C534M Grade 1; use molded tubular material wherever possible.

1. Minimum Service Temperature: Minus 40 degrees F.
2. Maximum Service Temperature: 180 degrees F.
3. Connection: Waterproof vapor barrier adhesive.

C Elastomeric Foam Adhesive: Air dried, contact adhesive, compatible with insulation.

**2.04 JACKETING AND ACCESSORIES**

A Canvas Jacket: UL listed 6 oz/sq yd plain weave cotton fabric treated with dilute fire-retardant lagging adhesive.

1. Lagging Adhesive: Compatible with insulation.
  - a. Manufacturers:
    - 1) Vimasco Corporation:
    - 2) GLT Products

B Aluminum Jacket:

1. Manufacturers:
  - a. Alumaguard.
  - b. ITW.
2. Comply with ASTM B209/B209M, Temper H14, minimum thickness of 0.016 inch with factory-applied polyethylene and kraft paper moisture barrier on the inside surface.
3. Thickness: 0.016 inch sheet.
4. Finish: Embossed.
5. Joining: Longitudinal slip joints and 2 inch laps.
6. Fittings: 0.016 inch thick die-shaped fitting covers with factory-attached protective liner.
7. Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum.

C Reinforced Tape:

1. FSK tape suitable for sealing seams between insulation, insulated pipe bends, and fittings resulting in a tight, smooth surface without wrinkles.
2. Comply with UL 723, ASTM E84.
3. Moisture Vapor Permeability: 0.00 perm inch, when tested in accordance with ASTM E96/E96M.
4. Finish: Match insulation.

D Plain Foil Tape:

1. Aluminum foil with pressure-sensitive adhesive on paper release liner.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

A Test piping for design pressure, liquid tightness, and continuity prior to applying insulation materials.

B Verify that surfaces are clean and dry, with foreign material removed.

**3.02 INSTALLATION**

A Install in accordance with manufacturer's instructions and the MICA manual 8th edition. In cases of conflict, the more stringent instructions shall apply.

B Where existing piping insulation is either removed or damaged during construction, it shall be reinsulated per these specifications.

- C Where insulation thickness exceeds 3 inches, the insulation shall be two layers. Secure first layer before installing the next layer and stagger the joints.
- D Install multiple layers of insulation with longitudinal and end seams staggered.
- E Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- F Install insulation with least number of joints practical.
- G Exposed Piping: Locate insulation and cover seams in least visible locations.
- H Insulated Pipes Conveying Fluids Below Ambient Temperature:
  - 1. Insulate entire system, including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
  - 2. Insulation on all pipes or ducts conveying air or liquids below the ambient temperature is required to have a continuous vapor barrier. On all insulation with a vapor barrier, seal the joints, duct wrap seams, vapor retarder (ASJ) film seams and penetrations in insulation at hangers, supports, anchors, and other projections with a vapor-barrier coating/mastic as specified in the individual insulation sections.
  - 3. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier coating/mastic.
  - 4. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
  - 5. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- I For hot piping conveying fluids over 120 degrees F, insulate flanges and unions at equipment.
- J Glass Fiber Insulated Pipes Conveying Fluids Above Ambient Temperature:
  - 1. Provide standard jackets, with vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.
  - 2. Insulate fittings and joints with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.
- K Inserts and Shields:
  - 1. Shields: Galvanized steel, 20 gauge, one half the circumference of the insulation, and a minimum of 12 inches long, between pipe hangers or pipe hanger rolls and inserts.
  - 2. Insert location: Between support shield and piping and under the finish jacket.
  - 3. Insert Configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
  - 4. Insert Material: Hydrous calcium silicate insulation or other heavy density insulating material suitable for the planned temperature range.
- L Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, see Section 07 84 00.
- M Pipe Exposed in Mechanical Rooms or Finished Spaces: Finish with canvas jacket sized for finish painting. Canvas shall be coated twice with Foster fireproof lagging to ensure specified flame and smoke spread ratings.
- N For refrigerant line sets and condensate piping exposed to view serving wall mounted units, provide lineset cover system. Speedichannel by DiversiTech, Hide-A-Line by DuctlessAire, or equivalent by Inaba Denko.
- O Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Provide with 0.016 inch aluminum rolled jacket. Cover with aluminum jacket with aluminum bands 12 inches on center and at each butt joint located on bottom side of horizontal piping. Fittings shall be covered with two piece factory fabricated "ELL-JACS."
- P All exposed piping surfaces, insulation, supports, etc., shall be painted with two coats of oil base paint. Color shall be selected by the Owner.
- Q Insulation systems shall be installed per the applicable plate from the MICA manual 8th edition:

1. Pre-formed Pipe Insulation Single Layer Construction: Plate 1-100
2. Flexible Foam Insulation: Plate 1-200
3. Field applied Metal Jacketing: Plate 1-400
4. Non-metallic sealed jacketing systems: PVC, etc: Plate 1-510
5. Split Ring Hangers: Plate 1-600
6. Clevis Hanger with High Density Inserts: Plate 1-610
7. Pre-Insulated Pipe Support, Standoff Clamp: Plate 1-640
8. Vapor Stop (Dam) - Pipe: Plate 1-660
9. Refrigerant and Low Temperature: Plate 1-801
10. Traced Piping: Plate 1-900
11. Pre-formed Elbow Insulation: Plate 2-100
12. Mechanical Fitting Field Fabricated: Plate 2-116
13. Pre-formed or Fabricated Tee Insulation: Plate 2-120
14. Field or Factory-Fabricated Valve Insulation: Plate 2-130
15. In-line Flange Insulation Built-up and Beveled: Plate 2-135
16. Flexible Foam Fittings: 90s and 45s: Plate 2-200
17. Flexible Foam Fittings, Ts: 2-220
18. Flexible Foam Ts: Plate 2-225
19. Non-metallic Jackets: Fitting and Valve Insulation Sealed Jacketing Systems: Plate 2-536
20. Vapor Stop (Dam) - Fittings: Plate 2-660
21. Flexible Foam for Low Temperature Equipment: 4-210
22. Vapor Stop (Dam) - Equipment: 4-660

**3.03 SCHEDULE**

**A Condensate**

1. Condensate lines shall be insulated with 1.0 inch thick closed cell insulation. The insulation shall extend from the connection on the unit until it either terminates at a floor drain or other indirect waste receptor, or turns underground.

**B Refrigerant**

1. Refrigerant lines shall be insulated with 1.5 inch thick closed cell elastomeric foam insulation. Both gas and liquid lines should be insulated.

**END OF SECTION 23 07 19**

**SECTION 23 11 23**  
**FACILITY NATURAL-GAS PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Pipe, pipe fittings, valves, and connections for natural gas piping systems.

**1.02 REFERENCE STANDARDS**

- A ANSI Z21.18/CSA 6.3 - Gas Appliance Pressure Regulators 2019.
- B ANSI Z21.80/CSA 6.22 - Line Pressure Regulators 2019.
- C ANSI Z223.1 - National Fuel Gas Code 2021.
- D ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2023.
- E ASME B16.3 - Malleable Iron Threaded Fittings: Classes 150 and 300 2021.
- F ASME B31.1 - Power Piping 2022.
- G ASME B31.9 - Building Services Piping 2020.
- H ASTM A53/A53M - Standard Specification for Pipe, Steel, Black and Hot-Dipped, Zinc-Coated, Welded and Seamless 2022.
- I ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- J ASTM A234/A234M - Standard Specification for Piping Fittings of Wrought Carbon Steel and Alloy Steel for Moderate and High Temperature Service 2023a.
- K AWWA C105/A21.5 - Polyethylene Encasement for Ductile-Iron Pipe Systems 2018.
- L MSS SP-78 - Gray Iron Plug Valves, Flanged and Threaded Ends 2011.
- M MSS SP-110 - Ball Valves Threaded, Socket-Welding, Solder Joint, Grooved and Flared Ends 2010, with Errata .

**1.03 SUBMITTALS**

- A Product Data: Provide data on pipe materials, pipe fittings, valves, and accessories. Provide manufacturers catalog information. Indicate valve data and ratings.
- B Welders' Certificates: Submit certification of welders' compliance with ASME BPVC-IX.
- C Shop Drawings: For non-penetrating rooftop supports, submit detailed layout developed for this project, with design calculations for loadings and spacings.

**1.04 QUALITY ASSURANCE**

- A Perform work in accordance with applicable codes.
- B Valves: Manufacturer's name and pressure rating marked on valve body.
- C Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- D Identify pipe with marking including size, ASTM material classification, and ASTM specification.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A Accept valves on site in shipping containers with labeling in place. Inspect for damage.
- B Provide temporary protective coating on cast iron and steel valves.
- C Provide temporary end caps and closures on piping and fittings. Maintain in place until installation.
- D Protect piping systems from entry of foreign materials by temporary covers, completing sections of the work, and isolating parts of completed system.

**PART 2 PRODUCTS**

**2.01 NATURAL GAS PIPING, BURIED WITHIN 5 FEET OF BUILDING**

- A Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
  - 1. Fittings: ASTM A234/A234M, wrought steel welding type.
  - 2. Joints: ANSI Z223.1, welded.
  - 3. Jacket: AWWA C105/A21.5 polyethylene jacket or double layer, half-lapped 10 mil polyethylene tape.

**2.02 NATURAL GAS PIPING, ABOVE GRADE**

- A Steel Pipe: ASTM A53/A53M, Grade B, Type F, Schedule 40 black.
  - 1. Fittings: ASME B16.3, malleable iron, or ASTM A234/A234M, wrought steel welding type.

2. Joints: Threaded (2 inch and under only) or welded to ASME B31.1.

**2.03 FLANGES, UNIONS, AND COUPLINGS**

- A Unions for Pipe Sizes 2 Inches and Under:
  1. Ferrous pipe: Class 150 malleable iron threaded unions.
- B Flanges for Pipe Size Over 2 Inch:
  1. Ferrous Pipe: Class 150 forged steel slip-on flanges; preformed neoprene gaskets.
- C Dielectric Connections: Union with galvanized or plated steel threaded end, copper solder end, water impervious isolation barrier.

**2.04 PIPE HANGERS AND SUPPORTS**

- A Provide hangers and supports that comply with MSS SP-58.
  1. If type of hanger or support for a particular situation is not indicated, select appropriate type using MSS SP-58 recommendations.
  2. Pipe Hangers for Hot and Chilled Water 6" and smaller: Cooper B3100, Anvil Fig. 260, or equivalent.
  3. Hangers for Hot Pipe 8" and larger: Adjustable steel yoke, cast iron roll, double hanger. Cooper B3110, Anvil Fig. 181, or equivalent.
  4. Riser Clamps: Cooper B3373, Anvil Fig. 40, or equivalent.
  5. Beam Clamps: Cooper B3050, Anvil Fig. 134, or equivalent.
  6. Offset Clamps: Cooper B3148, Anvil Fig. 103, or equivalent.
  7. Ceiling Plate: Cooper B3199, Anvil Fig. 610, or equivalent.
  8. Wall Brackets: Cooper B3067, Anvil Fig. 199, or equivalent.
  9. Rod Ceiling Plate: Cooper, Anvil Fig. 610, or equivalent.
  10. Concrete Inserts: Cooper B2500, Anvil Fig. 95 or equivalent.
  11. Multiple or Trapeze Hangers: Steel channels with welded spacers and hanger rods.
  12. Rooftop Supports for Low-Slope Roofs: Steel pedestals with bases that rest on top of roofing membrane, not requiring any attachment to the roof structure and not penetrating the roofing assembly, with support fixtures as specified; and as follows:
    - a. Bases: High density polypropylene.
    - b. Base Sizes: As required to distribute load sufficiently to prevent indentation of roofing assembly.
    - c. Steel Components: Stainless steel, or carbon steel hot-dip galvanized after fabrication in accordance with ASTM A123/A123M.
    - d. Attachment/Support Fixtures: As recommended by manufacturer, same type as indicated for equivalent indoor hangers and supports; corrosion resistant material.
    - e. Height: Provide minimum clearance of 6 inches under pipe to top of roofing.
    - f. Manufacturers:
      - 1) PHP Systems/Design
      - 2) Caddy
      - 3) Miro

**2.05 BALL VALVES**

- A Manufacturers:
  1. Conbraco Industries, Inc
  2. Grinnell Products, a Tyco Business
  3. Milwaukee Valve Company
  4. Nibco, Inc
  5. Apollo
- B Construction, 4 Inches and Smaller: MSS SP-110, Class 150, 400 psi CWP, bronze or ductile iron body, 304 stainless steel ball, regular port, Teflon seats and stuffing box ring, blow-out proof stem, lever handle, solder or threaded ends with union.

**2.06 PLUG VALVES**

- A Construction 2-1/2 Inches and Larger: MSS SP-78, 175 psi CWP, cast iron body and plug, pressure lubricated, Teflon or Buna N packing, flanged or grooved ends. Provide lever operator with set screw.

**2.07 STRAINERS**

- A Manufacturers:
  - 1. Armstrong International, Inc
  - 2. Green Country Filter Manufacturing
  - 3. WEAMCO
  - 4. Or Approved Equal
- B Size 2 inch and Under:
  - 1. Threaded brass body for 175 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
  - 2. Class 150, threaded bronze body 300 psi CWP, Y pattern with 1/32 inch stainless steel perforated screen.
- C Size 1-1/2 inch to 4 inch:
  - 1. Class 125, flanged iron body, Y pattern with 1/16 inch stainless steel perforated screen.

**2.08 LINE PRESSURE REGULATORS AND APPLIANCE REGULATORS INDICATORS**

- A Manufacturers:
  - 1. Actaris Metering Systems (A brand of ITT Controls)
  - 2. Dungs Combustion Controls
  - 3. Maxitrol Company
  - 4. Pietro Fiorentini
  - 5. Or Approved Equal
- B Compliance Requirements:
  - 1. Appliance Regulator: ANSI Z21.18/CSA 6.3.
  - 2. Line Pressure Regulator: ANSI Z21.80/CSA 6.22.
- C Materials in Contact With Gas:
  - 1. Housing: Aluminum, steel (free of non-ferrous metals).
  - 2. Seals and Diaphragms: NBR-based rubber.
- D Maximum Inlet Operating Pressure: 10 psi.
  - 1. Appliance Regulator: 10 psi.
  - 2. Line Pressure Regulator: 10 psi.
- E Maximum Body Pressure: 10 psi.
- F Output Pressure Range: 1 inch wc to 80 inch wc.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
- B Remove scale and dirt, on inside and outside, before assembly.
- C Prepare piping connections to equipment with flanges or unions.

**3.02 INSTALLATION**

- A Install in accordance with manufacturer's instructions.
- B Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C Route piping in orderly manner and maintain gradient. Route parallel and perpendicular to walls.
- D Install piping to maintain headroom, conserve space, and not interfere with use of space.
- E Group piping whenever practical at common elevations.
- F Provide clearance in hangers and from structure and other equipment for installation of insulation and access to valves and fittings.
- G Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- H Install valves with stems upright or horizontal, not inverted.
- I Pipe vents from gas pressure reducing valves to outdoors and terminate in weather proof hood.
- J Sleeve pipes passing through partitions, walls and floors.
- K Pipe Hangers and Supports:
  - 1. Install in accordance with ASME B31.9.
  - 2. Place hangers within 12 inches of each horizontal elbow.

3. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

**3.03 TESTING**

- A All gas piping systems shall be tested in strict accordance with the National Fire Protection Association's National Fuel Gas Code NFPA54, and the State Building Code.
- B All gas piping system shall be air tested at 50 psi for a period of not less than four (4) hours without loss of pressure. Any leaks that occur shall be repaired and another test started. All joints shall be checked for leaks with a water-soap solution. Where leaks are found, the joint shall be re-made. The piping shall then be put back under pressure and shall hold for four (4) straight hours.

**3.04 APPLICATION**

- A Install unions downstream of valves and at equipment or apparatus connections.
- B Install brass male adapters each side of valves in copper piped system. Solder adapters to pipe.
- C Install ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.

**3.05 SCHEDULES**

- A Pipe Hanger Spacing:
  1. Metal Piping:
    - a. Pipe Size: 1/2 inches to 1-1/4 inches:
      - 1) Maximum Hanger Spacing: 6.5 ft.
      - 2) Hanger Rod Diameter: 3/8 inches.
    - b. Pipe Size: 1-1/2 inches to 2 inches:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 3/8 inch.
    - c. Pipe Size: 2-1/2 inches to 3 inches:
      - 1) Maximum Hanger Spacing: 10 ft.
      - 2) Hanger Rod Diameter: 1/2 inch.
    - d. Pipe Size: 4 inches to 6 inches:
      - 1) Maximum Hanger Spacing: 10 ft.

**END OF SECTION 23 11 23**

**SECTION 23 23 00**  
**REFRIGERANT PIPING**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Piping.
- B Moisture and liquid indicators.
- C Valves.
- D Check valves.
- E Flexible connections.
- F Exterior penetration accessories.

**1.02 REFERENCE STANDARDS**

- A ASME BPVC-IX - Boiler and Pressure Vessel Code, Section IX - Qualification Standard for Welding, Brazing, and Fusing Procedures; Welders; Brazers; and Welding, Brazing, and Fusing Operators 2023.
- B ASME B16.22 - Wrought Copper and Copper Alloy Solder-Joint Pressure Fittings 2021.
- C ASME B31.5 - Refrigeration Piping and Heat Transfer Components 2022.
- D ASME B31.9 - Building Services Piping 2020.
- E AWS A5.8M/A5.8 - Specification for Filler Metals for Brazing and Braze Welding 2019.
- F MSS SP-58 - Pipe Hangers and Supports - Materials, Design, Manufacture, Selection, Application, and Installation 2018, with Amendment (2019).

**1.03 SUBMITTALS**

- A Product Data: Provide general assembly of specialties, including manufacturer's catalogue information. Provide manufacturer's catalog data including load capacity.
- B Shop Drawings: Indicate schematic layout of system, including equipment, critical dimensions, and sizes.
- C Design Data: Submit design data indicating pipe sizing. Indicate load-carrying capacity of trapeze, multiple pipe, and riser support hangers.

**1.04 DELIVERY, STORAGE, AND HANDLING**

- A Deliver and store piping and specialties in shipping containers with labeling in place.
- B Protect piping and specialties from entry of contaminating material by leaving end caps and plugs in place until installation.
- C Dehydrate and charge components such as piping and receivers, seal prior to shipment, until connected into system.

**PART 2 PRODUCTS**

**2.01 SYSTEM DESCRIPTION**

**2.02 REGULATORY REQUIREMENTS**

- A Comply with ASME B31.9 for installation of piping system.
- B Welding Materials and Procedures: Comply with ASME BPVC-IX and applicable state labor regulations.
- C Products Requiring Electrical Connection: Listed and classified by UL, as suitable for the purpose indicated.

**2.03 REFRIGERANT PIPING**

- A Copper Tube: ASTM B280, H58 hard drawn only. Soft annealed copper tube will not be accepted.
  - 1. Fittings: ASME B16.22 wrought copper.
  - 2. Joints: Braze, AWS A5.8M/A5.8 BCuP silver/phosphorus/copper alloy.

**2.04 CONDENSATE PIPING AND EQUIPMENT DRAINS**

- A Copper Tube: ASTM B88 (ASTM B88M), Type L (B), drawn; using one of the following joint types:
  - 1. Solder Joints: ASME B16.18 cast brass/bronze or ASME B16.22 solder wrought copper fittings; ASTM B32 lead-free solder, HB alloy (95-5 tin-antimony) or tin and silver.

**2.05 PIPE SUPPORTS AND ANCHORS:**

- A Provide hangers and supports that comply with MSS SP-58.
- B Pipe Hangers for pipe 6" and smaller: Cooper B3100, Anvil Fig. 260, or equivalent.
- C Riser Clamps: Cooper B3373, Anvil Fig. 40, or equivalent.
- D Beam Clamps: Cooper B3050, Anvil Fig. 134, or equivalent.
- E Offset Clamps: Cooper B3148, Anvil Fig. 103, or equivalent

- F Ceiling Plate: Cooper B3199, Anvil Fig. 610, or equivalent
- G Wall Brackets: Cooper B3067, Anvil Fig. 199, or equivalent.
- H Rod Ceiling Plate: Cooper, Anvil Fig. 610, or equivalent.
- I Concrete Inserts: Cooper B2500, Anvil Fig. 95 or equivalent.
- J Copper Pipe Support: Carbon steel ring, adjustable, copper plated.
- K Hanger Rods: Mild steel threaded both ends, threaded one end, or continuous threaded.

**2.06 MOISTURE AND LIQUID INDICATORS**

- A Manufacturers:
  - 1. Henry Technologies
  - 2. Parker Hannifin/Refrigeration and Air Conditioning
  - 3. Sporlan, a Division of Parker Hannifin
  - 4. Or Approved Equal
- B Indicators: Single port type, UL listed, with copper or brass body, flared or soldered ends, sight glass, color coded paper moisture indicator with removable element cartridge and plastic cap; for maximum temperature of 200 degrees F and maximum working pressure of 500 psi.

**2.07 VALVES**

- A Manufacturers:
  - 1. Hansen Technologies Corporation
  - 2. Henry Technologies
  - 3. Flomatic Valves
  - 4. Or Approved Equal
- B Diaphragm Packless Valves:
  - 1. UL listed, globe or angle pattern, forged brass body and bonnet, phosphor bronze and stainless steel diaphragms, rising stem and handwheel, stainless steel spring, nylon seat disc, soldered or flared ends, with positive backseating; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.
- C Packed Angle Valves:
  - 1. Forged brass or nickel plated forged steel, forged brass seal caps with copper gasket, rising stem and seat with backseating, molded stem packing, soldered or flared ends; for maximum working pressure of 500 psi and maximum temperature of 275 degrees F.
- D Ball Valves:
  - 1. Two piece bolted forged brass body with teflon ball seals and copper tube extensions, brass bonnet and seal cap, chrome plated ball, stem with neoprene ring stem seals; for maximum working pressure of 500 psi and maximum temperature of 300 degrees F.
- E Service Valves:
  - 1. Forged brass body with copper stubs, brass caps, removable valve core, integral ball check valve, flared or soldered ends, for maximum pressure of 500 psi.

**2.08 STRAINERS**

- A Manufacturers:
  - 1. Hansen Technologies Corporation
  - 2. Parker Hannifin/Refrigeration and Air Conditioning
  - 3. Sporlan, a Division of Parker Hannifin
- B Straight Line or Angle Line Type:
  - 1. Brass or steel shell, steel cap and flange, and replaceable cartridge, with screen of stainless steel wire or monel reinforced with brass; for maximum working pressure of 430 psi.

**2.09 CHECK VALVES**

- A Manufacturers:
  - 1. Hansen Technologies Corporation
  - 2. Parker Hannifin/Refrigeration and Air Conditioning
  - 3. Sporlan, a Division of Parker Hannifin
  - 4. Or Approved Equal

5. Substitutions: See Section 01 60 00 - Product Requirements.

**B Globe Type:**

1. Cast bronze or forged brass body, forged brass cap with neoprene seal, brass guide and disc holder, phosphor-bronze or stainless steel spring, teflon seat disc; for maximum temperature of 300 degrees F and maximum working pressure of 425 psi.

**2.10 FLEXIBLE CONNECTORS**

**A Manufacturers:**

1. Circuit Hydraulics, Ltd
2. Flexicraft Industries
3. Penflex
4. Or Approved Equal

**B** Corrugated stainless steel hose with single layer of stainless steel exterior braiding, minimum 9 inches long with copper tube ends; for maximum working pressure of 640 psi.

**2.11 EXTERIOR PENETRATION ACCESSORIES**

**A** Flashing Panels for Exterior Wall Penetrations: Premanufactured components and accessories as required to preserve integrity of building envelope; suitable for conduits and facade materials to be installed.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A** Ream pipe and tube ends. Remove burrs. Bevel plain-end ferrous pipe.
- B** Remove scale and dirt on inside and outside before assembly.
- C** Prepare piping connections to equipment with flanges or unions.

**3.02 INSTALLATION**

- A** Install refrigeration specialties in accordance with manufacturer's instructions.
- B** Space refrigerant piping far enough apart to allow for field installed insulation of thickness specified.
- C** The installation of piping and related items shall be made neatly and in such a manner as not to interfere with access to valves or equipment. Expansion, drainage and maintenance of installed piping shall be possible.
- D** Route piping in orderly manner, with plumbing parallel to building structure, and maintain gradient.
- E** Install piping to conserve building space and avoid interference with use of space.
- F** Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G** Sleeves shall be provided wherever pipes pass through walls, floors and ceilings. Sleeves shall be Schedule 40, black steel, one-half inch in diameter larger than the pipe or insulation on the pipe. Sleeves through walls and ceilings shall be flush. Sleeves through floors shall extend one inch above finished floor. Sleeves through exterior walls shall be caulked and made watertight.
- H** Pipe Hangers and Supports:
  1. Install in accordance with ASME B31.5.
  2. Support horizontal piping as indicated.
  3. Place hangers within 12 inches of each horizontal elbow.
  4. Provide copper plated hangers and supports for copper piping.
- I** Arrange piping to return oil to compressor. Provide traps and loops in piping, and provide double risers as required. Slope horizontal piping 0.40 percent in direction of flow.
- J** Provide clearance for installation of insulation and access to valves and fittings.
- K** Flood piping system with nitrogen when brazing.
- L** Fully charge completed system with refrigerant after testing.

**3.03 FIELD QUALITY CONTROL**

- A** Test refrigeration system in accordance with ASME B31.5.
- B** All refrigerant equipment not tested at the factory shall be shut off from the rest of the system and tested under a vacuum with no evidence of leakage. Piping systems shall be tested after installation, and before any insulation is applied. All controls and other apparatus that may be damaged by the test pressure shall be removed before tests are made.
- C** Refrigerant piping leak testing shall be as follows, unless equipment manufacturer mandates or recommends or more stringent procedure:

1. Connect the refrigerant manifold gauge hoses to the liquid side and gas side service ports on the equipment and connect the center hose to a nitrogen tank fitted with a pressure regulator.
  2. Fill the lines with nitrogen to 590 psi but no more than 595 psi.
  3. Monitor the pressure periodically for a minimum of 24 hours. If the pressure drops, use soapy water to check for leaks. Bubbles will occur if joints are not tight.
  4. Repair leaks. Repeat the previous steps until the pressure remains constant for 24 hours.
  5. Maintain 145 psi of pressure for 15 minutes and check for further leakage. If the pressure drops, check for leaks and repair. Repeat this step until 145 psi of pressure is maintained for 15 minutes.
  6. Remove hoses from service ports.
- D Evacuation Procedure. After performing leak test, use a vacuum pump to triple evacuate the system as described below:
1. Use a vacuum pump with a check valve to prevent pump oil from flowing backward while the vacuum pump is closed. Completely close the liquid-vapor line service valves of the outdoor unit.
  2. Using vacuum-rated hoses, connect the manifold gauges to the liquid and suction (and high pressure, if applicable) gas pipes.
  3. Evacuate the system to 750 microns, hold for 5 minutes, and check for leaks. Repair and repeat as necessary until vacuum holds.
  4. Break the vacuum by applying 10 psi of nitrogen.
  5. Evacuate the system to 500 microns, hold for 5 minutes, and check for leaks. Repair and repeat as necessary until vacuum holds.
  6. Break the vacuum by applying 10 psi of nitrogen.
  7. Evacuate the system to 200 microns. Wait for 15 minutes. A rise of no more than 200 microns is acceptable. If over 400 microns, check for leaks, repair, and repeat.
  8. If under 400 microns, continue holding vacuum for 2.5 hours. If vacuum exceeds 400 microns at end of period, check for leaks, repair, and repeat.
  9. If system holds under 400 microns for 2.5 hours, system is ready for charging.

**3.04 SCHEDULES**

- A Hanger Spacing for Copper Tubing.
1. 1/2 inch, 5/8 inch, and 7/8 inch OD: Maximum span, 5 feet; minimum rod size, 1/4 inch.
  2. 1-1/8 inch OD: Maximum span, 6 feet; minimum rod size, 1/4 inch.
  3. 1-3/8 inch OD: Maximum span, 7 feet; minimum rod size, 3/8 inch.
  4. 1-5/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.
  5. 2-1/8 inch OD: Maximum span, 8 feet; minimum rod size, 3/8 inch.

**END OF SECTION 23 23 00**

**SECTION 23 31 00**  
**HVAC DUCTS AND CASINGS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Metal ducts.
- B Flexible ducts.

**1.02 REFERENCE STANDARDS**

- A ASHRAE (FUND) - ASHRAE Handbook - Fundamentals Most Recent Edition Cited by Referring Code or Reference Standard.
- B ASTM A36/A36M - Standard Specification for Carbon Structural Steel 2019.
- C ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process 2023.
- D ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials 2023b.
- E NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2024.
- F SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2020.
- G SMACNA (LEAK) - HVAC Air Duct Leakage Test Manual 2012.
- H UL 181 - Standard for Factory-Made Air Ducts and Air Connectors Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A Product Data: Provide data for duct materials and duct connections.
- B Shop Drawings: Indicate duct fittings, particulars such as gages, sizes, welds, and configuration prior to start of work for all systems.
  - 1. Clearly indicate which fittings shall be used on the project: elbows, wyes, takeoffs, transitions, offsets, etc.
- C Test Reports: Indicate pressure tests performed. Include date, section tested, test pressure, and leakage rate per appropriate seal class, following SMACNA (LEAK).

**1.04 QUALITY ASSURANCE**

- A Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience, and approved by manufacturer.
- B Galvanizing thickness and country of origin must be clearly stenciled on each duct section. At the discretion of the Engineer, sheet metal gauges and reinforcing may be randomly checked to verify all duct construction is in compliance.
- C Ductwork and fittings must have a computer generated label affixed to each section detailing the duct dimensions, sheet metal gauge, intermediate and joint reinforcement size, and the transverse connector brand and classification.

**1.05 FIELD CONDITIONS**

- A Do not install duct sealants when temperatures are less than those recommended by sealant manufacturers.
- B Maintain temperatures within acceptable range during and after installation of duct sealants.
- C If ductwork is stored on site, elevate duct above floors and maintain protection on ends.

**PART 2 PRODUCTS**

**2.01 GENERAL REQUIREMENTS**

- A Provide UL Class 1 ductwork, fittings, hangers, supports, and appurtenances in accordance with NFPA 90A and SMACNA (DCS) guidelines unless stated otherwise.
- B Duct Shape and Material in accordance with Allowed Static Pressure Range:
  - 1. Round: Plus or minus 2 in-wc of galvanized steel.
- C Duct Sealing and Leakage in accordance with Static Pressure Class:
  - 1. Duct Pressure Class and Material for Common Mechanical Ventilation Applications:
    - a. Supply Air: 2 in-wc pressure class, galvanized steel.
    - b. Return and Relief Air: -2 in-wc pressure class, galvanized steel.
    - c. General Exhaust Air: -2 in-wc pressure class, galvanized steel.
- D Duct Fabrication Requirements:

1. Duct and Fitting Fabrication and Support: SMACNA (DCS) including specifics for continuously welded round and oval duct fittings.
  2. Use reinforced and sealed sheet-metal materials at recommended gauges for indicated operating pressures or pressure class.
  3. Construct tees, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows must be used, provide airfoil turning vanes of perforated metal with glass fiber insulation.
  4. Provide turning vanes of perforated metal with glass fiber insulation when acoustical lining is indicated.
  5. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible; maximum 30 degrees divergence upstream of equipment and 45 degrees convergence downstream.
  6. Provide turning vanes of perforated metal with glass fiber insulation when an acoustical lining is required.
  7. Where ducts are connected to exterior wall louvers and duct outlet is smaller than louver frame, provide blank-out panels sealing louver area around duct. Use same material as duct, painted black on exterior side; seal to louver frame and duct.
- E Duct transverse joints and reinforcement materials, including angle ring flanges and stiffeners, shall be of the same material as the duct.
- F Low Pressure Supply: 2 inch w.g. pressure class, galvanized steel.
- G Return and Relief: -2 inch w.g. pressure class, galvanized steel.
- H General Exhaust: -2 inch w.g. pressure class, galvanized steel.
- I Outside Air Intake: -2 inch w.g. pressure class, galvanized steel.

**2.02 MATERIALS**

- A Galvanized Steel for Ducts: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B "Paint Grip" Finish or Mill Phosphatized Steel (Exposed Ductwork):
1. Galvanized G90 steel shall be put through a phosphate bath and have a layer of Chromate applied and dried leaving it ready to accept paint. This shall be done at the mill. The process produces a dull gray colored finish.
- C Joint Sealers and Sealants: Non-hardening, water resistant, mildew and mold resistant.
1. Manufacturers:
    - a. Childers
    - b. Ductmate
    - c. Durodyne
    - d. Foster
    - e. Hardcast
    - f. McGill Airseal
    - g. Sheet Metal Connectors, Inc.
    - h. Or Approved Equal
  2. Flexible, water-based, adhesive sealant designed for use in all pressure duct systems. After curing, it shall be resistant to ultraviolet light and shall prevent the entry of water, air, and moisture into the duct system. Sealer shall be UL 723 and UL 181B-M listed and meet NFPA requirements for Class 1 ductwork. VOC shall be <75 g/l.
  3. Neoprene gasket must be closed cell rubber based sealing tape and must pass UL 94 HF-1.
  4. Butyl rubber gasket which complies with UL 723, Mil-C 18969B and TTS-S-001657. This material, in addition to the above, shall not contain vegetable oils, fish oils, or any other type vehicle that will support fungal and/or bacterial growth.
  5. Surface Burning Characteristics: Flame spread index of zero and smoke developed index of zero, when tested in accordance with ASTM E84.
- D Hanger Rod: ASTM A36/A36M; steel, galvanized; threaded both ends, threaded one end, or continuously threaded.

E Cable Suspension System:

1. Suspension system shall be Gripple Hang-Fast as manufactured and supplied by Gripple, Inc., or Ductmate "Clutcher" cable hanging system.
2. Suspension system shall be load rated and verified by SMACNA Testing and Research Institute to be in compliance with SMACNA Standards.
3. All suspension systems shall used galvanized hardware.

**2.03 HANGERS AND SUPPORTS**

- A Refer to the Structural Drawings and Details for the limitations and applications of each type of hanger and weight when attaching to bar joists, trusses, or other building Structural elements. The Contractor shall be responsible for providing additional miscellaneous steel, unistrut, and other components to span multiple joists as required by the Structural Drawings to distribute concentrated loads.
- B Unless otherwise indicated, use straps or Z bar hangers with 3/8" rods to support rectangular ducts 48" wide and smaller and trapeze hangers with rods or angles to support rectangular ducts over 48" wide.
1. Use trapeze hangers to support externally insulated ductwork with weight bearing inserts.
- C For round ducts 24" diameter or smaller, use single hanger.
1. Cable Suspension System may be used up to 16" diameter
  2. Round Duct Strap Bracket by Ductmate Industries may be used up to 24" diameter.
- D For round ducts over 24" diameter, use 2 hangers with half round trapeze.
- E For round ducts over 25" diameter or larger, use 2 minimum 3/8" rods with trapeze.
- F The following upper attachments, upper attachment devices, lower hanger attachments, hanger devices, and/or hanger attachments are not allowed except where specifically indicated:
1. Hook or loop.
  2. Nailed pin fasteners.
  3. Expansion nails without washers.
  4. Powder charged or mechanically driven fasteners (forced entry anchors).
  5. Beam or "C" clamps without retaining clips or friction clamps (provide retaining clips for "C" clamps).
  7. Friction clamps for ductwork over 12".
  8. Non-factory manufactured upper attachments for metal pan deck including wire coil and double circle (Items 16 and 17 of Fig 4-3 of SMACNA HVAC Duct Construction Standards 95).
  9. Wire hanger.
  10. Trapeze hangers supported by wires or straps.
  11. Rods, straps or welded studs directly attached to metal deck.
  12. Drilled hole with attachment to structural steel.
  13. Lag screw expansion anchor.
  14. Rivets.
- G Supporting devices shall be standard products of manufacturers having published load ratings.
- H Unless drawings indicate the required framing, provide angle iron framing around roof opening where duct penetrates through roof decking, to maintain roof decking structural integrity in accordance with roof decking manufacturer's recommendations. This is not required for concrete decking. For concrete decking, consult with Structural Engineer for location and size of opening prior to execution of Work.
- I For welded ducts, soldered ducts or ducts with water tight joints, do not use supports utilizing screws or other penetrations into ductwork.
- J All hangers and supports shall be fully galvanized.

**2.04 METAL DUCTS**

- A Material Requirements:
1. Galvanized Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M FS Type B, with G90/Z275 coating.
- B Spiral Ducts: Round spiral lockseam duct with galvanized steel outer wall.
1. Manufacture in accordance with SMACNA (DCS).
  2. Manufacturers:

- a. EHG, a DMI Company
- b. GSI, a DMI Company
- c. Linx Industries, Inc, a DMI Company
- d. MKT Metal Manufacturing
- e. Or Approved Equal

## **2.05 NON-METAL DUCTS**

- A Flexible Ducts: UL 181, Class 0, interlocking spiral of aluminum foil.
1. Insulation: Fiberglass insulation with polyethylene vapor barrier film.
  2. Pressure Rating: 8 inches wg positive or negative.
  3. Maximum Velocity: 5000 fpm.
  4. Temperature Range: Minus 20 degrees F to 250 degrees F.
  5. Insulation: R6.0
    - a. Insulation material shall not be exposed to airstream.
  6. Manufacturers:
    - a. Lindab
    - b. Flexmaster
    - c. Clevaflex
    - d. Thermaflex
    - e. Or Approved Equal

## **2.06 LONGITUDINAL SEAM:**

- A Rectangular Duct:
1. Unless otherwise indicated, use Pittsburgh lock seam construction.
  2. Seal longitudinal seams with approved sealant or provide pre-sealed from factory with encapsulated mastic.
  3. Button punch snap lock construction (SMACNA L-2) is not allowed except for ductwork that is both low pressure (2" WG or lower pressure class) and 18" and smaller duct width.
  4. Button punch snap lock construction is not allowed for ductwork in chases and areas above inaccessible ceilings.
  5. Button punch snaplock construction is not allowed on exhaust ductwork or aluminum ductwork
- B Round and Oval Duct
1. Unless otherwise indicated, longitudinal seams shall be in accordance with SMACNA HVAC Duct Construction Standards with the following exceptions:
    - a. Snaplock seams are not allowed.
    - b. SMACNA seam types RL-3, 6A, 6B, 7, and 8 shown in Figure 3-2 are not allowed, except for 2" w.g. class round ducts 16" or less in diameter.

## **2.07 RECTANGULAR TRANSVERSE JOINT CONNECTORS:**

- A Slide-on Transverse Joint Connectors:
1. Duct constructed using engineered slide-on connector systems must be submitted and conform to manufacturer's published duct construction standards and guidelines for joint classification, sheet metal gauge, intermediate and joint reinforcement size and spacing, unless otherwise specified.
  2. Manufacturer of engineered connector system must have certified independent performance testing for leakage, deflection and seismic stability.
  3. All components of the engineered system must be clearly embossed with the manufacturer's name, model number or identifying marking.
  4. Butyl rubber gasket must be applied per the manufacturer's instructions on all connections except for breakaway connections. Closed Cell Neoprene gasket must be applied per the manufacturer's instructions on all breakaway connections. No substitution of connector system components or gaskets is permitted.
  5. All duct installed using engineered connectors must adhere to the manufacturer's published assembly and installation guidelines for all standard, breakaway, roof-top or specialty connections unless otherwise specified.

**B Formed-on Flanges:**

1. Lockformers TDC or Engles TDF may be used in accordance with T-25 flanges of SMACNA HVAC Duct Construction Standards, provided that corner pieces with bolts are used. If TDF/TDC flanges are damaged, replace the damaged joint(s) by straightening and reinforcing with minimum 1-1/2 x 1-1/2 x 1/4 angle at each side of transverse joint

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A Install, support, and seal ducts in accordance with SMACNA (DCS).
- B During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering the ductwork system.
- C Install ductwork parallel to building walls and ceilings and at such heights not to obstruct any portion of window, doorway, stairway, or passageway. Install ductwork to allow adequate access and service space for equipment and access clearances for cable tray/j-hooks. Refer to drawings and/or manufacturer's recommendations. Install vertical ductwork plumb. Make allowances for beams, pipes or other obstructions in building construction and for work of other contractors. Check plans showing work of other trades and consult with Engineer in event of any interference.
- D Where interferences develop in the field, offset or reroute ductwork as required to clear such interferences. Do not divide duct and do not route any other utilities such as piping or conduit through duct. In all cases, consult drawings for exact location of space allocated for duct, ceiling heights, door and window openings, or other architectural details before fabricating or installing duct. Consult Designer where conflicts arise between ductwork and other utilities which cannot be resolved by relocating duct.
- E Where offsets in ductwork are required, contractor to use standard 30, 45 or 90-degree elbows. Where space constraints do not allow for the use of standard elbows for offsets, use of angled offsets as depicted by SMACNA Figure 2-7 (Angled Offset Type 1) may be used with maximum angle of offset not to exceed 15 degrees maximum. Offsets Type 2 and 3 in SMACNA Figure 2-7 shall not be allowed.
- F Rectangular Duct Elbows:
  1. Rectangular Duct: Unless specific type is indicated, provide radius elbows with splitter vanes with minimum centerline radius to width or diameter ratio of 1.5
    - a. 1.5 radius elbows with full splitter vanes as follows:
      - 1) One vane for duct width 2-12"
      - 2) Two vanes for duct width 13-20"
      - 3) Three vanes for duct width 21"-36"
      - 4) Four vanes for duct width 38" and larger
      - 5) Fabricate vanes in accordance with SMACNA.
    - b. Rectangular throat elbows with turning vanes where 1.5 radius elbows do not fit.
    - c. Rectangular throat/radius heel elbows or rectangular elbows without turning vanes shall not be used.
- G Round and Oval Duct Elbows:
  1. Unless specific type is indicated, use radius elbows with centerline radius to diameter ratio of 1.5. ONLY where 1.5 radius elbows do not fit, 1.0 radius elbows may be used if approved by the Engineer.
- H Construct ductwork so that interior surfaces are smooth. Internal duct hangers and internal bracing are not allowed. Refer to above for internal tie rods.
- I Support coils, filters, air terminals, dampers, sound attenuating devices, or other devices installed in duct systems with angles or channels and make all connections to such equipment including equipment furnished by others. Secure frames with gaskets, nuts, bolts and washers.
- J Flexible ducts shall not exceed 5 feet in length. Bends, kinks, and sagging of flexible duct will not be accepted. The maximum permitted sag is 1/2" per foot of support spacing.
- K Install outside air intake duct to pitch down at minimum 1" per 20 ft toward intake louver or plenum and to drain to outside of building. Solder or seal seams to form watertight joints.
- L Install exhaust air duct to pitch down at minimum 1" per 20 ft toward exhaust louver.

- M Where 2 different metal ducts meet, install joint in such a manner that metal ducts do not contact each other by using proper gasket seal or compound.
- N Flexible Ducts: Connect to metal ducts with adhesive plus sheet metal screws.
  - 1. Flexible ducts are not allowed for special exhaust systems, such as laboratory exhaust, vehicle exhaust, etc.
  - 2. Splicing of flexible duct will not be allowed.
  - 3. Flexible ducts shall not pass through any partition, wall, floor, or ceiling.
- O Duct sizes indicated are precise inside dimensions. For lined ducts, maintain sizes inside lining.
- P Provide openings in ductwork as indicated to accommodate thermometers and controllers. Provide pilot tube openings as indicated for testing of systems, complete with metal can with spring device or screw to insure against air leakage. For openings, insulate ductwork and install insulation material inside a metal ring.
- Q Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- R All exposed ductwork to be painted shall be mill bonderized or "paint grip." The contractor shall thoroughly clean all ductwork surfaces to be free from oils, grease, lubricants, and other contaminants prior to application of paint. Follow
- S Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized steel primer.
- T Use double nuts and lock washers on threaded rod supports.
- U At exterior wall louvers, seal duct to louver frame and install blank-out panels.
- V All trapeze hanger rods shall be cut to within 1" of the bottom nut.

**END OF SECTION 23 31 00**

**SECTION 23 33 00**  
**AIR DUCT ACCESSORIES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Backdraft dampers - metal.
- B Duct access doors.
- C Duct test holes.
- D Fire dampers.
- E Flexible duct connectors.
- F Volume control dampers.
- G Miscellaneous products:
  - 1. Internal strut end plugs.
  - 2. Duct opening closure film.

**1.02 REFERENCE STANDARDS**

- A NFPA 90A - Standard for the Installation of Air-Conditioning and Ventilating Systems 2024.
- B NFPA 92 - Standard for Smoke Control Systems 2021, with Amendment.
- C SMACNA (DCS) - HVAC Duct Construction Standards Metal and Flexible 2020.
- D UL 33 - Safety Heat Responsive Links for Fire-Protection Service Current Edition, Including All Revisions.
- E UL 555 - Standard for Fire Dampers Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A Product Data: Provide for shop fabricated assemblies including volume control dampers. Include electrical characteristics and connection requirements.
- B Manufacturer's Installation Instructions: Provide instructions for fire dampers and combination fire and smoke dampers.
- C Project Record Drawings: Record actual locations of access doors and test holes.
- D Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. Extra Fusible Links: One of each type and size.

**1.04 QUALITY ASSURANCE**

- A Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum five years of documented experience.
- B Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- C All dampers shall be certified to bear the AMCA Certified Ratings Program seal for Air Performance, Efficiency, and Air Leakage.

**1.05 DELIVERY, STORAGE, AND HANDLING**

- A Protect dampers from damage to operating linkages and blades.
- B Storage: Store materials in a dry area indoor, protected from physical damage and in accordance with manufacturer's instructions.

**PART 2 PRODUCTS**

**2.01 AIR TURNING DEVICES/EXTRACTORS**

- A Manufacturers:
  - 1. Carlisle HVAC Products
  - 2. Elgen Manufacturing, Inc
  - 3. Ruskin Company
  - 4. Titus HVAC, a brand of Johnson Controls
  - 5. Ward Industries, a brand of Hart and Cooley, Inc
  - 6. Or Approved Equal
- B Multi-blade device with blades aligned in short dimension; steel construction; with individually adjustable blades, mounting straps.

**2.02 BACKDRAFT DAMPERS - METAL**

- A Manufacturers:

1. Nailor Industries, Inc
2. Ruskin Company, a brand of Johnson Controls
3. United Enertech
4. Greenheck
5. Arrow
6. Or Approved Equal

- B Frames shall be flanged, a minimum of 3 inches wide, and a minimum of 20 gauge roll formed galvanized steel or 0.125 inch extruded aluminum with pre-punched mounting holes and welded corner clips for maximum rigidity.
- C Blades shall be single piece, with a maximum width of 6 inches, counter balanced, and shall be constructed of minimum 26 gauge roll formed galvanized steel or 0.070 inch extruded aluminum. Blade ends shall overlap for maximum weather protection.
- D Blade seals shall be extruded vinyl and mechanically attached to blade edge.
- E Bearings shall be corrosion resistant synthetic.
- F Linkages shall use a galvanized tie bar with stainless steel pivot pins.
- G Axles shall be stainless steel.
- H Mounting shall be suitable for the required orientation.

**2.03 DUCT AIR TURNING VANES**

- A Provide factory manufactured turning vanes in each elbow where inside radius is less than the width of the duct, and in all square or rectangular elbows.
- B Turning vane assemblies shall be adequately supported and affixed to prevent rattling, breakaway, and shall not deform. Assemblies longer than 12 inches shall be double wall.
- C Turning vanes in negative pressure ductwork with pressure rating above 2 inches shall be installed in accordance with SMACNA Industrial Duct Construction Standard.
- D Turning vanes shall match the duct material construction.
- E Rectangular Throat Elbow Truning Vanes (Vane Runner Length up to 18" and Vane Length up to 36")
1. Provide single blade type vanes having 2" radius and 1-1/2" spacing, 24 gauge minimum. Construct vanes in accordance with SMACNA HVAC Duct Construction Standards.
  2. If duct size changes in mitered elbow, use single blade type vanes with trailing edge extension.
- F Rectangular Throat Elbow Truning Vanes (Vane Runner Length up to 18" and Vane Length up to 36"):
1. Use double wall airfoil type with smoothly-rounded entry nose and extended trailing edge on 2.4" center spacing.
  2. Vanes shall be equal to HEP (High Efficiency Profile) vanes as manufactured by Aero/Dyne Co.
- G Radius Elbow Splitter Vanes:
1. Splitter vanes for radius elbows shall be extended entire length of fitting and constructed in accordance with SMACNA HVAC Duct Construction Standards.
- H Manufacturers:
1. Aero Dyne
  2. Ductmate, Inc.
  3. Sheet Metal Connectors, Inc.
  4. Duro-Dyne
  5. DynAir Inc.
  6. Or Approved Equal

**2.04 WIRE MESH SCREENS**

- A Screen assemblies shall be removable.
- B Mesh: 1/2 inch square pattern, 1/16 inch galvanized wire, interwoven, welded at wire intersections and to the frame to prevent rattles.
- C Frames: Minimum of 1 inch by 1 inch by 1/8 inch galvanized steel angles for duct sizes through 24 inches, 1-1/2 inch by 1-1/2 inch by 3/16 inch for duct sizes between 25 inches and 48 inches, and 2 inches by 2 inches for ducts larger than 48 inches continuous around perimeter of screen. Provide intermediate supports to limit screen deflection to 1/16 inch at maximum design airflow.

**2.05 FLEXIBLE DUCT 90° ELBOW SUPPORT**

- A Manufacturers:
  - 1. Build Right Products
  - 2. Hart and Cooley
  - 3. Thermaflex
  - 4. Or Approved Equal
- B Pre-manufactured support to form any brand flexible duct into a smooth 90 degree elbow.
  - 1. One size shall fit 4" to 16" flexible ducts
  - 2. No additional tools shall be required for installation
  - 3. UL listed for use in Return Air Plenums

**2.06 DUCT ACCESS DOORS**

- A Manufacturers:
  - 1. Acudor Products Inc, a Division of Nelson Industrial Inc
  - 2. Ductmate Industries, Inc, a DMI Company
  - 3. Durodyne
  - 4. Elgen Manufacturing
  - 5. MKT Metal Manufacturing
  - 6. Nailor Industries Inc
  - 7. Ruskin Company
  - 8. SEMCO LLC
  - 9. Or Approved Equal
- B Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ducts, install minimum 1 inch thick insulation with sheet metal cover.
  - 1. Up to 18 inches Square: Provide two hinges and two sash locks.
  - 2. Up to 24 by 48 inches: Three hinges and two compression latches with outside and inside handles.
- C Access doors with sheet metal screw fasteners are not acceptable.
- D Provide access doors of adequate size to allow easy access to the equipment that will require maintenance. Provide insulated or acoustically lined doors to prevent condensation where applicable.
- E Manufacturer shall provide a neoprene gasket around perimeter of access door for airtight seal.
- F Systems 2" w.g. or less shall use a hinged, cam, or hinged & cam square framed access door.
- G Systems 3" w.g. and above shall use a sandwich type access door. Construct doors in accordance with Figure 7-3 of the 2005 SMACNA Manual, "HVAC Duct Construction Standards, Metal & Flexible," Third Edition. Doors shall be rated for +/- 10" w.g.

**2.07 DUCT TEST HOLES**

- A Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

**2.08 FIRE DAMPERS**

- A Manufacturers:
  - 1. Nailor Industries Inc
  - 2. NCA, a brand of Metal Industries Inc
  - 3. Pottorff
  - 4. Ruskin Company
  - 5. United Enertech
  - 6. Air Balance/ABI
  - 7. Greenheck
  - 8. Metal Industries
  - 9. Prefco
  - 10. ATI Industries
  - 11. Or Approved Equal

- B Fabricate in accordance with NFPA 90A and UL 555, and as indicated.
- C Fire Resistance: 1-1/2 hours or 3 hours as required by assembly rating.
- D Dynamic Closure Rating: Dampers shall be classified for dynamic closure to 4000 fpm and 4 inches w.g. static pressure.
- E Construction:
  - 1. Integral Sleeve Frame: Minimum 20 gauge roll formed galvanized steel. Sleeve length to be determined by Contractor for each condition.
  - 2. Blades:
    - a. Curtain type
    - b. Action: Spring or gravity closure upon fusible link release.
    - c. Orientation: Horizontal.
    - d. Material: Minimum 24 gage roll formed, galvanized steel.
  - 3. Closure Springs: Type 301 stainless steel, constant force type, if required.
  - 4. Mounting: Vertical and/or Horizontal.
  - 5. Duct Transition Connection, Damper Style:
    - a. B style – rectangular connection, blades out of air stream, high free area.
    - b. G style – A style connection, grille mounting tabs at end of sleeve for grille.
    - c. CR style – round connection, sealed.
  - 6. Finish: Mill galvanized.
- F Fusible Links: UL 33, separate at 165 degrees F with adjustable link straps for combination fire/balancing dampers.
- G Breakaway Connection:
  - 1. Ductmate or Drivemate.

**2.09 FLEXIBLE DUCT CONNECTORS**

- A Manufacturers:
  - 1. Carlisle HVAC Products
  - 2. Ductmate Industries, Inc, a DMI Company
  - 3. Elgen Manufacturing, Inc
  - 4. Durodyne
  - 5. Or Approved Equal
- B Flexible duct connector shall be used where ductwork connects to fan apparatus or fan casings to isolate vibration transfer. Connectors shall be attached in such a manner as to provide an airtight and waterproof seal.
- C Connectors will comply with NFPA 90A, “Installation of Air Conditioning & Ventilation Systems” and NFPA 90B, “Installation of Warm Air Heating & Air Conditioning Systems”.
- D Connector fabrics shall meet NFPA 701 (formerly UL 214.)
- E Connector fabrics shall be mildew resistant per ASTM G21.
- F Indoor installations shall be NFPA 701 listed, fire retardant Vinyl coated woven nylon or Neoprene coated woven fiberglass fabric. Minimum density of Vinyl is 20 oz. /sq. yd. and rated to 200F. Minimum density of Neoprene 30 oz. / sq. yard and rated to 200F.
- G Outdoor installations shall be NFPA 701 listed UV-resistant Hypalon coated woven fiberglass fabric. Minimum density 24 oz. /sq. yd. and rated to 250F.
- H High temperature applications shall be NFPA 701 listed, Silicone coated satin weave fiberglass fabric. Minimum density 17.5 oz. /sq. yd. and rated to 500 F.
- I Chemical resistant applications shall be of Teflon coated woven fiberglass fabric. Minimum density 18 oz. /sq. yd. and rated to 500 F.
- J Fabricate in accordance with SMACNA (DCS) and as indicated.
- K Flexible Duct Connections: Fabric crimped into metal edging strip.

**2.10 VOLUME CONTROL DAMPERS**

- A Manufacturers:
  - 1. MKT Metal Manufacturing

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Roanoke Rapids Graded School District

2. Nailor Industries Inc
  3. NCA, a brand of Metal Industries Inc
  4. Ruskin Company:
  5. United Enertech
  6. Greenheck
  7. Pottorff
  8. Johnson Controls
  9. Air Balance, Inc.
  10. Or Approved Equal
- B Fabricate in accordance with SMACNA (DCS) and as indicated.
- C Round Control Damper - 1 in w.g. and below:
1. Velocity: Up to 2,000 fpm
  2. Temperature: 180°F
  3. Construction:
    - a. Frame Material - Galvanized Steel
    - b. Frame Thickness: 20 gauge
    - c. Blade Material: Galvanized Steel
    - d. Axle Bearings: Bronze
    - e. Axle Material: Plated Steel
    - f. Operator: 3/8 inch sq. locking manual quadrant.
      - 1) On insulated ducts, provide 2 inch standoff bracket
    - g. Manufacturers:
      - 1) Greenheck MBDR-50
      - 2) Ruskin
      - 3) Nailor
- D Round Control Damper - 4 in w.g. and below:
1. Velocity: Up to 3,000 fpm
  2. Temperature: 180°F
  3. Leakage: 4 cfm/ft<sup>2</sup> @ 1 in. wg
  4. Construction:
    - a. Frame Material - Galvanized Steel
    - b. Frame Thickness: 20 gauge
    - c. Blade Material: Galvanized Steel
    - d. Blade seal: Silicone
    - e. Axle Bearings: Bronze
    - f. Axle Material: Plated Steel
    - g. Operator: 3/8 inch sq. locking manual quadrant.
      - 1) On insulated ducts, provide 2 inch standoff bracket
  5. Manufacturers:
    - a. Greenheck VCDR-53
    - b. Ruskin
    - c. Nailor
- E Rectangular Single Blade Dampers: 1 in w.g. and below, up to 10 x 30 inch duct
1. Velocity: Up to 2,000 fpm
  2. Temperature: 180°F
  3. Construction:
    - a. Frame Material - Galvanized Steel
    - b. Frame Thickness: 20 gauge
    - c. Blade Material: Galvanized Steel
    - d. Axle Bearings: Synthetic sleeve type
    - e. Axle Material: Plated Steel

- f. Operaror: 3/8 inch sq. locking manual quadrant, 2-1/2 inch long extension
  - 1) On insulated ducts, provide 2 inch standoff bracket
- 4. Manufacturers:
  - a. Greenheck MBD-10M
  - b. Ruskin
  - c. Nailor
- F Rectangular Multi-Blade Balancing Dampers: 2 in w.g. and below
  - 1. Pressure: Up to 4 in w.g.
  - 2. Velocity: 2,000 fpm
  - 3. Temperature: 180°F
  - 4. Construction:
    - a. Frame Material - Galvanized Steel
    - b. Frame Thickness: 16 gauge
    - c. Blade Material: Galvanized Steel
    - d. Blade Thickness: 16 gauge
    - e. Blade Type: 3V
    - f. Blade Operation: Opposed
    - g. Axle Bearings: Synthetic sleeve type
    - h. Axle Material: Plated Steel
    - i. Operaror: 1/2 inch locking manual quadrant, 1-1/2 inch long standoff bracket
    - j. Extension Pin: 1/2 inch diagonal glass reinforced polymer extends 3-1/2 inch beyond frame
  - 5. Manufacturers:
    - a. Greenheck MBD-15
    - b. Ruskin
    - c. Nailor
- G Quadrants:
  - 1. Provide locking, indicating quadrant regulators on single and multi-blade dampers.
  - 2. On insulated ducts mount quadrant regulators on stand-off mounting brackets, bases, or adapters.
  - 3. Where rod lengths exceed 30 inches provide regulator at both ends.

**2.11 MISCELLANEOUS PRODUCTS**

- A Internal Strut End Plugs: Combination end-mounting and sealing plugs for metal conduit used as internal reinforcement struts for metal ducts; plug crimped inside conduit with outside gasketed washer seal.
- B Duct Opening Closure Film: Mold-resistant, self-adhesive film to keep debris out of ducts during construction.
  - 1. Thickness: 2 mils.
  - 2. High tack water based adhesive.
  - 3. UV stable light blue color.
  - 4. Elongation Before Break: 325 percent, minimum.
  - 5. Manufacturers:
    - a. Carlisle HVAC Products; Dynair Duct Protection Film
    - b. Surface Shields
    - c. Trimaco
    - d. Ductmate ProGuard
    - e. Or Approved Equal

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A Install accessories in accordance with manufacturer's instructions, NFPA 90A, and follow SMACNA (DCS). Refer to Section 23 31 00 for duct construction and pressure class.
- B Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- C Provide a pre-manufactured support at each diffuser to turn the flex duct into a 90° elbow.

- D Contractor shall identify balancing dampers above the ceiling by either spray painting them bright orange or hanging an orange flag from the damper handle. If hanging a flag in a return air plenum, material shall comply with fire and smoke spread ratings for plenum use.
- E All fire dampers, smoke dampers, and combination fire/smoke dampers shall be installed with bottom edge 24" maximum above lay-in ceiling.
- F All balancing dampers shall be installed maximum 30" above the lay-in ceiling.
- G Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, combination fire and smoke dampers, and elsewhere as indicated. Provide minimum 12 by 12 inch size for hand access, size for shoulder access, and as indicated. Provide 8 by 8 inch for balancing dampers only. Review locations prior to fabrication.
- H Provide duct test holes where indicated and required for testing and balancing purposes.
- I Provide fire dampers, combination fire and smoke dampers, and smoke dampers at locations indicated, where ducts and outlets pass through fire rated components. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- J Install smoke dampers and combination smoke and fire dampers in accordance with NFPA 92.
- K The Contractor shall inspect and test all fire dampers, smoke dampers, and combination fire/smoke dampers in accordance with NFPA 80 in the presence of the Authority Having Jurisdiction.
- L Demonstrate re-setting of fire dampers to Owner's representative.
- M At fans and motorized equipment associated with ducts, provide flexible duct connections immediately adjacent to the equipment.
- N At equipment supported by vibration isolators, provide flexible duct connections immediately adjacent to the equipment.
  - 1. Refer to Section 23 05 48.
- O Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.
- P Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.

**END OF SECTION 23 33 00**

**SECTION 23 34 23**  
**HVAC POWER VENTILATORS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Roof exhausters.

**1.02 REFERENCE STANDARDS**

- A AMCA (DIR) - (Directory of) Products Licensed Under AMCA International Certified Ratings Program 2015.
- B AMCA 99 - Standards Handbook 2016.
- C AMCA 204 - Balance Quality and Vibration Levels for Fans 2020.
- D AMCA 208-18 - Calculation of the Fan Energy Index.
- E AMCA 210 - Laboratory Methods of Testing Fans for Certified Aerodynamic Performance Rating 2016.
- F NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- G UL 705 - Power Ventilators Current Edition, Including All Revisions.

**1.03 SUBMITTALS**

- A Product Data: Provide data on fans and accessories including fan curves with specified operating point clearly plotted, power, RPM, sound power levels at rated capacity, and electrical characteristics and connection requirements.
- B All fans shall be certified to bear the AMCA Certified Ratings Program seal for Sound and Air Performance.
- C All fans shall be certified to bear the AMCA Certified Ratings Program seal for FEI (Fan Energy Index).
- D For fans over 1.0 HP, the submittal shall have the fan efficiency index (FEI) clearly indicated. The FEI shall be as determined by AMCA 208-18.
- E Maintenance Data: Include instructions for lubrication, motor and drive replacement, spare parts list, and wiring diagrams.
- F Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Fan Belts: One set for each individual fan.

**1.04 QUALITY ASSURANCE**

- A Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**1.05 FIELD CONDITIONS**

- A Permanent ventilators may not be used for ventilation during construction.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A Greenheck
- B Loren Cook Company
- C PennBarry
- D Twin City Fan & Blower
- E Or Approved Equal

**2.02 POWER VENTILATORS - GENERAL**

- A Static and Dynamically Balanced: Comply with AMCA 204.
- B Performance Ratings: Comply with AMCA 210, bearing certified rating seal.
- C Sound Ratings: AMCA 301, tested to AMCA 300 and bearing AMCA Certified Sound Rating Seal.
- D Fabrication: Comply with AMCA 99.
- E UL Compliance: UL listed and labeled, designed, manufactured, and tested in accordance with UL 705.
- F Electrical Components: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.
- G Enclosed Safety Switches: Comply with NEMA 250.
- H Each fan shall bear a permanently affixed manufacture's nameplate containing the model number and individual serial number

**2.03 ROOF EXHAUSTERS**

- A Fan Unit: V-belt or direct driven as indicated, with spun aluminum housing; resilient mounted motor; 1/2 inch mesh, 0.62 inch thick aluminum wire birdscreen; square base to suit roof curb with continuous curb gaskets.
- B Wheel:
  - 1. Constructed of Aluminum or Composite
  - 2. Non-overloading, backward inclined centrifugal
  - 3. The wheel cone and fan inlet shall be matched and shall have precise running tolerances for maximum performance and operating efficiency.
- C Roof Curb: 20 inch high self-flashing of galvanized steel with continuously welded seams, built-in cant strips, insulation and curb bottom, and factory installed nailer strip.
- D Disconnect Switch: Factory wired, non-fusible, in housing for thermal overload protected motor and wall mounted solid state speed controller or EC motor, refer to fan schedule..
- E Backdraft Damper: Gravity actuated, aluminum multiple blade construction, felt edged with offset hinge pin, nylon bearings, blades linked.
- F Sheaves: Cast iron or steel, dynamically balanced, bored to fit shafts and keyed; variable and adjustable pitch motor sheave selected so required rpm is obtained with sheaves set at mid-position; fan shaft with self-aligning pre-lubricated ball bearings.

**2.04 INLINE CENTRIFUGAL FANS**

- A Wheel:
  - 1. Forward curved centrifugal wheel
  - 2. Constructed of galvanized steel or calcium carbonate filled polypropylene
  - 3. Statically and dynamically balanced in accordance to AMCA Standard 204-05
- B Housing:
  - 1. Constructed of heavy gauge galvanized steel
  - 2. Interior shall be lined with 0.5 inches of acoustical insulation
- C Disconnect Switch: Cord and plug in housing for thermal overload protected motor and wall mounted solid state speed controller.
- D Spring Loaded Aluminum Backdraft Damper:
  - 1. Prevents air from entering back into the building when fan is off
  - 2. Eliminates rattling or unwanted backdrafts

**PART 3 EXECUTION**

**3.01 INSTALLATION**

- A Install in accordance with manufacturer's instructions.
- B Secure roof exhausters with cadmium plated steel lag screws to roof curb.
- C Extend ducts to roof exhausters into roof curb. Counterflash duct to roof opening.
- D Hung Cabinet Fans:
  - 1. Install fans with resilient mountings and flexible electrical leads; see Section 23 05 48.
  - 2. Install flexible connections specified in Section 23 33 00 between fan and ductwork. Ensure metal bands of connectors are parallel with minimum one inch flex between ductwork and fan while running.
- E Provide sheaves required for final air balance.
- F Install backdraft dampers on inlet to roof and wall exhausters.
- G Provide backdraft dampers on outlet from cabinet and ceiling exhausters fans and as indicated.

**END OF SECTION 23 34 23**

**SECTION 23 37 00**  
**AIR OUTLETS AND INLETS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Diffusers:
- B Registers/grilles:
  - 1. Wall-mounted, supply register/grilles.
  - 2. Wall-mounted, exhaust and return register/grilles.

**1.02 REFERENCE STANDARDS**

- A AMCA 550 - Test Method for High Velocity Wind Driven Rain Resistant Louvers 2022.
- B ASHRAE Std 70 - Method of Testing the Performance of Air Outlets and Air Inlets 2023.
- C SMACNA (ASMM) - Architectural Sheet Metal Manual 2012.

**1.03 SUBMITTALS**

- A Product Data: Provide data for equipment required for this project. Review outlets and inlets as to size, finish, and type of mounting prior to submission. Submit schedule of outlets and inlets showing type, size, location, application, and noise level.
- B Provide performance data for each inlet and outlet model and size variation, indicating CFM range, throw data, noise data, and pressure drop.

**1.04 QUALITY ASSURANCE**

- A Test and rate air outlet and inlet performance in accordance with ASHRAE Std 70.
- B Louver shall comply with AMCA 540 and AMCA 550.
- C Louvers licensed to bear AMCA Certified Ratings Seal. Ratings based on tests and procedures performed in accordance with AMCA 500-L, AMCA 511 and AMCA 540 and comply with AMCA Certified Ratings Program. AMCA Certified Ratings Seal applies to air performance and water penetration ratings.
- D Manufacturer Qualifications: Company specializing in manufacturing the type of products specified in this section, with minimum three years of documented experience.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A Carnes, a division of Carnes Company Inc
- B Krueger
- C Metalaire, a brand of Metal Industries Inc: [www.metalaire.com/#sle](http://www.metalaire.com/#sle).
- D Nailor
- E Price Industries
- F Ruskin Company
- G Titus
- H Tuttle and Bailey
- I Or Approved Equal

**2.02 SQUARE CONE DIFFUSERS**

- A Type: Provide square, adjustable pattern, stamped, multi-core diffuser to discharge air in four way pattern.
- B Connections: Round.
- C Frame: Provide surface mount and inverted T-bar type. In plaster ceilings, provide plaster frame and ceiling frame.
- D Fabrication: Aluminum with baked enamel finish.
- E Color: As indicated.

**2.03 WALL SUPPLY REGISTERS/GRILLES**

- A Type: Streamlined and individually adjustable blades, 3/4 inch minimum depth, 3/4 inch maximum spacing with spring or other device to set blades, vertical face, double deflection.
- B Frame: 1-1/4 inch margin with countersunk screw mounting and gasket.
- C Fabrication: Steel with 20 gauge, 0.0359 inch minimum frames and 22 gauge, 0.0299 inch minimum blades, steel and aluminum with 20 gauge, 0.0359 inch minimum frame, or aluminum extrusions, with factory baked enamel finish.

D Color: As indicated.

E Damper: Integral, gang-operated opposed blade type with removable key operator, operable from face.

**2.04 WALL EXHAUST AND RETURN REGISTERS/GRILLES**

A Type: Streamlined blades, 3/4 inch minimum depth, 3/4 inch maximum spacing, with spring or other device to set blades, vertical face.

B Frame: 1-1/4 inch margin with countersunk screw mounting.

C Fabrication: Steel frames and blades, with factory baked enamel finish.

D Color: As indicated on the drawings.

E Damper: Integral, gang-operated, opposed blade type with removable key operator, operable from face.

**2.05 DRYER VENT**

A Manufacturers

1. Seiho

2. Or Approved Equal

B Heavy duty aluminum construction with flapper backdraft damper

C Size: 4" or 6" as scheduled or indicated on Drawings

D Finish: Anodized

**PART 3 EXECUTION**

**3.01 INSTALLATION**

A Install in accordance with manufacturer's instructions.

B Comply with SMACNA (ASMM) for flashing/counter-flashing of roof penetrations and supports for roof curbs and roof mounted equipment.

C Check location of outlets and inlets and make necessary adjustments in position to comply with architectural features, symmetry, and lighting arrangement.

D Install diffusers to ductwork with air tight connection.

E Provide balancing dampers on duct take-off to diffusers, and grilles and registers, despite whether dampers are specified as part of the diffuser, or grille and register assembly.

F Paint ductwork visible behind air outlets and inlets matte black. Refer to Section 09 91 23.

G Inspect areas to receive louvers. Notify the Architect of conditions that would adversely affect the installation or subsequent utilization of the louvers. Do not proceed with installation until unsatisfactory conditions are corrected.

H Install louvers plumb, level, and in alignment with adjacent work.

I The supporting structure shall be designed to accommodate the point loads transferred by the louvers when subject to the design wind loads. Coordinate with the General Contractor and Framing Contractor.

**END OF SECTION 23 37 00**

**SECTION 23 81 21**  
**VERTICAL PACKAGED OUTDOOR MOUNTED HEAT PUMP**

**PART 1 GENERAL**

**1.01 SUBMITTALS**

- A Submittals for Single Packaged Vertical Outdoor Mount heat pump or air conditioner shall include: equipment performance, dimensions, and electrical requirements
- B Factory Warranty documentation verifying 5 year compressor, and 5 year parts warranty
- C Control submittal if controller is provided by equipment manufacturer.
- D Confirmation of UL/ETL listings.

**1.02 WARRANTY**

- A Unit shall include a full 5-year parts warranty covering compressor, sealed refrigeration system, heat exchange coils, ventilation packages, as defined by the terms and conditions of the manufacturer's Limited Warranty agreement. Labor is excluded in the Bard standard warranty. Any 5 year compressor, 1 year parts warranty shall not be accepted. All parts warranty documentation shall be included in submittal data. Any exceptions to a manufacturer's standard warranty must be acknowledged in writing by the Manufacturer's senior manager

**PART 2 - PRODUCTS**

**2.01 GENERAL EQUIPMENT REQUIREMENTS**

- A Capacities of Heat Pumps as indicated on drawing and schedules are net capacities actually required. Efficiencies shall be at AHRI conditions, submitted performance shall be at specified conditions.
- B Furnish and install a self-contained, vertical, floor standing, interior mount, thru the-wall, heat pump. Units shall be, self- contained vertical packaged (SPVU) heat pump. Cooling performance shall be tested and certified by AHRI per Standard 390 and listed in the AHRI database. AHRI certificate shall be included in submittal data. If AHRI documentation is not available, third party performance certification by an agency preapproved by the specifier may be considered. Third party submittals of capacity and efficiency in heating and cooling shall be provided 10 days prior to bid and include statement of performance indemnification from the Manufacturer.
- C Units shall be UL or ETL listed and labeled, classified in accordance ANSI/UL 1995/CSA 22.2 No. 235-05 fourth edition. Unit shall be constructed following ISO:9001 quality control procedures and be factory assembled, fully charged internally wired, 100% run tested. Run test data shall be stored and available upon request.

**2.02 CONSTRUCTION**

- A Construction shall be a single, enclosed, weatherproof casing constructed of 20-gauge galvanized steel, stainless steel, or aluminum (choose one). Unit base is constructed of 16-gauge galvanized steel for painted and aluminum cabinets, stainless steel for stainless cabinets. Each exterior casing panel to be bonderized and finished with baked-on exterior polyester enamel paint prior to assembly. The baked-on cured paint finish shall pass the industry rub test with a minimum of 72 rubs MEK (Methyl, Ethyl Ketone) or standard rub test of a minimum of 100 rubs using Toluene. Cooling section shall be fully insulated with a non-fiberglass material with heavy duty foil facing for durability and ease of cleaning. Fiberglass insulation is not acceptable. Openings shall be provided for power connections. Access openings appropriate for outside structure to all fan motors and compressor for making repairs and for removing internal components without removing unit from its permanent installation. Fresh air intake and outdoor coil shall be protected from intrusions by a sturdy metal grating with less than 1/4 inch openings. Back of unit shall be painted in neutral color to reduce visibility from outdoors..
- B Painted cabinet construction shall be a minimum of 20 gauge Zinc coated steel, painted units shall have baked on paint, designed and tested to withstand 1000 hours of salt spray test per ASTM B117-03.
- C Stainless steel construction shall be 316 grade, with stainless steel screws and fasteners for all exposed areas. The condenser fan blade shall be treated with corrosion resistant material, and condenser fan motor mounts shall be stainless steel.
- D Colors shall be custom color selected by Owner/Architect/Engineer.

**2.03 MOUNTING BRACKETS**

- A Full-length, side mounting brackets shall be an integral part of the cabinet. Bottom mounting bracket shall be provided.

**2.04 FILTERS**

- A Unit shall be factory furnished with 2” pleated filters and have a Minimum Efficiency Reporting Value of MERV 8 per ASHRAE standard 52.2.

**2.05 INDOOR BLOWER MOTOR**

- A The indoor blower motor shall be electronically commutated variable speed (ECM), factory programmed to produce rated air flow from 0 to 0.5 inch WC of external static pressure.

**2.06 ELECTRICAL COMPONENTS AND CONTROLS**

- A Electrical components shall be easily accessible for routine inspection and maintenance through front service panels. Circuit breaker shall be standard on all 208/230 volt models and a disconnect standard on all 460 volt models.
- B Circuit breaker/disconnect access is through lockable access panel. Lock and key are to be provided with each unit. Unit shall have single point entry for line voltage. Electrical component access point shall be located at standard eye level to allow easy serviceability.
- C The internal low voltage control circuit shall consist of a current limiting 24 VAC type 75 VA transformer with circuit breaker.
- D All units with 3-phase power shall include factory mounted phase rotation monitor. This device shall protect scroll compressor from reverse rotation and also protect unit from phase failure. If 3-phase power is incorrectly connected at the field power connections, the phase monitor shall lock out the unit and a red light will illuminate indicating incorrect phase. If unit is wired correctly a green light will illuminate. If a power leg is lost, the phase monitor will lockout the unit due to phase imbalance. Once the condition is corrected, turning the power off at the circuit breaker or disconnect will reset the phase monitor.
- E Provide BACnet interface for each unit.

**2.07 DEHUMIDIFICATION AND HOT GAS REHEAT**

- A This shall be a factory installed option
- B The dehumidification option shall incorporate an independent reheat coil in the supply air stream in addition to the standard evaporator coil, 2 way valve, solid state dehumidification circuit board, and independent dehumidification terminal on 24 volt control terminal strip. The coil shall be mounted after the evaporator coil, and sized to nominally match the sensible cooling capacity. The solid state dehumidification circuit will monitor the 24 volt terminal for a call for dehumidification.

**2.08 VENTILATION – ENERGY RECOVERY VENTILATOR**

- A Energy Recovery module shall consist of 2 rotary wheels in an insulated cassette frame complete with silica gel media, seals, drive motor, belt, intake and exhaust blowers. Dampers will be used to prevent infiltration during off periods.
- B The inherit design of the ERV shall be such as to promote self-cleaning in standard conditions.
- C Intake and exhaust blower motors shall be fractional horsepower ecm motors providing either 3 selectable cfm levels (450, 375, 300 ) or modulating cfm based on 0-10 v modulating signal from a control source. Intake and exhaust airflow shall be independently adjustable providing for positive pressurization of the space.
- D The ERV thermal performance shall be certified by the manufacturer in accordance with ASHRAE Standard 84, Method of Testing Air-to Air Heat Exchangers and ARI Standard 1060, Rating for Air-to-Air Energy Recovery Ventilation Equipment Cassettes, and shall be listed in the ARI Certified Products
- E Unit complies with ANSI/ASHRAE Standard 62.1 Ventilation for Acceptable Air Quality.
- F The energy transfer media shall include enthalpy transfer utilizing silica gel desiccant or other media with high latent transfer capability. All components of the ERV assembly shall be warranted (parts only) 5 years from date of installation.

**2.09 GAS HEAT**

- A Provide natural gas fire furnace for heat.

- B Heavy duty 18-gauge stainless steel tubular heat exchanger with mechanically joined construction and a ten-year warranty. An advanced burner design provides quiet operation. Direct spark ignition control (DSI) and remote sensor delivers smooth, proven ignition sequence. Timed blower control and diagnostics are also features of integrated control. Honeywell gas valve and burner orifices are factory standard for natural gas.

**2.10 OPTIONAL ACCESSORIES**

- A Top discharge plenum box.
- B Supply air discharge plenum box shall be provided by manufacturer.
- C Insulation shall be covered with acoustically designed perforated galvanized metal. Plenum box shall include 1 or 2 front discharge diffusers, and may include one diffuser on each side of the plenum box.

**PART 3 EXECUTION**

**3.01 FACTORY STARTUP**

- A Provide services of authorized factory representative to startup units.

**END OF SECTION 23 81 21**

**SECTION 23 81 29**  
**VARIABLE REFRIGERANT FLOW HVAC SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Variable refrigerant volume HVAC system includes:
  - 1. Outdoor/condensing unit(s).
  - 2. Indoor/evaporator units.
  - 3. Refrigerant piping.
  - 4. Control panels.
  - 5. Control wiring.

**1.02 REFERENCE STANDARDS**

- A AHRI 210/240 - Performance Rating of Unitary Air-Conditioning and Air-Source Heat Pump Equipment 2023.
- B ASHRAE Std 90.1 I-P - Energy Standard for Buildings Except Low-Rise Residential Buildings Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- C ITS (DIR) - Directory of Listed Products Current Edition.
- D NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E UL 1995 - Heating and Cooling Equipment Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A Preinstallation Meeting: Conduct a preinstallation meeting one week prior to the start of the work of this section; require attendance by all affected installers.

**1.04 SUBMITTALS**

- A Product Data: Submit manufacturer's standard data sheets showing the following for each item of equipment, marked to correlate to equipment item markings indicated in Contract Documents:
  - 1. Outdoor/Central Units:
    - a. Refrigerant Type and Size of Charge.
    - b. Cooling Capacity: Btu/h.
    - c. Heating Capacity: Btu/h.
    - d. Cooling Input Power: Btu/h.
    - e. Heating Input Power: Btu/h.
    - f. Operating Temperature Range, Cooling and Heating.
    - g. Air Flow: Cubic feet per minute.
    - h. Fan Curves.
    - i. External Static Pressure (ESP): Inches WG.
    - j. Sound Pressure Level: dB(A).
    - k. Electrical Data:
      - 1) Maximum Circuit Amps (MCA).
      - 2) Maximum Fuse Amps (MFA).
      - 3) Maximum Starting Current (MSC).
      - 4) Full Load Amps (FLA).
      - 5) Total Over Current Amps (TOCA).
      - 6) Fan Motor: HP.
    - l. Weight and Dimensions.
    - m. Maximum number of indoor units that can be served.
    - n. Maximum refrigerant piping run from outdoor/condenser unit to indoor/evaporator unit.
    - o. Maximum height difference between outdoor/condenser unit to indoor/evaporator unit, both above and below.
    - p. Control Options.
  - 2. Indoor/Evaporator Units:
    - a. Cooling Capacity: Btu/h.

- b. Heating Capacity: Btu/h.
- c. Cooling Input Power: Btu/h.
- d. Heating Input Power: Btu/h.
- e. Air Flow: Cubic feet per minute.
- f. Fan Curves.
- g. External Static Pressure (ESP): Inches WG.
- h. Sound Pressure level: dB(A).
- i. Electrical Data:
  - 1) Maximum Circuit Amps (MCA).
  - 2) Maximum Fuse Amps (MFA).
  - 3) Maximum Starting Current (MSC).
  - 4) Full Load Amps (FLA).
  - 5) Total Over Current Amps (TOCA).
  - 6) Fan Motor: HP.
- j. Maximum Lift of Built-in Condensate Pump.
- k. Weight and Dimensions.
- l. Control Options.
3. Control Panels: Complete description of options, control points, zones/groups.
4. Capacities and ratings shall be at the conditions shown on the Drawings.
- B Shop Drawings: Installation drawings custom-made for this project; include as-designed HVAC layouts, locations of equipment items, refrigerant piping sizes and locations, condensate piping sizes and locations, remote sensing devices, control components, electrical connections, control wiring connections. Include:
  1. Detailed piping diagrams, with branch balancing devices.
  2. Condensate piping routing, size, and pump connections.
  3. Detailed power wiring diagrams.
  4. Detailed control wiring diagrams.
  5. Locations of required access through fixed construction.
  6. Drawings required by manufacturer.
- C Design Data:
  1. Provide design calculations showing that system will achieve performance specified.
  2. Provide design data required by ASHRAE Std 90.1 I-P.
- D Sustainable Design Documentation: Submit manufacturer's product data on refrigerant used, showing compliance with specified requirements.

#### **1.05 QUALITY ASSURANCE**

- A Manufacturer Qualifications:
  1. Company that has been manufacturing variable refrigerant volume heat pump equipment for at least 5 years.
- B Installer Qualifications: Trained, certified, and approved by manufacturer of equipment.

#### **1.06 DELIVERY, STORAGE AND HANDLING**

- A Deliver, store, and handle equipment and refrigerant piping according to manufacturer's recommendations.

#### **1.07 WARRANTY**

- A See Section 01 78 00 - Closeout Submittals, for additional warranty requirements.
- B Compressors: Provide five (5) year parts and labor compressor warranty. All warranty service work shall be performed by a factory trained service professional.

### **PART 2 PRODUCTS**

#### **2.01 MANUFACTURERS**

- A Carrier/Toshiba
- B Daikin
- C LG
- D Mitsubishi
- E Samsung

F Or Approved Equal

**2.02 HVAC SYSTEM DESIGN**

- A System Operation: Heating or cooling, selected at system level.
  - 1. Provide a complete functional system that achieves the specified performance based on the specified design conditions and that is designed and constructed according to the equipment manufacturer's requirements.
  - 2. Outdoor/Condenser unit locations are indicated on drawings.
  - 3. Indoor/Evaporator unit locations are indicated on drawings.
  - 4. Required equipment unit capacities are indicated on drawings.
  - 5. Connect equipment to condensate piping; condensate piping is shown on the drawings.
- B Cooling Mode Interior Performance:
  - 1. Daytime Setpoint: 75 degrees F, plus or minus 2 degrees F.
  - 2. Setpoint Range: 65 degrees F to 77 degrees F.
  - 3. Night Setback: 80 degrees F.
  - 4. Interior Relative Humidity: 55 percent, maximum.
- C Heating Mode Interior Performance:
  - 1. Daytime Setpoint: 70 degrees F, plus or minus 2 degrees F.
  - 2. Setpoint Range: 59 degrees F to 80 degrees F.
  - 3. Night Setback: 65 degrees F.
  - 4. Interior Relative Humidity: 20 percent, minimum.
- D Operating Temperature Ranges:
  - 1. Cooling Mode Operating Range: 23 degrees F to 110 degrees F dry bulb.
  - 2. Heating Mode Operating Range: 0 degrees F to 77 degrees F dry bulb; minus 4 degrees F to 60 degrees F wet bulb; without low ambient controls or auxiliary heat source.
- E Controls: Provide the following control interfaces:
  - 1. For Each Indoor/Evaporator Unit: One wall-mounted wired "local" controller, with temperature sensor; locate where indicated.
  - 2. One central remote control panel for entire system; locate where indicated.
- F Local Controllers: Wall-mounted, wired, containing temperature sensor.

**2.03 EQUIPMENT**

- A All Units: Factory assembled, wired, and piped and factory tested for function and safety.
  - 1. Refrigerant: R-410A.
  - 2. Performance Certification: AHRI Certified; [www.ahrinet.org](http://www.ahrinet.org).
  - 3. Safety Certification: Tested to UL 1995 by UL or Intertek-ETL, listed in ITS (DIR), and bearing the certification label.
  - 4. Provide outdoor/condensing units capable of serving indoor unit capacity up to 140 percent of the capacity of the outdoor/condensing unit.
  - 5. Provide units capable of serving the zones indicated.
  - 6. Thermal Performance: Provide heating and cooling capacity as indicated, based on the following nominal operating conditions:
    - a. Cooling: Indoor air temperature of 77 degrees F dry bulb, 65 degrees F wet bulb; outdoor air temperature of 95 degrees F dry bulb; and 25 feet
    - b. Heating: Outdoor air temperature of 20 degrees F dry bulb, 18 degrees F wet bulb; indoor air temperature of 70 degrees F dry bulb; and 25 feet
  - 7. Energy Efficiency: Report EER and COP based on tests conducted at "full load" in accordance with AHRI 210/240 or alternate test method approved by U.S. Department of Energy.
- B Electrical Characteristics:
  - 1. Power - Indoor Units: 208 to 230 Volts, single phase, 60 Hz.
  - 2. 208-230 Voltage Range: 187 to 253 volts.
- C Remote Centralized Control Panel: BACnet compatible.

- D Unit Controls: As required to perform input functions necessary to operate system; provided by manufacturer of units.
  - 1. Provide interfaces to remote control and building automation systems as specified.
- E Wiring:
  - 1. Control Wiring: 18 AWG, 2-conductor, non-shielded, non-polarized, stranded cable.
  - 2. Control Wiring Configuration: Daisy chain.
- F Refrigerant Piping:
  - 1. Insulate each refrigerant line set individually between the condensing and indoor units.

**2.04 OUTDOOR/CONDENSING UNITS**

- A Outdoor/Condensing Units: Air-cooled DX refrigeration units, designed specifically for use with indoor/evaporator units; factory assembled and wired with all necessary electronic and refrigerant controls; modular design for ganging multiple units.
  - 1. Refrigeration Circuit: Scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
  - 2. Refrigerant: Factory charged.
  - 3. Variable Volume Control: Modulate compressor capacity automatically to maintain constant suction and condensing pressures while varying refrigerant volume to suit heating/cooling loads.
  - 4. Capable of being installed with wiring and piping to the left, right, rear or bottom.
  - 5. Capable of heating operation at low end of operating range as specified, without additional low ambient controls or auxiliary heat source; during heating operation, reverse cycle (cooling mode) oil return or defrost is not permitted, due to potential reduction in space temperature.
  - 6. Sound Pressure Level: As specified, measured at 3 feet from front of unit; provide night setback sound control as a standard feature; three selectable sound level steps of 55 dB, 50 dB, and 45 dB, maximum.
  - 7. Power Failure Mode: Automatically restart operation after power failure without loss of programmed settings.
  - 8. Safety Devices: High pressure sensor and switch, low pressure sensor/switch, control circuit fuses, crankcase heaters, fusible plug, overload relay, inverter overload protector, thermal protectors for compressor and fan motors, over current protection for the inverter and anti-recycling timers.
  - 9. Provide refrigerant sub-cooling to ensure the liquid refrigerant does not flash when supplying to us indoor units.
  - 10. Oil Recovery Cycle: Automatic, occurring 2 hours after start of operation and then every 8 hours of operation; maintain continuous heating during oil return operation.
  - 11. Controls: Provide contacts for electrical demand shedding.
- B Unit Cabinet: Weatherproof and corrosion resistant; rust-proofed mild steel panels coated with baked enamel finish.
  - 1. Designed to allow side-by-side installation with minimum spacing.
- C Fans: One or more direct-drive propeller type, vertical discharge, with multiple speed operation via DC (digitally commutating) inverter.
  - 1. Provide minimum of 2 fans for each condensing unit.
  - 2. External Static Pressure: Factory set at 0.12 in WG, minimum.
  - 3. Indoor Mounted Air-Cooled Units: External static pressure field set at 0.32 in WG, minimum; provide for mounting of field-installed ducts.
  - 4. Fan Airflow: As indicated for specific equipment.
  - 5. Fan Motors: Factory installed; permanently lubricated bearings; inherent protection; fan guard; output as indicated for specific equipment.
- D Condenser Coils: Copper tubes expanded into aluminum fins to form mechanical bond; waffle louver fin and rifled bore tube design to ensure high efficiency performance.
- E Compressors: Scroll type, hermetically sealed, variable speed inverter-driven and fixed speed in combination to suit total capacity; minimum of one variable speed, inverter driven compressor per condenser unit; minimum of two compressors per condenser unit; capable of controlling capacity within range of 6

percent to 100 percent of total capacity.

1. Variable Speed Control: Capable of changing the speed to follow the variations in total cooling and heating load as determined by the suction gas pressure; high/low pressures calculated by samplings of evaporator and condenser temperatures every 20 seconds, with compressor capacity adjusted to eliminate deviation from target value by changing inverter frequency or on/off setting of fixed speed compressors.
2. Multiple Condenser Modules: Balance total operation hours of compressors by means of duty cycling function, providing for sequential starting of each module at each start/stop cycle, completion of oil return, and completion of defrost, or every 8 hours.
3. Failure Mode: In the event of compressor failure, operate remaining compressor(s) at proportionally reduced capacity; provide microprocessor and associated controls specifically designed to address this condition.
4. Provide each compressor with crankcase heater, high pressure safety switch, and internal thermal overload protector.
5. Provide oil separators and intelligent oil management system.
6. Provide spring mounted vibration isolators.

## **2.05 INDOOR/EVAPORATOR UNITS**

- A All Indoor/Evaporator Units: Factory assembled and tested DX fan-coil units, with electronic proportional expansion valve, control circuit board, factory wiring and piping, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
1. Refrigerant: Refrigerant circuits factory-charged with dehydrated air, for field charging.
  2. Temperature Control Mechanism: Return air thermistor and computerized Proportional-Integral-Derivative (PID) control of superheat.
  3. Dehumidification Function: In conjunction with wall-mounted wired remote controller.
  4. Coils: Direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond; waffle louver fin and high heat exchange, rifled bore tube design; factory tested.
    - a. Provide thermistor on liquid and gas lines.
  5. Fans: Direct-drive, with statically and dynamically balanced impellers; high and low speeds unless otherwise indicated; motor thermally protected.
  6. Return Air Filter: Washable long-life net filter with mildew proof resin, unless otherwise indicated.
  7. Condensate Drainage: Built-in condensate drain pan with drain connection.
    - a. Units With Built-In Condensate Pumps: Provide condensate safety shutoff and alarm.
  8. Cabinet Insulation: Sound absorbing foamed polystyrene and polyethylene insulation.
  9. Provide isolation ball valves at each piping connection to each indoor unit.
- B Concealed-In-Ceiling Units: Ducted horizontal discharge and return; galvanized steel cabinet.
1. Return Air Filter: High efficiency MERV 8.
  2. Sound Pressure: Measured at low speed at 5 feet below unit.
  3. Provide external static pressure switch adjustable for high efficiency filter operation
  4. Condensate Pump: Built-in, with lift of 21 inches, minimum.
  5. Switch box accessible from side or bottom.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A Verify that condensate piping has been installed and is in the proper location prior to starting installation.

### **3.02 INSTALLATION**

- A Install in accordance with manufacturer's instructions.
- B Install refrigerant piping in accordance with equipment manufacturer's instructions.
- C Perform wiring in accordance with NFPA 70, National Electric Code (NEC).
- D Coordinate with installers of systems and equipment connecting to this system.
- E Provide isolation ball valves at piping connections to each indoor unit.

### **3.03 SYSTEM STARTUP**

- A Provide manufacturer's field representative to perform system startup.

B Prepare and start equipment and system in accordance with manufacturer's instructions and recommendations.

C Adjust equipment for proper operation within manufacturer's published tolerances.

**3.04 CLEANING**

A Clean exposed components of dirt, finger marks, and other disfigurements.

**3.05 CLOSEOUT ACTIVITIES**

A Training: Train Owner's personnel on operation and maintenance of system.

1. Use operation and maintenance manual as training reference, supplemented with additional training materials as required.
2. Provide minimum of one day of training.
3. Instructor: Manufacturer's training personnel.
4. Location: At project site.
5. Provide video recording of the training session. Turn over video to Owner at the conclusion of the project.

**3.06 PROTECTION**

A Protect installed components from subsequent construction operations.

**END OF SECTION 23 81 29**

**SECTION 23 82 00**  
**CONVECTION HEATING AND COOLING UNITS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Electric unit heaters.

**1.02 REFERENCE STANDARDS**

- A AHRI 410 - Forced-Circulation Air-Cooling and Air-Heating Coils 2001, with Addenda (2011).

**1.03 SUBMITTALS**

- A Product Data: Provide typical catalog of information including arrangements.
- B Shop Drawings:
  - 1. Indicate cross sections of cabinets, grilles, bracing and reinforcing, and typical elevations.
  - 2. Indicate air coil and frame configurations, dimensions, materials, rows, connections, and rough-in dimensions.
  - 3. Submit schedules of equipment and enclosures typically indicating length and number of pieces of element and enclosure, corner pieces, end caps, cap strips, access doors, pilaster covers, and comparison of specified heat required to actual heat output provided.
  - 4. Submit the following for blower-coil units indicating:
    - a. Overall dimensions including installation, operation, and service clearances.
    - b. Unit shipping, installation, and operating weights including dimensions.
    - c. Fan curves with specified operating point clearly plotted.
  - 5. Indicate mechanical and electrical service locations and requirements.
- C Certificates: Certify that coils are tested and rated in accordance with AHRI 410.

**1.04 QUALITY ASSURANCE**

- A Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum three years documented experience.
- B Products Requiring Electrical Connection: Listed and classified by Underwriters Laboratories Inc. as suitable for the purpose specified and indicated.

**PART 2 PRODUCTS**

**2.01 ELECTRIC UNIT HEATERS**

- A Manufacturers:
  - 1. INDEECO (Industrial Engineering and Equipment Company)
  - 2. Modine Manufacturing Company
  - 3. Trane, a brand of Ingersoll Rand
  - 4. Markel
  - 5. REDD-I
  - 6. Raywall
  - 7. Or Approved Equal
- B Provide products listed, classified, and labeled by Underwriters Laboratories Inc. (UL), Intertek (ETL), or testing firm acceptable to Authority Having Jurisdiction as suitable for the purpose indicated.
- C Heating Element Assembly:
  - 1. Thermal safety cut-out within electric terminal box with automatically reset switch located near electric terminal box.
  - 2. Horizontal Projection Units:
    - a. Nickel chromium resistance wire surrounded with magnesium oxide and sheathed in steel, spiral-finned tubes.
    - b. High-mass, all steel tubular type, copper brazed, centrally located and installed in fixed element banks.
- D Housing:
  - 1. Suitable for ceiling or high altitude mount using provided hardware appendages.
  - 2. Horizontal Projection Units:

- a. Construction materials to consist of heavy gauge steel with galvanized, polyester powder coat, or high gloss baked enamel finish.
  - b. Provide with threaded holes for threaded rod suspension.
  - c. Provisions for access to internal components for maintenance, adjustments, and repair.
- E Air Inlets and Outlets:
- 1. Inlets: Provide stamped louvers or protective grilles with fan blade guard.
  - 2. Outlets: Provide diffuser cones, directional louvers, or radial diffusers.
- F Fan: Factory balanced, direct drive, axial type with fan guard.
- G Motor: Totally enclosed, thermally protected, and provided with permanently lubricated bearings.
- H Controls:
- 1. 24-volt auxiliary relay.
  - 2. Terminal block for remote control.
  - 3. 2-speed fan switch.
  - 4. Built-in thermostat for wall mounted units. Remote low-voltage thermostat for suspended units.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A Verify that surfaces are suitable for installation.

**3.02 INSTALLATION**

- A Install in accordance with manufacturer's recommendations.
- B All coils, fan coils, unit heaters, and other devices shall be fully accessible for cleaning and servicing. Contractor shall coordinate accessibility with other trades.
- C Unit Heaters:
  - 1. Hang from building structure, with pipe hangers anchored to building, not from piping or electrical conduit.
  - 2. Mount as high as possible to maintain greatest headroom unless otherwise indicated.
- D Units with Electric Heating Elements:
  - 1. Install as indicated including electrical devices furnished by manufacturer but not factory installed.

**3.03 CLEANING**

- A After construction and painting is completed, clean exposed surfaces of units.
- B Touch-up marred or scratched surfaces of factory-finished cabinets using finish materials furnished by the manufacturer.

**3.04 PROTECTION**

- A Provide finished cabinet units with protective covers during the balance of construction.

**END OF SECTION 23 82 00**

**SECTION 26 01 00**  
**ELECTRICAL GENERAL PROVISIONS**

**PART 1 GENERAL**

**1.01 SCOPE OF WORK**

- A This Contractor shall provide all materials, equipment and labor necessary to install and set into operation the electrical equipment as shown on the Engineering Drawings and as contained herein.

**1.02 QUALITY ASSURANCE**

- A See the General and Supplementary General Conditions and Architectural Divisions.
- B All work shall be in accordance with the North Carolina State Building Code, which includes the 2020 edition of the National Electrical Code.
- C The Contractor shall be responsible for obtaining all permits and shall notify inspection departments as work progresses.
- D Wherever the words "Approved", "Approval", and "Approved Equal" appear, it is intended that items other than the model numbers specified shall be subject to the approval of the Engineer.
- E "Provide" as used herein shall mean that the Contractor responsible shall furnish and install said item or equipment. "Furnish" as used herein shall mean that the Contractor responsible shall acquire and make available said item or equipment and that installation shall be by others. "Install" as used herein shall mean that the Contractor responsible shall make installation of items or equipment furnished by others.
- F All personnel under this Contractor's supervision shall be qualified to perform those portions of the work assigned to them. Personnel (including project managers) deemed to be negative to the overall success of the project shall be removed from the project and replaced with qualified personnel who will be positive for the project. Upon written notification that particular personnel have been deemed negative to the overall success of the project, this Contractor shall immediately replace such particular personnel. The engineer shall be sole arbiter and any decision regarding fitness of this Contractor's personnel for this project shall not be subject to appeal.

**1.03 SUBMITTALS**

- A See General and Supplementary General Conditions and Division 1.
- B Within ten (10) days after notification of the award of the Contract and written notice to begin work, the Contractor shall submit for approval to the Architect/Engineer a detailed list of equipment and material which he proposes to use.
- C The Contractor shall provide an electronic pdf copy of the submittal data on the products, methods, etc. proposed for use on the project. The submittal shall contain complete submittal data on all products, methods, etc. proposed for use on the project.
- D Each submittal shall bear the approval of the Contractor indicating that he has reviewed the data and found it to meet the requirements of the specifications as well as space limitations and other project conditions. The submittals shall be clearly identified showing project name, manufacturer's catalog number and all necessary performance and fabrication data. Detailed submittal data shall be provided when items are to be considered as substitution for specified items. Acceptance for approval shall be in writing from the Engineer.
- E The Contractor shall submit to the Engineer a set of accurately marked-up plans indicating all changes encountered during the construction. Final payment will be contingent on receipt of these as-built plans.
- F The Contractor shall furnish an electronic copy of maintenance and operating instructions.
- G The Contractor shall submit to the Engineer a duplicate set of final electrical inspection certificates prior to final payment.

**1.04 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A All material and equipment shall be delivered and unloaded by the Contractor within the project site as noted herein or as directed by the Owner.
- B The Contractor shall protect all material and equipment from breakage, theft or weather damage. No material or equipment shall be stored on the ground.
- C The material and equipment shall remain the property of the Contractor until the project has been completed and turned over to the Owner.

- D Where equipment cannot be stored at the site due to exposure to the elements or lack of storage space, the contractor shall store all equipment in a bonded warehouse until the time of installation.

**1.05 WORK CONDITIONS AND COORDINATION**

- A The Contractor shall review the entire set of plans to establish points of connection and the extent of electrical work to be provided in his Contract.
- B The contractor is responsible for reviewing the complete set of contract documents. Coordinate all phasing requirements with architectural drawings. Coordinate equipment locations and utility routing with all trades to ensure code compliance and constructibility.
- C This Contractor shall be responsible for all electrical work and make final connections to equipment installed in his Contract.
- D Pipe, conduit and duct chases required for installation of work shall be provided by the General Contractor unless otherwise noted. This Contractor shall be responsible for coordinating the location of all required chases.
- E All work shall be coordinated with other trades. Cutting of new work and subsequent patching shall be approved by Architect/ Engineer and shall be at the Contractor's expense with no extra cost to the Owner.

**1.06 GUARANTEE**

- A See the General and Supplementary General Conditions.
- B Where extended warranties or guarantees are available from the manufacturer, the Contractor shall prepare the necessary Contract Documents to validate these warranties as required by the manufacturer and present them to the Architect/Engineer.

**PART 2 PRODUCTS**

**2.01 MATERIAL QUALITY**

- A Material and equipment shall be new, unless noted otherwise, of the highest grade and quality and free from defects or other imperfections. Material and equipment found defective shall be removed and replaced at the Contractor's expense.

**2.02 EQUIPMENT LISTINGS**

- A All materials and equipment shall be third party listed by an agency accredited by the NCBCC and NC Department of Insurance (NC DOI). The list of accredited agencies may be obtained on NCDOI's web site.

**PART 3 EXECUTION**

**3.01 INSPECTION**

- A If any part of this Contractor's work is dependent for its proper execution or for its subsequent efficiency or appearance on the character or conditions of contiguous work not executed by him, the Contractor shall examine and measure such contiguous work and report to the Architect or Engineer in writing any imperfection therein, or conditions that render it unsuitable for the reception of this work. Should the Contractor proceed without making such written report, he shall be held to have accepted such work and the existing conditions and he shall be responsible for any defects in this work consequent hereon and will not be relieved of the obligation of any guarantee because of any such imperfection or condition.
- B After the designer pre-final inspection and confirmation that the final punch list items have been completed. The contractor shall schedule a final electrical inspection with the SCO office. Inspections shall be Monday through Friday unless specifically coordinated with the SCO office.

**3.02 INSTALLATION**

- A All work shall be performed in a manner indicating proficiency in the trade.
- B All conduit, pipes, ducts, etc., shall be either parallel to building walls or plumb where installed in a vertical position and shall be concealed when located in architecturally finished areas.
- C Any cutting or patching required for installation of this Contractor's work shall be kept to a minimum. Written approval shall be required by the Architect/Engineer if cutting of primary structure is involved.
- D All patching shall be done in such a manner as to restore the areas or surfaces to match existing finishes.
- E The Contractor shall lay-out and install his work in advance of pouring concrete floors or walls. He shall furnish and install all sleeves or openings through poured masonry floors or walls above grade required for passage of all conduits, pipes or duct installed by him. The Contractor shall furnish and install all inserts and hangers required to support his equipment.

- F The Contractor shall be responsible for removing all spray-on fireproofing overspray from all equipment, light fixtures, and all other materials provided as part of the electrical contract.

**3.03 PERFORMANCE**

- A The Contractor shall perform all excavation and backfill operations necessary for installation of his work.
- B Rock excavation shall be defined in the Supplementary General Conditions, Division 1 or Division 2. Unless specifically stated, neither rock excavation nor a unit price for rock excavation shall be required in the bid.

**3.04 ERECTION**

- A All support steel, angles, channels, pipes or structural steel stands and anchoring devices that may be required to rigidly support or anchor material and equipment shall be provided by this Contractor.

**3.05 FIELD QUALITY CONTROL**

- A The Contractor shall conform to the requirements of Division 3 for concrete testing.
- B The Contractor shall test his entire installation and shall furnish the labor and materials required for these tests. Tests shall be performed in accordance with the requirements of the particular section of the specifications and in accordance with the requirements of the State Ordinances and Codes, and the National Electrical Code. The Contractor shall notify the Architect or Engineer of his readiness for such test. A final inspection by the Electrical Inspector or Local Authority Having Jurisdiction is required, and an inspection certificate is required prior to authorization of final payment.
- C Testing required for compliance with the Contract shall be stated in subsequent sections.
- D All tests specified shall be completely documented indicating time of day, date, temperature and all other pertinent test information including the entity conducting the test.
- E All required documentation of readings required by each test shall be submitted to the Engineer prior to, and as one of the prerequisites for, final acceptance of the project.

**3.06 ADJUST AND CLEAN**

- A All equipment and installed materials shall be thoroughly clean and free of all dirt, oil, grit, grease, etc.
- B Factory painted equipment shall not be repainted unless damaged areas exist. These areas shall be touched up with a material suitable for the intended service. In no event shall nameplates be painted.
- C At a scheduled meeting, the Contractor shall instruct the Owner or the Owner's representative in the operation and maintenance of all equipment installed under his Contract (in the presence of the Engineer).

**3.07 MAINTENANCE AND OPERATING MANUAL**

- A The Contractor shall prepare an electronic submission of a manual describing the proper maintenance and system operation. This manual shall not consist of standard factory printed data intended for dimension or design purposes (although these may be included), but shall be prepared to describe this particular job. This manual shall include the following:
  - B Data on all equipment as listed on the fixture and equipment schedules on the plans. Also data on all fire alarm, telephone system, public address system, security system, lighting control systems, CCTV, MATV, CATV, generator, battery backup system, etc. that are applicable for the project.
  - C Warranties as required for each product.
  - D A check list for periodic maintenance of all equipment requiring maintenance. (i.e., fire alarm system, security system, generator, battery backup system, etc.)
  - E Maintenance and spare parts data for all equipment.
  - F As-Built wiring for equipment containing field wired systems. (i.e., fire alarm, security, data system, CATV, telephone, public address, etc.)
  - G The manuals shall be dated and signed by the Contractor when completed.
  - H The operating and maintenance manuals shall be submitted to the Engineer for approval. When the manuals are considered complete by the Engineer, they will be turned over to the Owner for their permanent use.

**END OF SECTION 26 01 00 26 01 00**

**SECTION 26 05 05**  
**ELECTRICAL DEMOLITION**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Electrical demolition.

**PART 2 PRODUCTS**

**2.01 MATERIALS AND EQUIPMENT**

- A Materials and equipment for patching and extending work.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A Verify field measurements and circuiting arrangements are as indicated.
- B Report discrepancies to Architect before disturbing existing installation.

**3.02 PREPARATION**

- A Disconnect electrical systems in walls, floors, and ceilings to be removed.
- B Coordinate utility service outages with utility company.
- C Provide temporary wiring and connections to maintain existing systems in service during construction. When work must be performed on energized equipment or circuits, use personnel experienced in such operations.
- D Existing Electrical Service: Maintain existing system in service until new system is complete and ready for service. Disable system only to make switchovers and connections. Minimize outage duration.
  - 1. Obtain permission from Owner at least 48 hours before de-energizing system.
- E Fire alarm system shall be maintained to all occupied portions of the building.
  - 1. Notify Owner and Fire Marshall a least 48 hours before partially or completely disabling system.
  - 2. If the Fire alarm system cannot be maintained in the occupied portion of the building contractor shall provide a fire watch in accordance with NFPA 72 and local authority requirements.

**3.03 DEMOLITION AND EXTENSION OF EXISTING ELECTRICAL WORK**

- A Perform work for removal and disposal of equipment and materials containing toxic substances regulated under the Federal Toxic Substances Control Act (TSCA) in accordance with applicable federal, state, and local regulations. Lamps are to be disposed of in accordance with NC G.S. 130A - 310.60. Applicable equipment and materials include, but are not limited to:
  - 1. PCB-containing electrical equipment, including transformers, capacitors, and switches.
  - 2. PCB- and DEHP-containing lighting ballasts.
  - 3. Mercury-containing lamps and tubes, including fluorescent lamps, high intensity discharge (HID), arc lamps, ultra-violet, high pressure sodium, mercury vapor, ignitron tubes, neon, and incandescent.
- B Remove, relocate, and extend existing installations to accommodate new construction.
- C Remove abandoned wiring to source of supply.
- D Remove exposed abandoned conduit, including abandoned conduit above accessible ceiling finishes. Where conduit cannot be removed from floors or walls, cut conduit flush with walls and floors, and patch surfaces.
- E Disconnect abandoned outlets and remove devices. Remove abandoned outlets if conduit servicing them is abandoned and removed. Provide blank cover for abandoned outlets that are not removed.
- F Repair adjacent construction and finishes damaged during demolition and extension work.
- G Maintain access to existing electrical installations that remain active. Modify installation or provide access panel as appropriate.
- H Remove all devices from walls or ceilings shown to be removed on the Architectural drawings whether shown on the electrical demolition plans or not.
- I Where existing downstream devices are to remain, extend existing branch circuit conduit and conductors to maintain service.

**3.04 CLEANING AND REPAIR**

- A Clean and repair existing materials and equipment that remain or that are to be reused.

**END OF SECTION 26 05 05**

**SECTION 26 05 19**  
**POWER CONDUCTORS AND CABLES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Single conductor building wire.
- B Underground feeder and branch-circuit cable.
- C Service entrance cable.
- D Wiring connectors.
- E Electrical tape.
- F Oxide inhibiting compound.
- G Wire pulling lubricant.

**1.02 REFERENCE STANDARDS**

- A ASTM B3 - Standard Specification for Soft or Annealed Copper Wire 2013 (Reapproved 2018).
- B ASTM B8 - Standard Specification for Concentric-Lay-Stranded Copper Conductors, Hard, Medium-Hard, or Soft 2011 (Reapproved 2017).
- C ASTM B33 - Standard Specification for Tin-Coated Soft or Annealed Copper Wire for Electrical Purposes 2010, with Editorial Revision (2020).
- D ASTM B787/B787M - Standard Specification for 19 Wire Combination Unilay-Stranded Copper Conductors for Subsequent Insulation 2004 (Reapproved 2020).
- E NFPA 70 - National Electrical Code; National Fire Protection Association, Including All Applicable Amendments and Supplements; 2020.

**1.03 SUBMITTALS**

- A Product Data: Provide manufacturer's standard catalog pages and data sheets for conductors and cables, including detailed information on materials, construction, ratings, listings, and available sizes, configurations, and stranding.
- B Field Quality Control Test Reports.
- C Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- D Project Record Documents: Record actual installed circuiting arrangements. Record actual routing of exterior below grade conduit and associated hand holes or man holes..
- E Maintenance Materials: Furnish the following for Owner's use in maintenance of project.

**1.04 QUALITY ASSURANCE**

- A Comply with requirements of NFPA 70.
- B Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum five years documented experience.
- C Product Listing Organization Qualifications: Third party agencies shall be amongst those accredited by the NCBC (North Carolina Building Code Council) to label Electrical and Mechanical Equipment.

**1.05 DELIVERY, STORAGE, AND HANDLING**

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

**1.06 FIELD CONDITIONS**

- A Do not install or otherwise handle thermoplastic-insulated conductors at temperatures lower than 14 degrees F, unless otherwise permitted by manufacturer's instructions. When installation below this temperature is unavoidable, notify Architect and obtain direction before proceeding with work.

**PART 2 PRODUCTS**

**2.01 CONDUCTOR AND CABLE APPLICATIONS**

- A Do not use conductors and cables for applications other than as permitted by NFPA 70 and product listing.
- B Provide single conductor building wire installed in suitable raceway unless otherwise indicated, permitted, or required.
- C Nonmetallic-sheathed cable is not permitted.
- D Service entrance cable is not permitted.

1. For underground service entrance, installed in raceway.

## **2.02 CONDUCTOR AND CABLE GENERAL REQUIREMENTS**

- A Provide products that comply with requirements of NFPA 70.
- B Provide products listed, classified, and labeled as suitable for the purpose intended.
- C All conductors shall be labeled two feet on centers indicating size, type, voltage, rating, and manufacturer's name.
- D Provide new conductors and cables manufactured not more than one year prior to installation.
- E Unless specifically indicated to be excluded, provide all required conduit, boxes, wiring, connectors, etc. as required for a complete operating system.
- F Comply with NEMA WC 70.
- G Conductor Material:
  1. Provide copper conductors except where aluminum conductors are specifically indicated. Substitution of aluminum conductors for copper is not permitted. Conductor sizes indicated are based on copper unless specifically indicated as aluminum. Conductors designated with the abbreviation "AL" indicate aluminum.
  2. Copper Conductors: Soft drawn annealed, 98 percent conductivity, uncoated copper conductors.
  3. Aluminum Conductors (only where specifically indicated or permitted for substitution): AA-8000 series aluminum alloy conductors.
- H Minimum Conductor Size: 12 AWG.
- I Maximum Conductor Size: 500 kcmil
- J Conductors for branch circuits shall be sized to prevent a voltage drop exceeding three percent (3%) at the farthest outlet of power, heating and lighting loads, or any combination of such loads. The maximum total voltage drop on both feeders and branch circuits to the farthest outlet shall not exceed five percent (5%).
  1. Where the branch circuit conductor length from the panel to the first outlet on a 277 volt circuit exceeds 125 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG. Increase the branch circuit conductor size an additional wire size for reach 125' of additional length of the entire circuit. The ground conductor size shall be increased proportionately to the increase in the phase conductors per 2020 NEC 250.122(B).
  2. Where the conductor length from the panel to the first outlet on a 120 volt circuit exceeds 50 feet, the branch circuit conductors from the panel to the first outlet shall not be smaller than #10 AWG. Increase the branch circuit conductor size an additional wire size for reach 100' of additional length of the entire circuit. The ground conductor size shall be increased proportionately to the increase in the phase conductors per 2020 NEC 250.122(B).
- K Conductor Color Coding:
  1. Color code conductors as indicated unless otherwise required by the authority having jurisdiction. Maintain consistent color coding throughout project.
  2. Color Coding Method:
    - a. Conductors #10 AWG and smaller shall be factory color coded.
    - b. Conductors #3 and larger shall be factory color coded on the entire length.
  3. Color Code:
    - a. 480Y/277 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Brown.
      - 2) Phase B: Orange.
      - 3) Phase C: Yellow.
      - 4) Neutral/Grounded: Gray.
    - b. 208Y/120 V, 3 Phase, 4 Wire System:
      - 1) Phase A: Black.
      - 2) Phase B: Red.
      - 3) Phase C: Blue.
      - 4) Neutral/Grounded: White.
    - c. Equipment Ground, All Systems: Green.

- d. 0 - 10V Dimming conductors: Violet and Grey

### **2.03 BUILDING WIRE**

- A Approved Manufacturers as listed below or approved equal:
  - 1. Copper or Aluminum Building Wire:
    - a. Triangle
    - b. Okonite
    - c. Houston Wire and Cable
    - d. or approved equal
- B Description: Single conductor insulated wire.
- C Conductor Stranding:
  - 1. Feeders and Branch Circuits:
    - a. Size 10 AWG and Smaller: Solid.
    - b. Size 8 AWG and Larger: Class B Stranded.
- D Insulation Voltage Rating: 600 V.
- E Insulation:
  - 1. Copper Building Wire: Type THHN/THWN or XHHW-2.
  - 2. Conductors routed on roofs or other exterior surface where raceway is exposed to direct sunlight shall be type XHHW-2 insulation.
  - 3. Aluminum Building Wire (only where specifically indicated or permitted for substitution): Type XHHW-2.

### **2.04 WIRING CONNECTORS**

- A Description: Wiring connectors appropriate for the application, suitable for use with the conductors to be connected, and listed as complying with UL 486A-486B or UL 486C as applicable.
- B Connectors for Grounding and Bonding: Comply with Section 26 05 26.
- C Wiring Connectors for Splices and Taps:
  - 1. Splices or taps shall not be allowed for feeder conductors unless specifically noted on plans.
  - 2. Where a splice or tap for feeder conductors is noted on the plans, connectors shall be Blackburn insulated multi-tap or approved equal.
  - 3. Splices in branch circuit conductors shall be allowed in accessible junction boxes, troughs, or gutters.
    - a. Copper Conductors #10 AWG and smaller: Use twist-on insulated spring connectors.
    - b. Copper Conductors #8 AWG and larger: Use mechanical connectors with gum rubber tape or friction tape. Solderless mechanical connectors with UL listed insulating covers may be used at contractor's option.
  - 4. Use of split bolts is not allowed.
  - 5. "Sta-kon" or other permanent type crimp connectors shall not be used for branch circuit connections.
- D Wiring Connectors for Terminations:
  - 1. Provide terminal lugs for connecting conductors to equipment furnished with terminations designed for terminal lugs.
  - 2. Provide compression adapters for connecting conductors to equipment furnished with mechanical lugs when only compression connectors are specified.
  - 3. Where over-sized conductors are larger than the equipment terminations can accommodate, provide connectors suitable for reducing to appropriate size, but not less than required for the rating of the overcurrent protective device.
- E Twist-on Insulated Spring Connectors: Rated 600 V, 221 degrees F for standard applications and 302 degrees F for high temperature applications; pre-filled with sealant and listed as complying with UL 486D for damp and wet locations.

### **2.05 ACCESSORIES**

- A Electrical Tape:
  - 1. Vinyl Color Coding Electrical Tape: Integrally colored to match color code indicated; listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; suitable for continuous temperature environment up to 221 degrees F.

- a. Product: Okonite 2000 or approved equal.
- 2. Vinyl Insulating Electrical Tape: Complying with ASTM D3005 and listed as complying with UL 510; minimum thickness of 7 mil; resistant to abrasion, corrosion, and sunlight; conformable for application down to 0 degrees F and suitable for continuous temperature environment up to 221 degrees F.
- B Oxide Inhibiting Compound: Listed; suitable for use with the conductors or cables to be installed.
- C Wire Pulling Lubricant: Listed; suitable for use with the conductors or cables to be installed and suitable for use at the installation temperature.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A Verify that interior of building has been protected from weather.
- B Verify that work likely to damage wire and cable has been completed.
- C Verify that raceways, boxes, and equipment enclosures are installed and are properly sized to accommodate conductors and cables in accordance with NFPA 70.
- D Verify that field measurements are as indicated.
- E Verify that conditions are satisfactory for installation prior to starting work.

**3.02 PREPARATION**

- A Clean raceways thoroughly to remove foreign materials before installing conductors and cables.

**3.03 INSTALLATION**

- A Circuiting Requirements:
  - 1. Circuit routing indicated is diagrammatic.
  - 2. Maintain separation of Class 1, Class 2, and Class 3 remote-control, signaling, and power-limited circuits in accordance with NFPA 70.
  - 3. 0 - 10V lighting dimming conductors may not be routed in the same raceway with line voltage conductors.
  - 4. Maintain separation of wiring for emergency systems in accordance with NFPA 70.
  - 5. Common Neutrals: Unless otherwise indicated, sharing of neutral/grounded conductors among up to three single phase branch circuits of different phases installed in the same raceway is not permitted. Provide dedicated neutral/grounded conductor for each individual branch circuit.
  - 6. A dedicated green equipment grounding conductor shall be provided for all raceways containing branch circuit or feeder conductors. Equipment ground conductor shall be sized in accordance with the NEC.
- B Install products in accordance with manufacturer's instructions.
- C Install conductors and cable in a neat and workmanlike manner. Neatly train and lace wiring inside boxes, equipment, and panelboards.
- D Installation in Raceway:
  - 1. Tape ends of conductors and cables to prevent infiltration of moisture and other contaminants.
  - 2. Pull all conductors and cables together into raceway at same time.
  - 3. Do not damage conductors and cables or exceed manufacturer's recommended maximum pulling tension and sidewall pressure.
  - 4. Use suitable wire pulling lubricant for conductors #4 AWG or larger, except when lubricant is not recommended by the manufacturer.
- E Paralleled Conductors: Install conductors of the same length and terminate in the same manner.
- F Secure and support conductors and cables in accordance with NFPA 70 using suitable supports and methods approved by the authority having jurisdiction. Provide independent support from building structure. Do not provide support from raceways, piping, ductwork, or other systems.
- G Install conductors with a minimum of 12 inches of slack at each outlet.
- H Neatly train conductors inside boxes, wireways, panelboards and other equipment enclosures. Conductors shall not be laced or bundled to avoid overheating.
- I Group or otherwise identify neutral/grounded conductors with associated ungrounded conductors inside enclosures in accordance with NFPA 70.

- J Make wiring connections using specified wiring connectors.
  - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors.
  - 2. Do not remove conductor strands to facilitate insertion into connector.
  - 3. Clean contact surfaces on conductors and connectors to suitable remove corrosion, oxides, and other contaminants. Do not use wire brush on plated connector surfaces.
  - 4. Connections for Aluminum Conductors: Fill connectors with oxide inhibiting compound where not pre-filled by manufacturer.
- K Insulate ends of spare conductors using vinyl insulating electrical tape.
- L Unless specifically indicated to be excluded, provide final connections to all equipment and devices, including those furnished by others, as required for a complete operating system.

### **3.04 FIELD QUALITY CONTROL**

- A All tests shall be completely documented indicating time of day, date, temperature and all pertinent test information. All required documentation shall be submitted to the Engineer prior to, and as a prerequisite for, final acceptance of the project. All test results shall be included in the Owner's operation and maintenance manual.
- B Inspect and test in accordance with NETA ATS, Section 7.3.2.
  - 1. Perform each of the following visual and electrical tests:
    - a. Compare cable data with drawings and specifications to ensure compliance with contract documents.
    - b. Inspect exposed sections of conductor and cable for physical damage and correct connection according to the single-line diagram.
    - c. Test bolted connections for high resistance using one of the following:
      - 1) A low-resistance ohmmeter.
      - 2) Calibrated torque wrench.
    - d. Inspect compression-applied connectors for correct cable match and indentation.
    - e. Inspect for correct identification.
    - f. Inspect cable jacket and condition.
    - g. Continuity test on each conductor and cable.
    - h. Uniform resistance of parallel conductors.
- C Insulation resistance test is required for all feeder conductors prior to energizing feeders, sub-feeders, or service entrance conductors.
  - 1. All current carrying feeder phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. This shall be done with a 500 volt insulation resistance tester. In the procedures listed below shall be followed:
    - a. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG wire and smaller, 250,000 ohms or more for #4 AWG wire or larger, between conductors and between conductor and the grounding conductor.
    - b. After all fixtures, devices and equipment are installed and all connections completed to each panel, the Contractor shall disconnect the neutral feeder conductor from the neutral bar and take an insulation resistance reading between the neutral bar and the grounded enclosure. If this reading is less than 250,000 ohms, the Contractor shall disconnect the branch circuit neutral wires from this neutral bar. He shall then test each one separately to the panel and until the low readings are found. The Contractor shall correct troubles, reconnect and retest until at 250,000 ohms from the neutral bar to the grounded panel can be achieved with only the neutral feeder disconnected.
    - c. The Contractor shall send a letter to the Engineer certifying that the above has been done and tabulating the insulation resistance readings for each panel. This shall be done at least four (4) days prior to final inspection.
    - d. At final inspection, The Contractor shall furnish a insulation resistance tester and show the Engineer's representatives that the panels comply with the above requirements. He shall also furnish a hook-on type ammeter and voltmeter to take current and voltage readings as directed by

the representatives.

- e. Results of the test shall be made available to the engineer at the required pre-energization walk through.
- 2. Disconnect surge protective devices (SPDs) prior to performing any high potential testing. Replace SPDs damaged by performing high potential testing with SPDs connected.
- D Correct deficiencies and replace damaged or defective conductors and cables and re-test as indicated above. Contractor shall submit new test results to the Engineer to demonstrate the deficiency has been corrected.

**END OF SECTION 26 05 19**

**SECTION 26 05 26**

**GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Grounding and bonding requirements.
- B Conductors for grounding and bonding.
- C Connectors for grounding and bonding.
- D Ground bars.
- E Ground rod electrodes.

**1.02 REFERENCE STANDARDS**

- A IEEE 81 - IEEE Guide for Measuring Earth Resistivity, Ground Impedance, and Earth Surface Potentials of a Grounding System 2012.
- B NEMA GR 1 - Grounding Rod Electrodes and Grounding Rod Electrode Couplings 2022.
- C NETA ATS - Standard For Acceptance Testing Specifications For Electrical Power Equipment And Systems 2021.
- D NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- E UL 467 - Grounding and Bonding Equipment Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A Coordination:
  - 1. Verify exact locations of underground metal water service pipe entrances to building.
  - 2. Coordinate the work with other trades to provide steel reinforcement complying with specified requirements for concrete-encased electrode.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B Sequencing:
  - 1. Do not install ground rod electrodes until final backfill and compaction is complete.

**1.04 SUBMITTALS**

- A Product Data: Provide manufacturer's standard catalog pages and data sheets for grounding and bonding system components.
- B Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- C Field quality control test reports.
- D Project Record Documents: Record actual locations of grounding electrode system components and connections.

**1.05 QUALITY ASSURANCE**

- A Comply with requirements of NFPA 70.
- B Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.
- C Product Listing Organization Qualifications: Third party agencies shall be amongst those accredited by the NCBC (North Carolina Building Code Council) to label Electrical and Mechanical Equipment.

**1.06 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.01 GROUNDING AND BONDING REQUIREMENTS**

- A Existing Work: Where existing grounding and bonding system components are indicated to be reused, they may be reused only where they are free from corrosion, integrity and continuity are verified, and where acceptable to the authority having jurisdiction.
- B Do not use products for applications other than as permitted by NFPA 70 and product listing.

- C Unless specifically indicated to be excluded, provide all required components, conductors, connectors, conduit, boxes, fittings, supports, accessories, etc. as necessary for a complete grounding and bonding system.
- D Where conductor size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.
- E Grounding System Resistance:
  - 1. Achieve specified grounding system resistance under normally dry conditions unless otherwise approved by Architect. Precipitation within the previous 48 hours does not constitute normally dry conditions.
  - 2. Grounding Electrode System: Not greater than 5 ohms to ground, when tested according to IEEE 81 using "fall-of-potential" method.
  - 3. Between Grounding Electrode System and Major Electrical Equipment Frames, System Neutral, and Derived Neutral Points: Not greater than 0.5 ohms, when tested using "point-to-point" methods.
- F Grounding Electrode System:
  - 1. Provide connection to required and supplemental grounding electrodes indicated to form grounding electrode system.
    - a. Provide continuous grounding electrode conductors without splice or joint.
    - b. Install grounding electrode conductors in raceway where exposed to physical damage. Bond grounding electrode conductor to metallic raceways at each end with bonding jumper.
  - 2. Metal Underground Water Pipe(s):
    - a. Provide connection to underground metal domestic and fire protection (where present) water service pipe(s) that are in direct contact with earth for at least 10 feet at an accessible location not more than 5 feet from the point of entrance to the building.
    - b. Provide bonding jumper(s) around insulating joints/pipes as required to make pipe electrically continuous.
    - c. Provide bonding jumper around water meter of sufficient length to permit removal of meter without disconnecting jumper.
  - 3. Metal In-Ground Support Structure:
    - a. Provide connection to metal in-ground support structure that is in direct contact with earth in accordance with NFPA 70.
  - 4. Concrete-Encased Electrode:
    - a. Where metallic structural components meet the definition of a concrete encased electrode as defined in NEC 250.52, the concrete encased electrode shall be bonded to the grounding electrode system per NEC 250.50. Coordinate with the structure prior to pouring concrete foundations.
    - b. Provide connection to concrete-encased electrode consisting of not less than 20 feet of either steel reinforcing bars or bare copper conductor not smaller than 4 AWG embedded within concrete foundation or footing that is in direct contact with earth in accordance with NFPA 70.
  - 5. Ground Rod Electrode(s):
    - a. Space electrodes not less than 10 feet from each other and any other ground electrode until maximum allowed resistance to ground is achieved.
    - b. Where location is not indicated, locate electrode(s) at least 5 feet outside building perimeter foundation as near as possible to electrical service entrance; where possible, locate in softscape (uncovered) area.
  - 6. Provide additional ground electrode(s) as required to achieve specified grounding electrode system resistance.
  - 7. Ground Bar: Provide ground bar in main electrical room, separate from service equipment enclosure, for common connection point of grounding electrode system bonding jumpers as permitted in NFPA 70. Connect grounding electrode conductor provided for service-supplied system grounding to this ground bar.
    - a. Ground Bar Size: 1/4" x 2" x 18" unless otherwise indicated or required.

- b. Where ground bar location is not indicated, locate in accessible location as near as possible to service disconnect enclosure.
  8. unless otherwise noted. Location as identified on plans.
  9. Ground Riser: Provide common grounding electrode conductor not less than 3/0 AWG for tap connections to multiple separately derived systems as permitted in NFPA 70.
- G Service-Supplied System Grounding:
1. For each service disconnect, provide grounding electrode conductor to connect neutral (grounded) service conductor to grounding electrode system. Unless otherwise indicated, make connection at neutral (grounded) bus in service disconnect enclosure.
  2. For each service disconnect, provide main bonding jumper to connect neutral (grounded) bus to equipment ground bus where not factory-installed. Do not make any other connections between neutral (grounded) conductors and ground on load side of service disconnect.
- H Separately Derived System Grounding:
1. Separately derived systems include, but are not limited to:
    - a. Transformers.
    - b. Uninterruptible power supplies (UPS), when configured as separately derived systems.
    - c. Generators, when neutral is switched in the transfer switch.
  2. Provide grounding electrode conductor to connect derived system grounded conductor to nearest effectively grounded metal building frame. Unless otherwise indicated, make connection at neutral (grounded) bus in source enclosure.
  3. Provide bonding jumper to connect derived system grounded conductor to nearest metal building frame and nearest metal water piping in the area served by the derived system, where not already used as a grounding electrode for the derived system. Make connection at same location as grounding electrode conductor connection.
  4. Where common grounding electrode conductor ground riser is used for tap connections to multiple separately derived systems, provide bonding jumper to connect the metal building frame and metal water piping in the area served by the derived system to the common grounding electrode conductor.
  5. Provide system bonding jumper to connect system grounded conductor to equipment ground bus. Make connection at same location as grounding electrode conductor connection. Do not make any other connections between neutral (grounded) conductors and ground on load side of separately derived system disconnect.
- I Bonding and Equipment Grounding:
1. Provide bonding for equipment grounding conductors, equipment ground busses, metallic equipment enclosures, metallic raceways and boxes, device grounding terminals, and other normally non-current-carrying conductive materials enclosing electrical conductors/equipment or likely to become energized as indicated and in accordance with NFPA 70.
  2. Provide insulated equipment grounding conductor in each feeder and branch circuit raceway. Do not use raceways as sole equipment grounding conductor.
  3. Where circuit conductor sizes are increased for voltage drop, increase size of equipment grounding conductor proportionally in accordance with NFPA 70.
  4. Unless otherwise indicated, connect wiring device grounding terminal to branch circuit equipment grounding conductor and to outlet box with bonding jumper.
  5. Terminate branch circuit equipment grounding conductors on solidly bonded equipment ground bus only. Do not terminate on neutral (grounded) or isolated/insulated ground bus.
  6. Provide bonding jumper across expansion or expansion/deflection fittings provided to accommodate conduit movement.
  7. Provide bonding for interior metal piping systems in accordance with NFPA 70. This includes, but is not limited to:
    - a. Metal water piping where not already effectively bonded to metal underground water pipe used as grounding electrode.
    - b. Metal gas piping.

- c. Metal process piping.
- J Communications Systems Grounding and Bonding:
  - 1. Provide intersystem bonding termination at service equipment or metering equipment enclosure and at disconnecting means for any additional buildings or structures in accordance with NFPA 70.
  - 2. Provide bonding jumper in raceway from intersystem bonding termination to each communications room or backboard and provide ground bar for termination.
    - a. Bonding Jumper Size: #3/0 AWG.
    - b. Raceway Size: 1" trade size unless otherwise indicated or required.
    - c. Ground Bar Size: 1/4" x 2" x 18" unless otherwise indicated or required.
    - d. Ground Bar Mounting Height: 18 inches above finished floor unless otherwise indicated.

## **2.02 GROUNDING AND BONDING COMPONENTS**

- A General Requirements:
  - 1. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - 2. Provide products listed and labeled as complying with UL 467 where applicable.
- B Conductors for Grounding and Bonding, in Addition to Requirements of Section 26 05 26:
  - 1. Use insulated copper conductors unless otherwise indicated.
    - a. Exceptions:
      - 1) Use bare copper conductors where installed underground in direct contact with earth.
      - 2) Use bare copper conductors where directly encased in concrete (not in raceway).
  - 2. Where insulated grounding conductors are used conductors shall be colored solid green.
  - 3. Grounding electrode conductors #4 AWG and larger shall be installed in raceway.
- C Connectors for Grounding and Bonding:
  - 1. Description: Connectors appropriate for the application and suitable for the conductors and items to be connected; listed and labeled as complying with UL 467.
  - 2. Unless otherwise indicated, use exothermic welded connections for underground, concealed and other inaccessible connections.
  - 3. Unless otherwise indicated, use double crimp compression connectors or exothermic welded connections for accessible connections.
- D Ground Bars:
  - 1. Description: Copper rectangular ground bars with mounting brackets and insulators.
  - 2. Size: As indicated elsewhere in this section.
  - 3. Holes for Connections: All mechanical connectors shall be double hole double crimp compression connectors..
- E Ground Rod Electrodes:
  - 1. Comply with NEMA GR 1.
  - 2. Material: Copper-bonded (copper-clad) steel.
  - 3. Size: 3/4 inch diameter by 10 feet length, unless otherwise indicated.

## **PART 3 EXECUTION**

### **3.01 EXAMINATION**

- A Verify that work likely to damage grounding and bonding system components has been completed.
- B Verify that field measurements are as indicated.
- C Verify that conditions are satisfactory for installation prior to starting work.

### **3.02 INSTALLATION**

- A Install products in accordance with manufacturer's instructions.
- B Install grounding and bonding system components in a neat and workmanlike manner.
- C Boxes with concentric, eccentric or oversized knockouts shall be provided with bonding bushings and jumpers. The jumper shall be sized per NEC table 250-122 and lugged to the box.
- D Ground Rod Electrodes: Unless otherwise indicated, install ground rod electrodes vertically. Where encountered rock prohibits vertical installation, install at 45 degree angle.
  - 1. Outdoor Installations: Unless otherwise indicated, install with top of rod 6 inches below finished grade.

- E Make grounding and bonding connections using specified connectors.
  - 1. Remove appropriate amount of conductor insulation for making connections without cutting, nicking or damaging conductors. Do not remove conductor strands to facilitate insertion into connector.
  - 2. Remove nonconductive paint, enamel, or similar coating at threads, contact points, and contact surfaces.
  - 3. Exothermic Welds: Make connections using molds and weld material suitable for the items to be connected in accordance with manufacturer's recommendations.
  - 4. Compression Connectors: Secure connections using manufacturer's recommended tools and dies. Connectors must be UL listed for use with grounding electrode conductors.
- F Identify grounding and bonding system components in accordance with Section 26 05 53.

**3.03 FIELD QUALITY CONTROL**

- A Inspect and test in accordance with NETA ATS Section 7.13.
  - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
  - 2. Verify that ground system was installed in accordance with the contract documents and NEC Article 250.
  - 3. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
    - a. Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
  - 4. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal at ground test wells and at individual ground rods. Make tests at ground rods before any conductors are connected.
    - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
    - b. Perform tests by fall-of-potential method according to IEEE 81.
- B Perform ground electrode resistance tests under normally dry conditions. Precipitation within the previous 48 hours does not constitute normally dry conditions.
- C Investigate and correct deficiencies where measured ground resistances do not comply with specified requirements.
- D Submit detailed reports indicating inspection and testing results and corrective actions taken.

**END OF SECTION 26 05 26**

**SECTION 26 05 29**

**HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Support and attachment requirements and components for equipment, conduit, cable, boxes, and other electrical work.

**1.02 RELATED REQUIREMENTS**

- A Section 26 05 33.13 - Conduit for Electrical Systems: Additional support and attachment requirements for conduits.
- B Section 26 05 36 - Cable Trays for Electrical Systems: Additional support and attachment requirements for cable tray.
- C Section 26 05 33.16 - Boxes and Cabinets: Additional support and attachment requirements for boxes.

**1.03 REFERENCE STANDARDS**

- A NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.04 ADMINISTRATIVE REQUIREMENTS**

- A Coordination:
- B Sequencing:

**1.05 SUBMITTALS**

- A Product Data: Provide manufacturer's standard catalog pages and data sheets for channel (strut) framing systems, non-penetrating rooftop supports, and post-installed concrete and masonry anchors.
- B Manufacturer's Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.

**1.06 QUALITY ASSURANCE**

**1.07 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.01 SUPPORT AND ATTACHMENT COMPONENTS**

- A General Requirements:
  - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
  - 2. Provide products listed, classified, and labeled as suitable for the purpose intended, where applicable.
  - 3. Where support and attachment component types and sizes are not indicated, select in accordance with manufacturer's application criteria as required for the load to be supported with a minimum safety factor of \_\_\_\_\_. Include consideration for vibration, equipment operation, and shock loads where applicable.
  - 4. Do not use products for applications other than as permitted by NFPA 70 and product listing.
- B Conduit and Cable Supports: Straps, clamps, etc. suitable for the conduit or cable to be supported.
  - 1. Conduit Straps: One-hole or two-hole type; steel or malleable iron.
  - 2. Conduit Clamps: Bolted type unless otherwise indicated.
- C Anchors and Fasteners:
  - 1. Concrete: Use preset concrete inserts, expansion anchors, or screw anchors.
  - 2. Solid or Grout-Filled Masonry: Use expansion anchors or screw anchors.
  - 3. Hollow Masonry: Use toggle bolts.
  - 4. Hollow Stud Walls: Use toggle bolts.
  - 5. Steel: Use beam clamps, machine bolts, or welded threaded studs.
  - 6. Sheet Metal: Use bolts, sheet metal screws, or bolts.
  - 7. Wood: Use wood screws.
  - 8. Plastic and lead anchors are not permitted.
  - 9. Powder-actuated fasteners are not permitted.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

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

**3.02 INSTALLATION**

- A Install products in accordance with manufacturer's instructions.
- B Perform work in accordance with NECA 1 (general workmanship).
- C Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
- D Do not provide support from suspended ceiling support system or ceiling grid.
- E Unless specifically indicated or approved by Architect, do not provide support from roof deck.
- F Do not penetrate or otherwise notch or cut structural members without approval of Structural Engineer.
- G Equipment Support and Attachment:
  - 1. Securely fasten floor-mounted equipment. Do not install equipment such that it relies on its own weight for support.
- H Conduits installed on the interior of exterior building walls shall be spaced off the wall surface a minimum of 1/4 inch using "clamp-backs" or strut.
- I Remove temporary supports.

**3.03 FIELD QUALITY CONTROL**

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

**END OF SECTION 26 05 29**

**SECTION 26 05 33.13**  
**CONDUIT FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Galvanized steel rigid metal conduit (RMC).
- B PVC-coated galvanized steel rigid metal conduit (RMC).
- C Flexible metal conduit (FMC).
- D Liquidtight flexible metal conduit (LFMC).
- E Electrical metallic tubing (EMT).
- F Rigid polyvinyl chloride (PVC) conduit.
- G Conduit fittings.
- H Accessories.

**1.02 REFERENCE STANDARDS**

- A ANSI C80.1 - American National Standard for Electrical Rigid Steel Conduit (ERSC) 2020.
- B ANSI C80.3 - American National Standard for Electrical Metallic Tubing -- Steel (EMT-S) 2020.
- C ANSI C80.6 - American National Standard for Electrical Intermediate Metal Conduit 2018.
- D ASTM B633 - Standard Specification for Electrodeposited Coatings of Zinc on Iron and Steel 2023.
- E ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware 2023.
- F ASTM A123/A123M - Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products 2017.
- G NECA 101 - Standard for Installing Steel Conduits (Rigid, IMC, EMT) 2020.
- H NECA 111 - Standard for Installing Nonmetallic Raceways (RNC, ENT, LFNC) 2017.
- I NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A Coordination:
  - 1. Coordinate minimum sizes of conduits with the actual conductors to be installed, including adjustments for conductor sizes increased for voltage drop.
  - 2. Coordinate the arrangement of conduits with structural members, ductwork, piping, equipment and other potential conflicts installed under other sections or by others.
  - 3. Verify exact conduit termination locations required for boxes, enclosures, and equipment installed under other sections or by others.
  - 4. Coordinate the work with other trades to provide roof penetrations that preserve the integrity of the roofing system and do not void the roof warranty.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.
- B Sequencing:
  - 1. Do not begin installation of conductors and cables until installation of conduit is complete between outlet, junction and splicing points.

**1.04 SUBMITTALS**

- A Product Data: Provide manufacturer's standard catalog pages and data sheets for conduits and fittings.
- B Project Record Documents: Record actual routing for conduits installed underground exterior to the building envelope.

**1.05 QUALITY ASSURANCE**

- A Conduit shall be delivered to the project site in bundles of full length pipes, each length marked with the trademark of the manufacturer and the Underwriters' Laboratories, Inc. stamp. Each conduit length shall be straight, true and free from scales, blisters, burrs and other imperfections.
  - 1. Product Listing Organization Qualifications: Third party agencies shall be amongst those accredited by the NCBC (North Carolina Building Code Council) to label Electrical and Mechanical Equipment.

**1.06 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.01 CONDUIT APPLICATIONS**

- A Do not use conduit and associated fittings for applications other than as permitted by NFPA 70 and product listing.
- B Unless otherwise indicated and where not otherwise restricted, use the conduit types indicated for the specified applications.
- C Embedded Within Concrete:
  - 1. Within Slab on Grade: Not permitted.
  - 2. Within Slab Above Ground: Not permitted.
  - 3. Within Poured Concrete Walls Above Ground: Use galvanized steel rigid metal conduit, intermediate metal conduit (IMC), PVC-coated galvanized steel rigid metal conduit, rigid PVC conduit, or reinforced thermosetting resin conduit (RTRC).
- D Outdoors: Apply raceways as indicated below unless otherwise noted
  - 1. Above ground conduit: Rigid galvanized steel conduit with 90o rigid elbow below grade transition to PVC.
  - 2. Roof: Rigid galvanized steel conduit supported on rubber blocks and unistrut frame. Conduit must be at least 3-1/2" above roof surface.
  - 3. Feeders: PVC Type DB concrete encased
  - 4. Branch circuits: Schedule 40 PVC direct buried
  - 5. Telecommunications: Schedule 40 PVC concrete encased
  - 6. Connections to vibrating equipment including transformers, generators, and other motor driven equipment: Liquid tight flexible metal conduit.
  - 7. Boxes and enclosures above ground Nema Type 4
  - 8. Where rigid polyvinyl (PVC) conduit is used for feeder conductors, transition to galvanized steel rigid metal conduit a minimum of three feet horizontally prior to emerging from underground.
  - 9. Where rigid polyvinyl (PVC) conduits are used for branch circuits, use galvanized steel rigid metal conduit elbows for bends.
- E Indoors: Finished spaces (not subject to physical damage)
  - 1. Raceway shall be routed concealed in interior portions of furred spaces, ceilings, and cavities, unless other than concrete or solid plaster where possible.
  - 2. Raceways 2 inch or less shall be allowed to be EMT conduit.
  - 3. All raceways concealed in exterior walls shall be rigid galvanized steel conduit.
  - 4. All raceways larger than 2 inch shall be rigid galvanized conduit.
  - 5. Where surface mounted conduit is required in finished spaces, contractor shall utilize surface metal raceway wire mold.
  - 6. Where there is a transition between RGS in a wall to EMT above ceiling, it shall be made at a junction box above accessible ceiling.
  - 7. Interior, Damp or Wet Locations: Use galvanized steel rigid metal conduit.
- F Stub Ups
  - 1. All feeder stub ups shall transition below grade from PVC to rigid a minimum of 3 feet horizontally from stub up location.
  - 2. All branch circuit stub ups, where exposed or in non-CMU walls, shall transition to rigid galvanized steel at 90 degree elbow.
  - 3. Schedule 40 rigid polyvinyl (PVC) stub ups are only allowed where conduits come up in CMU walls or the bottom of floor mounted equipment.
- G Unfinished spaces subject to damage (Electrical, Mechanical etc.)
  - 1. All conduit in unfinished spaces shall rigid galvanized steel. Conduit is not considered subject to damage when installed at least 10 feet above finished floor or tight to structure.
  - 2. Conduits are not required to transition to rigid galvanized steel where they are routed down into panelboards or other wall mounted equipment.
- H Exposed, Interior finished spaces: Use surface metal raceway as identified on the drawings.

1. Surface metal raceway shall be manufactured by Wiremold or approved equal.
2. A separate equipment ground conductor shall be run in the surface metal raceway.
- I Connection to vibrating equipment shall be made with flexible metal conduit or liquid tight flexible metal conduit depending on the environment installed.
- J Connections to Luminaires Above Accessible Ceilings: Use flexible metal conduit shall be allowed.
  1. Maximum Length: 6 feet.
- K Connections to Vibrating Equipment:
  1. Dry Locations: Use flexible metal conduit.
  2. Damp, Wet, or Corrosive Locations: Use liquidtight flexible metal conduit.
  3. Maximum Length: 6 feet unless otherwise indicated.
  4. Vibrating equipment includes, but is not limited to:
    - a. Transformers.
    - b. Motors.
    - c. Generators.

**2.02 CONDUIT REQUIREMENTS**

- A Existing Work: Where existing conduits are indicated to be reused, they may be reused only where they comply with specified requirements, are free from corrosion, and integrity is verified by pulling a mandrel through them.
- B Provide all conduit, fittings, supports, and accessories required for a complete raceway system.
- C Provide products listed, classified, and labeled as suitable for the purpose intended.
- D Minimum Conduit Size, Unless Otherwise Indicated:
  1. Interior: 3/4 inch (21 mm) trade size.
  2. Flexible Connections to Luminaires: 1/2 inch ( 13 mm) trade size.
  3. Exterior: 1 inch (27 mm) trade size.

**2.03 GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A Manufacturers:
  1. Allied Tube & Conduit.
  2. Republic Conduit.
  3. Wheatland Tube Company.
  4. or approved equal.
- B Description: NFPA 70, Type RMC standard weight mild steel, hot dipped galvanized, sherardised or zinc-coated rigid metal conduit complying with ANSI C80.1 and listed and labeled as complying with UL 6.
- C Fittings:
  1. Manufacturers:
    - a. Thomas & Betts Corporation.
    - b. Rayco.
    - c. Appleton.
    - d. or approved equal.
  2. Connectors and Couplings: Use steel compression fittings with insulated throats.

**2.04 INTERMEDIATE METAL CONDUIT (IMC)**

- A Description: NFPA 70, Type IMC galvanized steel intermediate metal conduit complying with ANSI C80.6 and listed and labeled as complying with UL 1242.
- B Fittings:
  1. Non-Hazardous Locations: Use fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
  2. Material: Use steel or malleable iron.
  3. Connectors and Couplings: Use threaded type fittings only. Threadless set screw and compression (gland) type fittings are not permitted.

**2.05 PVC-COATED GALVANIZED STEEL RIGID METAL CONDUIT (RMC)**

- A Manufacturers:
  1. Allied Tube & Conduit.

2. Republic Conduit.
3. Wheatland Tube Company.
4. or approved equal.

B Description: NFPA 70, Type RMC galvanized steel rigid metal conduit with external polyvinyl chloride (PVC) coating complying with NEMA RN 1 and listed and labeled as complying with UL 6.

C Exterior Coating: Polyvinyl chloride (PVC), nominal thickness of 40 mil.

D PVC-Coated Fittings:

1. Manufacturer: Same as manufacturer of PVC-coated conduit to be installed.
2. Non-Hazardous Locations: Use fittings listed and labeled as complying with UL 514B.
3. Exterior Coating: Polyvinyl chloride (PVC), minimum thickness of 40 mil.

**2.06 FLEXIBLE METAL CONDUIT AND LIQUIDTIGHT FLEXIBLE METAL CONDUIT (FMC LFMC)**

A Manufacturers:

1. Allied Tube & Conduit.
2. Republic Conduit.
3. Wheatland Tube Company.
4. or approved equal.

B Description: NFPA 70, Type FMC standard wall steel flexible metal conduit listed and labeled as complying with UL 1, and listed for use in classified firestop systems to be used.

C Description: NFPA 70, Type LFMC polyvinyl chloride (PVC) jacketed steel flexible metal conduit listed and labeled as complying with UL 360.

D Spiral strip construction shall allow the conduit to bend up to four times its internal radius.

E Fittings shall be compression type with insulated throats and listed for use with conduit specified.

**2.07 ELECTRICAL METALLIC TUBING (EMT)**

A Manufacturers:

1. Allied Tube & Conduit.
2. Republic Conduit.
3. Wheatland Tube Company.
4. or approved equal.

B Description: NFPA 70, Type EMT cold-rolled steel electrical metallic tubing with zinc coating on the inside and protected on the inside by a zinc, enamel or equivalent corrosion-resistant coating complying with ANSI C80.3 and listed and labeled as complying with UL 797.

C Fittings:

1. Description: Fittings complying with NEMA FB 1 and listed and labeled as complying with UL 514B.
2. Material: Use steel or malleable iron.
3. Connectors and Couplings: Use hexagonal compression (gland) type.
  - a. Do not use indenter type connectors and couplings.
  - b. Do not use set-screw type connectors and couplings.

**2.08 RIGID POLYVINYL CHLORIDE (PVC) CONDUIT**

A Manufacturers:

1. Allied Tube & Conduit.
2. Republic Conduit.
3. Wheatland Tube Company.
4. or approved equal.

B Description: NFPA 70, Type PVC rigid polyvinyl chloride conduit complying with NEMA TC 2 and listed and labeled as complying with UL 651; Schedule 40 or Schedule 80 as indicated; rated for use with conductors rated 90 degrees C.

C Fittings:

1. Manufacturer: Same as manufacturer of conduit to be connected.
2. Description: Fittings complying with NEMA TC 3 and listed and labeled as complying with UL 651; material to match conduit.

**2.09 ACCESSORIES**

- A Corrosion Protection Tape: PVC-based, minimum thickness of 20 mil.
- B Conduit Joint Compound: Corrosion-resistant, electrically conductive; suitable for use with the conduit to be installed.
- C Solvent Cement for PVC Conduit and Fittings: As recommended by manufacturer of conduit and fittings to be installed.
- D Pull Strings: Use nylon cord with average breaking strength of not less than 200 pound-force.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

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

**3.02 INSTALLATION**

- A Install products in accordance with manufacturer's instructions.
- B Install conduit in a neat and workmanlike manner tight against walls, columns or ceilings.
- C The conduit shall bend cold 90 degrees about a radius equal to ten (10) times its own diameter without signs of flaw or fracture in either pipe or protective coverings. All bends and offsets shall be made on a forming tool to prevent the conduit or its coating from being damaged in the bending.
- D Install galvanized steel rigid metal conduit (RMC) in accordance with NECA 101.
- E Install intermediate metal conduit (IMC) in accordance with NECA 101.
- F Install PVC-coated galvanized steel rigid metal conduit (RMC) using only tools approved by the manufacturer.
- G Install rigid polyvinyl chloride (PVC) conduit in accordance with NECA 111.
- H Conduit Routing:
  - 1. Unless dimensioned, conduit routing indicated is diagrammatic.
  - 2. Conceal all conduits unless specifically indicated to be exposed.
  - 3. Conduits in the following areas may be exposed, unless otherwise indicated:
    - a. Electrical rooms.
    - b. Mechanical equipment rooms.
  - 4. Arrange conduit to maintain maximum headroom, clearances, and access.
  - 5. Arrange conduit to provide no more than the equivalent of four 90 degree bends between pull points.
  - 6. Arrange conduit to provide no more than 100 feet between pull points.
  - 7. In every instance, conduit shall be installed in such a manner that the conductors may readily and easily be drawn or pulled in without strain or damage to the insulation; and, also, so that defective conductors may be readily and easily withdrawn and replaced by new conductors. Long radius bends and a sufficient number of approved pull and junction boxes shall be approved for this purpose, and as may be directed by the Engineer. All conduit shall be securely supported and grounded.
  - 8. Arrange conduit to prevent moisture traps. Provide drain fittings at low points and at sealing fittings where moisture may collect.
  - 9. Where conduits join any couplings or threaded fittings, the ends shall be made watertight.
  - 10. Maintain minimum clearance of 12 inches between conduits and hot surfaces. This includes, but is not limited to:
- I Conduit Support:
  - 1. Provide all required hangers, supports, anchors, fasteners, fittings, accessories, and hardware as necessary for the complete installation of electrical work.
  - 2. Secure and support conduits in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
  - 3. Provide independent support from building structure. Do not provide support from piping, ductwork, or other systems.
  - 4. Installation Above Suspended Ceilings: Do not provide support from ceiling support system. Do not provide support from ceiling grid or allow conduits to lay on ceiling tiles.

5. Use conduit strap to support single surface-mounted conduit.
    - a. Use clamp back spacer with conduit strap for damp and wet locations to provide space between conduit and mounting surface.
  6. Use metal channel (strut) with accessory conduit clamps to support multiple parallel surface-mounted conduits.
  7. Use conduit clamp to support single conduit from beam clamp or threaded rod.
  8. Use trapeze hangers assembled from threaded rods and metal channel (strut) with accessory conduit clamps to support multiple parallel suspended conduits.
  9. Steel Components: Use corrosion resistant materials suitable for the environment where installed.
    - a. Indoor Dry Locations: Use zinc-plated steel or approved equivalent unless otherwise indicated.
    - b. Outdoor and Damp or Wet Indoor Locations: Use galvanized steel, stainless steel, or approved equivalent unless otherwise indicated.
    - c. Zinc-Plated Steel: Electroplated in accordance with ASTM B633.
    - d. Galvanized Steel: Hot-dip galvanized after fabrication in accordance with ASTM A123/A123M or ASTM A153/A153M.
  10. Metal Channel (Strut) Framing Systems: Factory-fabricated continuous-slot metal channel (strut) and associated fittings, accessories, and hardware required for field-assembly of supports.
    - a. Minimum Channel Thickness: Steel sheet, 12 gage, 0.1046 inch.
    - b. Minimum Channel Dimensions: 1-5/8 inch width by 13/16 inch height.
- J Connections and Terminations:**
1. Use approved zinc-rich paint or conduit joint compound on field-cut threads of galvanized steel conduits prior to making connections.
  2. Where two threaded conduits must be joined and neither can be rotated, use three-piece couplings or split couplings. Do not use running threads.
  3. Use suitable adapters where required to transition from one type of conduit to another.
  4. Terminate threaded conduits in boxes and enclosures using threaded hubs or double lock nuts for dry locations and raintight hubs for wet locations.
  5. Provide insulating bushings or insulated throats at all conduit terminations to protect conductors.
  6. Secure joints and connections to provide maximum mechanical strength and electrical continuity.
  7. Condulet fittings shall not be used in lieu of pull boxes.
- K Penetrations:**
1. Do not penetrate or otherwise notch or cut structural members, including footings and grade beams.
  2. Make penetrations perpendicular to surfaces unless otherwise indicated.
  3. Where conduits penetrate waterproof membrane, seal as required to maintain integrity of membrane.
    - a. All raceway penetrating exterior walls or other water proof membranes shall slope away from the building with a minimum slope of 4" over 100 feet.
  4. Make penetrations for roof-mounted equipment within associated equipment openings and curbs where possible to minimize roofing system penetrations. Where penetrations are necessary, seal as required to preserve integrity of roofing system and maintain roof warranty.
  5. Install firestopping to preserve fire resistance rating of partitions and other elements. Refer to penetration details on plans.
  6. Where conduits cross building expansion joints or pass between areas with a temperature difference of 14 degrees C, provide expansion fittings on all raceway.
- L Underground Installation:**
1. Minimum Cover, Unless Otherwise Indicated or Required:
    - a. Underground, Exterior: 24 inches.
  2. Provide underground warning tape six to eight inches below finished grade directly above raceway. Tape shall be six inches wide with a minimum thickness of seven mil, non-distorting, colorfast, no-stretch, 600 pound tensile strength per six inch width, ultraviolet light fast. Message must repeat within a maximum of 40 inches. Painted legend shall be indicative of the type of underground line.

- M Concrete Encasement: Where conduits not otherwise embedded within concrete are indicated to be concrete-encased, provide concrete in accordance with Section 03 30 00 with minimum concrete cover of 3 inches on all sides unless otherwise indicated.
- N Ductbanks containing conductors of 600 volts or more shall be concrete encased with red dyed concrete.
- O Conduit Movement Provisions: Where conduits are subject to movement, provide expansion and expansion/deflection fittings to prevent damage to enclosed conductors or connected equipment. This includes, but is not limited to:
  - 1. Where conduits cross structural joints intended for expansion, contraction, or deflection.
  - 2. Where calculated in accordance with NFPA 70 for rigid polyvinyl chloride (PVC) conduit installed above ground to compensate for thermal expansion and contraction.
  - 3. Where conduits are subject to earth movement by settlement or frost.
- P Condensation Prevention: Where conduits cross barriers between areas of potential substantial temperature differential, provide sealing fitting or approved sealing compound at an accessible point near the penetration to prevent condensation. This includes, but is not limited to:
  - 1. Where conduits pass from outdoors into conditioned interior spaces.
  - 2. Where conduits pass from unconditioned interior spaces into conditioned interior spaces.
  - 3. Where conduits penetrate coolers or freezers.
- Q Provide 200 pound tensile strength pull string in all empty conduits and in conduits where conductors and cables are to be installed by others. Leave minimum slack of 12 inches at each end. All empty conduits shall terminate in a junction box.
- R All ducts shall be sealed at terminations, using sealing compound and plugs, as required to withstand 15 psi minimum hydrostatic pressure.

**3.03 FIELD QUALITY CONTROL**

- A Repair cuts and abrasions in galvanized finishes using zinc-rich paint recommended by manufacturer. Replace components that exhibit signs of corrosion.
- B Where coating of PVC-coated galvanized steel rigid metal conduit (RMC) contains cuts or abrasions, repair in accordance with manufacturer's instructions.
- C Correct deficiencies and replace damaged or defective conduits.

**3.04 CLEANING**

- A Clean interior of conduits to remove moisture and foreign matter.

**3.05 PROTECTION**

- A Immediately after installation of conduit, use suitable manufactured plugs to provide protection from entry of moisture and foreign material and do not remove until ready for installation of conductors.

**END OF SECTION 26 05 33.13**

**SECTION 26 05 33.16**  
**BOXES AND CABINETS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Outlet and device boxes up to 100 cubic inches, including those used as junction and pull boxes.
- B Cabinets and enclosures, including junction and pull boxes larger than 100 cubic inches.
- C Floor boxes.

**1.02 REFERENCE STANDARDS**

- A NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum) 2020.
- B NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate minimum sizes of boxes with the actual installed arrangement of conductors, clamps, support fittings, and devices, calculated according to NFPA 70.
  - 4. Coordinate minimum sizes of pull boxes with the actual installed arrangement of connected conduits, calculated according to NFPA 70.
  - 5. Coordinate the placement of boxes with millwork, furniture, devices, equipment, etc. installed under other sections or by others.
  - 6. Coordinate the work with other trades to preserve insulation integrity.
  - 7. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted boxes where indicated.
  - 8. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

- A Product Data: Provide manufacturer's standard catalog pages and data sheets for outlet and device boxes, junction and pull boxes, cabinets and enclosures, and floor boxes.
- B Project Record Documents: Record actual locations for outlet and device boxes, cabinets and enclosures, and floor boxes.

**1.05 QUALITY ASSURANCE**

- A Product Listing Organization Qualifications: Third party agencies shall be amongst those accredited by the NCBC (North Carolina Building Code Council) to label Electrical and Mechanical Equipment.

**1.06 DELIVERY, STORAGE, AND HANDLING**

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

**PART 2 PRODUCTS**

**2.01 BOXES**

- A General Requirements:
  - 1. The Electrical Contractor shall provide junction boxes, pull boxes, cable, support boxes, and wiring troughs as required by NEC and as otherwise indicated in the Drawings.
  - 2. Do not use boxes and associated accessories for applications other than as permitted by NFPA 70 and product listing.
  - 3. Provide all boxes, fittings, supports, and accessories required for a complete raceway system and to accommodate devices and equipment to be installed.
  - 4. Provide products listed, classified, and labeled as suitable for the purpose intended.
  - 5. Where box size is not indicated, size to comply with NFPA 70 but not less than applicable minimum size requirements specified.

6. Provide grounding terminals within boxes where equipment grounding conductors terminate.
  7. Each outlet designated on the plans shall be provided with an outlet box.
  8. In general, outlets shall be installed at the heights indicated. The Contractor shall examine the plans of and coordinate with all other trades to assure mounting heights are correct for the intended purpose.  
Assure that all mounting heights comply with the latest version of ADA. Outlets installed at incorrect heights shall be relocated to the correct elevation at the Contractor's expense.
- B Outlet and Device Boxes Up to 100 cubic inches, Including Those Used as Junction and Pull Boxes:**
1. Use sheet-steel boxes for dry locations unless otherwise indicated or required.
  2. Use cast iron boxes or cast aluminum boxes for damp or wet locations unless otherwise indicated or required; furnish with compatible weatherproof gasketed covers.
  3. Outlet boxes shall be 4" square, 2 1/8" deep unless otherwise noted.
  4. Use suitable concrete type boxes where flush-mounted in concrete.
  5. Use suitable masonry type boxes where flush-mounted in masonry walls.
  6. Do not use "through-wall" boxes designed for access from both sides of wall.
  7. Sheet-Steel Boxes: Comply with NEMA OS 1, and list and label as complying with UL 514A.
  8. Cast Metal Boxes: Comply with NEMA FB 1, and list and label as complying with UL 514A; furnish with threaded hubs.
  9. Junction boxes larger than 4" square shall be galvanized and without pre-formed knockouts.
  10. Boxes for Supporting Luminaires and Ceiling Fans: Listed as suitable for the type and weight of load to be supported; furnished with fixture stud to accommodate mounting of luminaire where required.
  11. Boxes for Ganged Devices: Use multigang boxes of single-piece construction. Do not use field-connected gangable boxes.
  12. Manufacturers Recessed:
    - a. Steel City Electric Company
    - b. Metropolitan
    - c. B & C
    - d. or approved equal.
  13. Manufacturers Surface:
    - a. Crouse-Hinds
    - b. Appleton
    - c. Rayco
    - d. or approved equal.
- C Cabinets and Enclosures, Including Junction and Pull Boxes Larger Than 100 cubic inches:**
1. Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E, or UL 508A.
  2. NEMA 250 Environment Type, Unless Otherwise Indicated:
  3. Junction and Pull Boxes Larger Than 100 cubic inches:
    - a. Provide screw-cover or hinged-cover enclosures unless otherwise indicated.
    - b. Boxes 12" square and Larger: Provide hinged-cover enclosures with quick access latches.
  4. Cabinets and Hinged-Cover Enclosures, Other Than Junction and Pull Boxes:
    - a. Provide lockable hinged covers, all locks keyed alike unless otherwise indicated.
  5. Manufacturers Surface:
    - a. Cooper.
    - b. Hoffman.
    - c. Hubbell Incorporated.
    - d. or approved equal..
- D Floor Boxes:**
1. Description: Floor boxes compatible with floor box service fittings provided; with partitions to separate multiple services; furnished with all components, adapters, covers, faceplates, and trims required for complete installation. Number of gangs as identified on plans.
  2. Cover and finish options shall be selected by architect prior to ordering.
  3. Use cast iron floor boxes within slab on grade.

- a. Protect moisture barrier during floor box installation.
4. Use sheet-steel floor boxes or fire rated poke throughs within slab above grade.
5. Metallic Floor Boxes: Fully adjustable (with integral means for leveling adjustment prior to and after concrete pour).
6. Manufacturer:
  - a. Legrand Wiremold
  - b. Hubbell Incorporated
  - c. Thomas & Betts Corporation
  - d. or approved equal.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

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

**3.02 INSTALLATION**

- A Install products in accordance with manufacturer's instructions.
- B Perform work in a neat and workmanlike manner.
- C Arrange equipment to provide maximum clearances.
- D Unless otherwise indicated, provide separate boxes for line voltage and low voltage systems.
- E Flush-mount boxes in finished areas unless specifically indicated to be surface-mounted.
- F Box Locations:
  1. Locate boxes in accessible locations.
  2. Locate boxes so that wall plates do not span different building finishes.
  3. Locate boxes so that wall plates do not cross masonry joints.
  4. Unless otherwise indicated, where multiple outlet boxes are installed at the same location at different mounting heights, install along a common vertical center line.
  5. Do not install flush-mounted boxes on opposite sides of walls back-to-back. Provide minimum 6 inches horizontal separation unless otherwise indicated.
  6. Fire Resistance Rated Walls: Install flush-mounted boxes such that the required fire resistance will not be reduced.
- G Box Supports:
  1. Secure and support boxes in accordance with NFPA 70 and Section 26 05 29 using suitable supports and methods approved by the authority having jurisdiction.
- H Install boxes plumb and level.
- I Flush-Mounted Boxes:
  1. Install boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that front edge of box or associated raised cover is not set back from finished surface more than 1/4 inch or does not project beyond finished surface.
  2. Install boxes in combustible materials such as wood so that front edge of box or associated raised cover is flush with finished surface.
  3. Repair rough openings around boxes in noncombustible materials such as concrete, tile, gypsum, plaster, etc. so that there are no gaps or open spaces greater than 1/8 inch at the edge of the box.
- J Install boxes as required to preserve insulation integrity.
- K Metallic Floor Boxes: Install box level at the proper elevation to be flush with finished floor.
- L Boxes in damp or wet locations shall be provided with gaskets and covers.
- M Install permanent barrier between ganged wiring devices when voltage difference between adjacent devices exceeds 300 V.
- N Close unused box openings.
- O Install blank wall plates on junction boxes and on outlet boxes with no devices or equipment installed or designated for future use.

**Chaloner Middle School HVAC Replacement**

Roanoke Rapids, NC

Smith Sinnett / 2023020

Roanoke Rapids Graded School District

**3.03 CLEANING**

- A Clean interior of boxes to remove dirt, debris, plaster and other foreign material.

**3.04 PROTECTION**

- A Immediately after installation, protect boxes from entry of moisture and foreign material until ready for installation of conductors.

**END OF SECTION 26 05 33.16**

**SECTION 26 05 53**  
**IDENTIFICATION FOR ELECTRICAL SYSTEMS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Electrical identification requirements.
- B Identification nameplates and labels.
- C Wire and cable markers.
- D Underground warning tape.
- E Warning signs and labels.

**1.02 ADMINISTRATIVE REQUIREMENTS**

- A Coordination:
  - 1. Verify final designations for equipment, systems, and components to be identified prior to fabrication of identification products.
- B Sequencing:
  - 1. Do not conceal items to be identified, in locations such as above suspended ceilings, until identification products have been installed.
  - 2. Do not install identification products until final surface finishes and painting are complete.

**1.03 SUBMITTALS**

- A Product Data: Provide manufacturer's standard catalog pages and data sheets for each product.
- B Shop Drawings: Provide schedule of items to be identified indicating proposed designations, materials, legends, and formats.

**1.04 FIELD CONDITIONS**

- A Do not install adhesive products when ambient temperature is lower than recommended by manufacturer.

**PART 2 PRODUCTS**

**2.01 IDENTIFICATION REQUIREMENTS**

- A Identification for Equipment:
  - 1. Use identification nameplate to identify each piece of electrical distribution and control equipment and associated sections, compartments, and components.
    - a. Switchboards:
      - 1) Identify ampere rating.
      - 2) Identify voltage and phase.
      - 3) Identify power source and circuit number. Include location.
      - 4) Use identification nameplate to identify main overcurrent protective device.
      - 5) Use identification nameplate to identify load(s) served for each branch device where not identified in a panelboard schedule.
    - b. Panelboards:
      - 1) Identify ampere rating.
      - 2) Identify voltage and phase.
      - 3) Identify power source and circuit number. Include location.
      - 4) Use typewritten circuit directory to identify load(s) served.
    - c. Transformers:
      - 1) Identify kVA rating.
      - 2) Identify voltage and phase for primary and secondary.
      - 3) Identify power source and circuit number. Include location.
      - 4) Identify load(s) served. Include location.
    - d. Enclosed switches, circuit breakers, and motor controllers:
      - 1) Identify voltage and phase.
      - 2) Identify power source and circuit number. Include location.
      - 3) Identify load(s) served. Include location.
    - e. Enclosed Contactors:
      - 1) Identify ampere rating.

- 2) Identify voltage and phase.
- 3) Identify coil voltage.
- 4) Identify load(s) and associated circuits controlled. Include location.
- f. Transfer Switches:
  - 1) Identify voltage and phase.
  - 2) Identify power source and circuit number for both normal power source and standby power source. Include location.
  - 3) Identify load(s) served. Include location.
  - 4) Identify short circuit current rating based on the specific overcurrent protective device type and settings protecting the transfer switch.
2. Service Equipment:
  - a. For buildings or structures supplied by more than one service, or any combination of branch circuits, feeders, and services, use identification nameplate at each service disconnecting means to identify all other services, feeders, and branch circuits supplying that building or structure. Verify format and descriptions with authority having jurisdiction.
3. Emergency System Equipment:
  - a. Use identification nameplate or voltage marker to identify emergency system equipment in accordance with NFPA 70.
4. Use identification nameplate to identify disconnect location for equipment with remote disconnecting means.
5. Available Fault Current Documentation: Use identification label to identify the available fault current and date calculations were performed at locations requiring documentation by NFPA 70 including but not limited to the following.
  - a. Service equipment.
- B Identification for Conductors and Cables:
  1. Color Coding for Power Conductors 600 V and Less: Comply with Section 26 05 19.
  2. Identification for Communications Conductors and Cables: Comply with Section 27 10 00.
  3. Use underground warning tape to identify power and communication feeders and branch circuits exterior to the building.
- C Identification for Cable Tray: Comply with Section 26 05 36.
- D Identification for Boxes:
  1. Use color coded boxes to identify specified systems.
    - a. Color-Coded Boxes: Field-painted per the same color coding as identified in this section for the system contained within.
    - b. Fire alarm junction boxes shall be painted on all sides including the box cover.
  2. For boxes concealed above accessible ceilings or exposed in mechanical or electrical rooms use neatly handwritten text using indelible marker to identify circuits enclosed.
  3. For exposed boxes in public areas, use only type written labels.
- E Identification for Devices:
  1. Wiring Device and Wallplate Finishes: Comply with Section 26 27 26.
  2. Use identification label to identify fire alarm system devices.
  3. For devices concealed above suspended ceilings, provide additional identification on ceiling tile below device location.
  4. Use identification label to identify receptacles protected by upstream GFI protection, where permitted.
- F Color Coding
  1. Phenolic Nameplates and associated conduit and boxes shall be identified with the following color scheme. Note: For existing buildings the contractor shall field verify the existing building standard and revise the color scheme to match the existing field conditions. Failure to match existing conditions will result in the contractor correcting the mislabeled equipment at his expense.
    - a. Blue surface white core - 120/208V equipment.
    - b. Black surface white core - 277/480V equipment.

- c. Bright red surface white core - fire alarm equipment.
- d. Dark red (burgundy) surface white core - security equipment.
- e. Green surface white core - emergency systems.
- f. Orange surface white core - telephone systems.
- g. Brown surface white core - data systems.
- h. White surface black core - paging systems.
- i. Purple surface white core - TV systems.

## **2.02 IDENTIFICATION NAMEPLATES AND LABELS**

### **A Identification Nameplates:**

1. Materials:
  - a. Indoor Clean, Dry Locations: Use plastic nameplates.
  - b. Outdoor Locations: Use plastic nameplates suitable for exterior use.
2. Plastic Nameplates: Two-layer or three-layer laminated electrically non-conductive phenolic with beveled edges; minimum thickness of 1/16 inch; engraved text.
3. Mounting Holes for Mechanical Fasteners: Two, centered on sides for sizes up to 1 inch high; Four, located at corners for larger sizes.
4. Nameplates shall be secured with self tapping stainless steel screws; if screws have sharp ends they shall be protected, otherwise rivets shall be used.

### **B Identification Labels:**

1. Materials: Use self-adhesive laminated plastic labels; UV, chemical, water, heat, and abrasion resistant.
  - a. Use only for indoor locations.
2. Text: Use factory pre-printed or machine-printed text. Do not use handwritten text.

### **C Format for Equipment Identification:**

1. Minimum Size: 1 inch by 2.5 inches.
2. Text: All capitalized unless otherwise indicated.
3. Minimum Text Height:
  - a. Equipment Designation: 1/2 inch.
  - b. Exception: Provide minimum text height of 1 inch for equipment located more than 10 feet above floor or working platform.

### **D Wiring device circuit labels.**

1. All wiring devices (receptacles and switches) shall be labeled with the circuit serving the device. Label shall be a typed adhesive label affixed to the front of the wiring device face plate. Label shall have black text on clear background.

## **2.03 UNDERGROUND WARNING TAPE**

**A Foil-backed Detectable Type Tape:** 3 inches wide, with minimum thickness of 7 mil, unless otherwise required for proper detection.

**B Legend:** Type of service, continuously repeated over full length of tape.

**C Color:**

1. Tape for Buried Power Lines: Black text on red background.
2. Tape for Buried Communication, Alarm, and Signal Lines: Black text on orange background.

## **2.04 WARNING SIGNS AND LABELS**

**A Comply with ANSI Z535.2 or ANSI Z535.4 as applicable.**

**B Warning Signs:**

1. Materials:
  - a. Indoor Dry, Clean Locations: Use factory pre-printed rigid plastic or self-adhesive vinyl signs.
  - b. Outdoor Locations: Use factory pre-printed rigid aluminum signs.
2. Rigid Signs: Provide four mounting holes at corners for mechanical fasteners.

**C Warning Labels:**

1. Materials: Use factory pre-printed or machine-printed self-adhesive polyester or self-adhesive vinyl labels; UV, chemical, water, heat, and abrasion resistant; produced using materials recognized to UL

2. Machine-Printed Labels: Use thermal transfer process printing machines and accessories recommended by label manufacturer.

**PART 3 EXECUTION**

**3.01 PREPARATION**

- A Clean surfaces to receive adhesive products according to manufacturer's instructions.

**3.02 INSTALLATION**

- A Install products in accordance with manufacturer's instructions.
- B Install identification products to be plainly visible for examination, adjustment, servicing, and maintenance.
- C Install identification products centered, level, and parallel with lines of item being identified.
- D Secure nameplates to exterior surfaces of enclosures using stainless steel screws.
- E Install self-adhesive labels and markers to achieve maximum adhesion, with no bubbles or wrinkles and edges properly sealed.
- F Install underground warning tape above buried lines with one tape per trench at six to eight inches below finished grade.
- G Secure rigid signs using stainless steel screws.
- H Mark all handwritten text, where permitted, to be neat and legible.

**3.03 FIELD QUALITY CONTROL**

- A Replace self-adhesive labels and markers that exhibit bubbles, wrinkles, curling or other signs of improper adhesion.

**END OF SECTION 26 05 53**

**SECTION 26 24 16**  
**PANELBOARDS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Power distribution panelboards.
- B Lighting and appliance panelboards.
- C Overcurrent protective devices for panelboards.

**1.02 REFERENCE STANDARDS**

- A UL 67 - Panelboards Current Edition, Including All Revisions.
- B UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures Current Edition, Including All Revisions.
- C NFPA 70 - National Electrical Code; National Fire Protection Association, Including All Applicable Amendments and Supplements; 2017.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A Coordination:
  - 1. Coordinate the work with other trades to avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Coordinate the work with other trades to provide walls suitable for installation of flush-mounted panelboards where indicated.
  - 4. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 5. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

- A Product Data: Provide manufacturer's standard catalog pages and data sheets for panelboards, enclosures, overcurrent protective devices, and other installed components and accessories.
  - 1. Contractor shall confirm that all lug sizes and quantities submitted are compatible with the conductors specified on the contract documents. Changes required to lug sizes and quantities due to lack of coordination between the contractor and the supplier are to be made at the contractor's expense.
- B Shop Drawings: Indicate outline and support point dimensions, voltage, main bus ampacity, overcurrent protective device arrangement and sizes, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  - 1. It is the contractor's responsibility to ensure that the equipment submitted to comply with the requirements of this section are in compliance with the requirements and recommendations of the power system studies. Any changes recommended by the power system study shall be incorporated at no expense to the project.
- C Field Quality Control Test Reports.
- D Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, and installation of product.
- E Project Record Documents: Record actual installed locations of panelboards and actual installed circuiting arrangements.
- F Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

**1.05 QUALITY ASSURANCE**

- A Comply with requirements of NFPA 70.
- B Maintain at the project site a copy of each referenced document that prescribes execution requirements.

- C Product Listing Organization Qualifications: Third party agencies shall be amongst those accredited by the NCBC (North Carolina Building Code Council) to label Electrical and Mechanical Equipment.
- D Contractor shall schedule a pre-energization site visit with the Engineer. Meeting shall be scheduled at least 7 days in advance. The results of the megger test and service ground resistance test shall be made available to the Engineer prior to scheduling the pre-energization site visit.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A Receive, inspect, handle, and store panelboards in accordance with manufacturer's instructions.
- B Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.
- C Handle carefully in accordance with manufacturer's written instructions to avoid damage to panelboard internal components, enclosure, and finish.

**1.07 FIELD CONDITIONS**

- A Maintain ambient temperature within the following limits during and after installation of panelboards:
  - 1. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A ABB/GE:
- B Eaton Corporation.
- C Schneider Electric; Square D Products.
- D Approved equal
- E Source Limitations: Furnish panelboards and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

**2.02 PANELBOARDS - GENERAL REQUIREMENTS**

- A Provide products listed, classified, and labeled as suitable for the purpose intended.
- B Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature:
    - a. Panelboards Containing Circuit Breakers: Between 23 degrees F and 104 degrees F.
- C Short Circuit Current Rating:
  - 1. Provide panelboards with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  - 2. When a power system study is included in the contract short circuit current ratings shall be verified with the study prior to submitting equipment for approval. Any changes required to meet the maximum available fault current shall be made in the submittal.
  - 3. Series rating is not allowed.
- D Panelboards Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- E Mains: Configure for top or bottom incoming feed as indicated or as required for the installation.
- F Branch Overcurrent Protective Devices: Replaceable without disturbing adjacent devices.
- G Bussing: Sized in accordance with UL 67 temperature rise requirements.
  - 1. Provide fully rated neutral bus unless otherwise indicated, with a suitable lug for each feeder or branch circuit requiring a neutral connection.
  - 2. Provide solidly bonded equipment ground bus in each panelboard, with a suitable lug for each feeder and branch circuit equipment grounding conductor.
- H Conductor Terminations: Suitable for use with the conductors to be installed.
- I Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: As indicated on the drawings.
  - 2. Boxes: Galvanized steel unless otherwise indicated.
  - 3. Fronts:
    - a. Fronts for Surface-Mounted Enclosures: Same dimensions as boxes.

- b. Fronts for Flush-Mounted Enclosures: Overlap boxes on all sides to conceal rough opening.
  - c. All covers shall be door in door type where one door can be opened to access the breakers and and dead front and the second door opens to the wire bending space adjacent to the dead front.
  - d. Door in door covers shall feature a full length piano hinge.
4. Lockable Doors: All locks keyed alike unless otherwise indicated.
- J Future Provisions: Prepare all unused spaces for future installation of devices including bussing, connectors, mounting hardware and all other required provisions.
- K Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- L Load centers are not acceptable.

### **2.03 POWER DISTRIBUTION PANELBOARDS**

- A Description: Panelboards complying with NEMA PB 1, power and feeder distribution type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B Conductor Terminations:
- 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Compression.
- C Bussing:
- 1. Phase and Neutral Bus Material: Copper.
  - 2. Ground Bus Material: Copper.
- D Circuit Breakers:
- 1. Provide bolt-on type.
  - 2. Provide thermal magnetic circuit breakers for circuit breaker frame sizes less than 250 amperes.
  - 3. Provide electronic trip circuit breakers for circuit breaker frame sizes 250 amperes and above.
- E Enclosures:
- 1. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  - 2. Provide clear plastic circuit directory holder mounted on inside of door.

### **2.04 LIGHTING AND APPLIANCE PANELBOARDS**

- A Description: Panelboards complying with NEMA PB 1, lighting and appliance branch circuit type, circuit breaker type, and listed and labeled as complying with UL 67; ratings, configurations and features as indicated on the drawings.
- B Conductor Terminations:
- 1. Main and Neutral Lug Material: Copper, suitable for terminating copper conductors only.
  - 2. Main and Neutral Lug Type: Compression.
- C Bussing:
- 1. Phase Bus Connections: Arranged for sequential phasing of overcurrent protective devices.
  - 2. Phase and Neutral Bus Material: Copper.
  - 3. Ground Bus Material: Copper.
- D Circuit Breakers: Thermal magnetic bolt-on type unless otherwise indicated.
- E Provide electronic trip circuit breakers for circuit breaker frame sizes [250] amperes and above.
- F Enclosures:
- 1. Fronts: Provide door-in-door trim with hinged cover for access to load terminals and wiring gutters, and separate lockable hinged door with concealed hinges for access to overcurrent protective device handles without exposing live parts.
  - 2. Provide clear plastic circuit directory holder mounted on inside of door.

### **2.05 OVERCURRENT PROTECTIVE DEVICES**

- A Molded Case Circuit Breakers:
- 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable;

- ratings, configurations, and features as indicated on the drawings.
2. Interrupting Capacity:
    - a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated.
    - b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated.
  3. Conductor Terminations:
    - a. Provide compression lugs.
    - b. Lug Material: Copper, suitable for terminating copper conductors only.
  4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
    - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 100 amperes and larger.
  5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
  6. Provide electronic trip circuit breakers for circuit breaker frame sizes larger than 250 amperes.
    - a. Provide the following individually field-adjustable trip response settings:
      - 1) Long time pickup, adjustable by setting dial.
      - 2) Long time delay.
      - 3) Short time pickup and delay.
      - 4) Instantaneous pickup.
      - 5) Ground fault pickup and delay where ground fault protection is indicated.
  7. Do not use handle ties in lieu of multi-pole circuit breakers.
  8. Provide multi-pole circuit breakers for multi-wire branch circuits as required by NFPA 70.
  9. Provide the following features and accessories where indicated or where required to complete installation:
    - a. Shunt Trip: Provide coil voltage as required for connection to indicated trip actuator.
    - b. Handle Pad-Lock Provision: For locking circuit breaker handle in OFF position.
      - 1) Provide handle locks for all breakers serving fire alarm equipment or elevator emergency communication systems. Handle locks shall be Space Age Electronics ELOCK series or approved equal.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A Verify that field measurements are as indicated.
- B Verify that the ratings and configurations of the panelboards and associated components are consistent with the indicated requirements.
- C Verify that mounting surfaces are ready to receive panelboards.
- D Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A Perform work in accordance with NECA 1 (general workmanship).
- B Install products in accordance with manufacturer's instructions.
- C Install panelboards securely, in a neat and workmanlike manner.
- D Arrange equipment to provide at least clearances in accordance with manufacturer's instructions and NFPA 70.
- E Provide required support and attachment in accordance with Section 26 05 29.
- F Install panelboards plumb.
- G Mount panelboards such that the highest position of any operating handle for circuit breakers or switches does not exceed 79 inches above the floor or working platform.
- H Provide grounding and bonding in accordance with Section 26 05 26.
- I Install all field-installed branch devices, components, and accessories.

- J Set field-adjustable circuit breaker tripping function settings as directed. If a power system study is included in the contract, set breakers according to the recommendations made in the study.
- K Provide filler plates to cover unused spaces in panelboards.
- L Provide circuit breaker lock-on devices to prevent unauthorized personnel from de-energizing essential loads where indicated. Also provide for the following:
  - 1. Emergency and night lighting circuits.
  - 2. Fire detection and alarm circuits.
  - 3. Intrusion detection and access control system circuits.
  - 4. Video surveillance system circuits.
- M Identify panelboards in accordance with Section 26 05 53.

**3.03 FIELD QUALITY CONTROL**

- A Molded Case Circuit Breakers: Perform inspections and tests listed in NETA ATS, Section 7.6.1.1 for all main circuit breakers and circuit breakers larger than 600 amperes. Tests listed as optional are not required.
  - 1. Verify equipment nameplate is in accordance with contract documents.
  - 2. Inspect physical and mechanical condition.
  - 3. Inspect anchorage and alignment.
  - 4. Verify unit is clean.
  - 5. Operate breaker to ensure smooth operation.
  - 6. Perform breaker adjustments in accordance with the power system study.
  - 7. Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
  - 8. Perform insulation-resistance test for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed.
  - 9. Perform contact/pole resistance test.
  - 10. Determine long-time and short time pickup and delay settings by primary current injection.
  - 11. Determine ground fault pickup and time delay by primary current injection.
- B Ground Fault Protection Systems: Test in accordance with manufacturer's instructions as required by NFPA 70.
- C Test GFCI circuit breakers to verify proper operation.
- D Test AFCI circuit breakers to verify proper operation.
- E Test shunt trips to verify proper operation.
- F Correct deficiencies and replace damaged or defective panelboards or associated components.
- G For Services and feeders 1000 amperes and larger, and any installation utilizing selective coordination, the following test should be performed on the circuit breakers. Testing shall be performed by a qualified manufacturer's factory technician at the job site. All readings shall be tabulated.
  - 1. Phase Tripping tolerance (within 20% of UL requirements).
  - 2. Trip time (per phase) in seconds.
  - 3. Instantaneous trip (amps) per phase.
  - 4. Insulation resistance (in megohms) at 1000-volts DC (phase to phase, and line to load).

**3.04 ADJUSTING**

- A Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.
- B Adjust alignment of panelboard fronts.
- C Load Balancing: For each panelboard, rearrange circuits such that the difference between each measured steady state phase load does not exceed 20 percent and adjust circuit directories accordingly. Maintain proper phasing for multi-wire branch circuits.

**3.05 CLEANING**

- A Clean dirt and debris from panelboard enclosures and components according to manufacturer's instructions.
- B Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION 26 24 16**

**SECTION 26 28 13**  
**FUSES**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Fuses.
- B Spare fuse cabinet.

**1.02 REFERENCE STANDARDS**

- A NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B UL 248-4 - Low-Voltage Fuses - Part 4: Class CC Fuses Current Edition, Including All Revisions.
- C UL 248-8 - Low-Voltage Fuses - Part 8: Class J Fuses Current Edition, Including All Revisions.
- D UL 248-10 - Low-Voltage Fuses - Part 10: Class L Fuses Current Edition, Including All Revisions.
- E UL 248-12 - Low-Voltage Fuses - Part 12: Class R Fuses Current Edition, Including All Revisions.
- F UL 248-15 - Low-Voltage Fuses - Part 15: Class T Fuses Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A Coordination:
  - 1. Coordinate fuse clips furnished in equipment provided under other sections for compatibility with indicated fuses.
  - 2. Coordinate fuse requirements according to manufacturer's recommendations and nameplate data for actual equipment to be installed.
  - 3. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

- A Product Data: Provide manufacturer's standard data sheets including voltage and current ratings, interrupting ratings, time-current curves, and current limitation curves.
  - 1. Spare Fuse Cabinet: Include dimensions.
- B Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
  - 1. See Section 01 60 00 - Product Requirements, for additional provisions.
  - 2. Extra Fuses: One set(s) of three for each type and size installed.
  - 3. Fuse Pullers: One set(s) compatible with each type and size installed.
  - 4. Spare Fuse Cabinet Keys: Two.

**1.05 QUALITY ASSURANCE**

- A Comply with requirements of NFPA 70.
- B Product Listing Organization Qualifications: Third party agencies shall be amongst those accredited by the NCBC (North Carolina Building Code Council) to label Electrical and Mechanical Equipment.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A Bussmann, a division of Eaton Corporation.
- B Littelfuse, Inc.
- C Mersen.
- D Approved equal.

**2.02 FUSES**

- A Provide products listed, classified, and labeled as suitable for the purpose intended.
- B Unless specifically indicated to be excluded, provide fuses for all fusible equipment as required for a complete operating system.
- C Provide fuses of the same type, rating, and manufacturer within the same switch.
- D Comply with UL 248-1.
- E Unless otherwise indicated, provide cartridge type fuses complying with NEMA FU 1, Class and ratings as indicated.
- F Voltage Rating: Suitable for circuit voltage.

- G Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- H Provide the following accessories where indicated or where required to complete installation:
  - 1. Fuseholders: Compatible with indicated fuses.

**2.03 SPARE FUSE CABINET**

- A Description: Wall-mounted sheet metal cabinet with shelves and hinged door with cylinder lock, suitably sized to store spare fuses and fuse pullers specified.
- B Cabinet shall be located in the main electrical room unless otherwise indicated by owner.
- C Finish: Manufacturer's standard, factory applied grey finish unless otherwise indicated.

**PART 3 EXECUTION**

**3.01 EXAMINATION**

- A Verify that fuse ratings are consistent with circuit voltage and manufacturer's recommendations and nameplate data for equipment.
- B Verify that mounting surfaces are ready to receive spare fuse cabinet.
- C Verify that conditions are satisfactory for installation prior to starting work.

**3.02 INSTALLATION**

- A Do not install fuses until circuits are ready to be energized.
- B Install fuses with label oriented such that manufacturer, type, and size are easily read.
- C Install spare fuse cabinet where indicated.
- D Identify spare fuse cabinet in accordance with Section 26 05 53.

**END OF SECTION 26 28 13**

**SECTION 26 28 16.16**  
**ENCLOSED SWITCHES AND CIRCUIT BREAKERS**

**PART 1 GENERAL**

**1.01 SECTION INCLUDES**

- A Enclosed safety switches.
- B Enclosed circuit breakers.

**1.02 REFERENCE STANDARDS**

- A NFPA 70 - National Electrical Code Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.
- B UL 489 - Molded-Case Circuit Breakers, Molded-Case Switches and Circuit Breaker Enclosures; Current Edition, Including All Revisions.

**1.03 ADMINISTRATIVE REQUIREMENTS**

- A Coordination:
  - 1. Coordinate the work with other trades. Avoid placement of ductwork, piping, equipment, or other potential obstructions within the dedicated equipment spaces and within working clearances for electrical equipment required by NFPA 70.
  - 2. Coordinate arrangement of electrical equipment with the dimensions and clearance requirements of the actual equipment to be installed.
  - 3. Verify with manufacturer that conductor terminations are suitable for use with the conductors to be installed.
  - 4. Notify Architect of any conflicts with or deviations from Contract Documents. Obtain direction before proceeding with work.

**1.04 SUBMITTALS**

- A Product Data: Provide manufacturer's standard catalog pages and data sheets for enclosed switches and other installed components and accessories.
- B Shop Drawings: Indicate outline and support point dimensions, voltage and current ratings, short circuit current ratings, conduit entry locations, conductor terminal information, and installed features and accessories.
  - 1. Include wiring diagrams showing all factory and field connections.
  - 2. Contractor shall confirm that all lug sizes and quantities submitted are compatible with the conductors specified on the contract documents. Changes required to lug sizes and quantities due to lack of coordination between the contractor and the supplier are to be made at the contractor's expense.
  - 3. It is the contractor's responsibility to ensure that the equipment submitted to comply with the requirements of this section are in compliance with the requirements and recommendations of the power system studies. Any changes recommended by the power system study shall be incorporated at no expense to the project.
- C Field Quality Control Test Reports.
- D Manufacturer's Installation Instructions: Indicate application conditions and limitations of use stipulated by product testing agency. Include instructions for storage, handling, protection, examination, preparation, installation, and starting of product.
- E Project Record Documents: Record actual locations of enclosed switches or circuit breakers.
- F Maintenance Data: Include information on replacement parts and recommended maintenance procedures and intervals.

**1.05 QUALITY ASSURANCE**

- A Comply with requirements of NFPA 70.
- B Maintain at the project site a copy of each referenced document that prescribes execution requirements.
- C Product Listing Organization Qualifications: Third party agencies shall be amongst those accredited by the NCBC (North Carolina Building Code Council) to label Electrical and Mechanical Equipment.

**1.06 DELIVERY, STORAGE, AND HANDLING**

- A Store in a clean, dry space. Maintain factory wrapping or provide an additional heavy canvas or heavy plastic cover to protect units from dirt, water, construction debris, and traffic.

- B Handle carefully in accordance with manufacturer's written instructions to avoid damage to enclosed switch internal components, enclosure, and finish.

**1.07 FIELD CONDITIONS**

- A Maintain ambient temperature between 23 degrees F and 104 degrees F during and after installation of enclosed circuit breakers.

**PART 2 PRODUCTS**

**2.01 MANUFACTURERS**

- A ABB/GE
- B Eaton Corporation.
- C Schneider Electric; Square D Products.
- D Approved Equal
- E Source Limitations: Furnish enclosed switches and associated components produced by the same manufacturer as the other electrical distribution equipment used for this project and obtained from a single supplier.

**2.02 ENCLOSED SAFETY SWITCHES**

- A Description: Quick-make, quick-break enclosed safety switches listed and labeled as complying with UL 98; heavy duty; ratings, configurations, and features as indicated on the drawings.
- B Provide products listed, classified, and labeled as suitable for the purpose intended.
- C All switches shall be heavy duty type.
- D Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature: Between -22 degrees F and 104 degrees F.
- E Horsepower Rating: Suitable for connected load.
- F Voltage Rating: Suitable for circuit voltage.
- G Auxilary Contacts: Suitable for 120v rated control circuit. Contractor is to provide auxilary contacts in any disconnecting means that is downstream from a frequency drive. aux contacts shall be mechanically tied to switching mechanisms and shall provide both a N.O. and N.C. contacts. verify with DIV 23 prior to ordering equipment.
- H Short Circuit Current Rating:
  - 1. Provide enclosed safety switches, when protected by the fuses or supply side overcurrent protective devices to be installed, with listed short circuit current rating not less than the available fault current at the installed location as indicated on the drawings.
  - 2. When a power system study is included in the contract, confirm the short circuit current rating of all devices with the results of the study prior to submitting for approval.
- I Enclosed Safety Switches Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- J Provide with switch blade contact position that is visible when the cover is open.
- K Fuse Clips for Fusible Switches: As required to accept fuses indicated.
  - 1. Where NEMA Class R fuses are installed, provide rejection feature to prevent installation of fuses other than Class R.
- L Conductor Terminations: Suitable for use with the conductors to be installed.
- M Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- N Provide solidly bonded equipment ground bus in each enclosed safety switch, with a suitable lug for terminating each equipment grounding conductor.
- O Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: As indicated on the drawings.
  - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.

- P Provide safety interlock to prevent opening the cover with the switch in the ON position with capability of overriding interlock for testing purposes.
- Q Heavy Duty Switches:
  - 1. Comply with NEMA KS 1.
  - 2. Conductor Terminations:
    - a. Provide mechanical lugs for switch ratings less than 400 amperes.
    - b. Provide compression lugs for switch ratings 400 amperes and above.
    - c. Lug Material: Copper, suitable for terminating copper conductors only.
  - 3. Provide externally operable handle with means for locking in the OFF position, capable of accepting three padlocks.

**2.03 ENCLOSED CIRCUIT BREAKERS**

- A Description: Units consisting of molded case circuit breakers individually mounted in enclosures.
- B Provide products listed, classified, and labeled as suitable for the purpose intended.
- C Unless otherwise indicated, provide products suitable for continuous operation under the following service conditions:
  - 1. Altitude: Less than 6,600 feet.
  - 2. Ambient Temperature: Between 23 degrees F and 104 degrees F.
- D Short Circuit Current Rating:
  - 1. Provide enclosed circuit breakers with listed short circuit current rating not less than the available fault current at the installed location indicated on the drawings.
- E Enclosed Circuit Breakers Used for Service Entrance: Listed and labeled as suitable for use as service equipment according to UL 869A.
- F Auxilary Contacts: Suitable for 120v rated control circuit. Contractor is to provide auxilary contacts in any disconnecting means that is downstream from a frequency drive. aux contacts shall be mechanically tied to switching mechanisms and shall provide both a N.O. and N.C. contacts. verify with DIV 23 prior to ordering equipment.
- G Conductor Terminations: Suitable for use with the conductors to be installed.
- H Provide thermal magnetic circuit breakers for circuit breaker frame sizes less than 250 amperes.
- I Provide electronic trip circuit breakers for circuit breaker frame sizes 250 amperes and above.
- J Provide insulated, groundable fully rated solid neutral assembly where a neutral connection is required, with a suitable lug for terminating each neutral conductor.
- K Provide solidly bonded equipment ground bus in each enclosed circuit breaker, with a suitable lug for terminating each equipment grounding conductor.
- L Enclosures: Comply with NEMA 250, and list and label as complying with UL 50 and UL 50E.
  - 1. Environment Type per NEMA 250: As indicated on the drawings.
  - 2. Finish for Painted Steel Enclosures: Manufacturer's standard, factory applied grey unless otherwise indicated.
  - 3. Provide surface-mounted enclosures unless otherwise indicated.
- M Provide externally operable handle with means for locking in the OFF position.
- N Ground Fault Protection: Where ground-fault protection is indicated, provide system listed and labeled as complying with UL 1053.
  - 1. Where electronic circuit breakers equipped with integral ground fault protection are used, provide separate neutral current sensor where applicable.
- O Selectivity: Where the requirement for selectivity is indicated, furnish products as required to achieve selective coordination.
- P MOLDED CASE CIRCUIT BREAKERS
  - 1. Description: Quick-make, quick-break, over center toggle, trip-free, trip-indicating circuit breakers listed and labeled as complying with UL 489, and complying with FS W-C-375 where applicable; ratings, configurations, and features as indicated on the drawings.
  - 2. Interrupting Capacity:

- a. Provide circuit breakers with interrupting capacity as required to provide the short circuit current rating indicated.
- b. Fully Rated Systems: Provide circuit breakers with interrupting capacity not less than the short circuit current rating indicated. Series rating is not allowed.
3. Conductor Terminations:
  - a. Provide mechanical lugs for circuit breaker frame sizes less than 400 amperes.
  - b. Provide compression lugs for circuit breaker frame sizes 400 amperes and above.
  - c. Lug Material: Copper, suitable for terminating copper conductors only.
4. Thermal Magnetic Circuit Breakers: For each pole, furnish thermal inverse time tripping element for overload protection and magnetic instantaneous tripping element for short circuit protection.
  - a. Provide field-adjustable magnetic instantaneous trip setting for circuit breaker frame sizes 100 amperes and larger.
5. Electronic Trip Circuit Breakers: Furnish solid state, microprocessor-based, true rms sensing trip units.
  - a. Provide the following individually field-adjustable trip response settings:
    - 1) Long time pickup, adjustable by setting dial.
    - 2) Long time delay.
    - 3) Short time pickup and delay.
    - 4) Instantaneous pickup.
    - 5) Ground fault pickup and delay where ground fault protection is indicated.
6. Multi-Pole Circuit Breakers: Furnish with common trip for all poles.

### **PART 3 EXECUTION**

#### **3.01 EXAMINATION**

- A Verify that field measurements are as indicated.
- B Verify that the ratings of the enclosed switches are consistent with the indicated requirements.
- C Verify that mounting surfaces are ready to receive enclosed safety switches.
- D Verify that conditions are satisfactory for installation prior to starting work.

#### **3.02 INSTALLATION**

- A Install products in accordance with manufacturer's instructions.
- B Install enclosed switches securely, in a neat and workmanlike manner.
- C Arrange equipment to provide minimum clearances in accordance with manufacturer's instructions and NFPA 70.
- D Provide required support and attachment in accordance with Section 26 05 29.
- E Install enclosed switches and breakers plumb.
- F Except where indicated to be mounted adjacent to the equipment they supply, mount enclosed switches such that the highest position of the operating handle does not exceed 79 inches above the floor or working platform.
- G Provide grounding and bonding in accordance with Section 26 05 26.
- H Provide fuses complying with Section 26 28 13 for fusible switches as indicated or as required by equipment manufacturer's recommendations.
- I Set field-adjustable circuit breaker tripping function settings as directed.
- J Where accessories are not self-powered, provide control power source as indicated or as required to complete installation.
- K Identify enclosed switches and breakers in accordance with Section 26 05 53.

#### **3.03 FIELD QUALITY CONTROL**

- A Perform inspections and tests listed in NETA ATS, Section 7.5.1.1 for breakers larger than 600A.
  1. Verify equipment nameplate is in accordance with contract documents.
  2. Inspect physical and mechanical condition.
  3. Inspect anchorage and alignment.
  4. Verify unit is clean.
  5. Operate breaker to ensure smooth operation.

6. Perform breaker adjustments in accordance with the power system study.
7. Perform resistance measurements through bolted connections with a low-resistance ohmmeter.
8. Perform insulation-resistance test for one minute on each pole, phase-to-phase and phase-to-ground with circuit breaker closed.
9. Perform contact/pole resistance test.
10. Determine long-time and short time pickup and delay settings by primary current injection.
11. Determine ground fault pickup and time delay by primary current injection.

B Correct deficiencies and replace damaged or defective enclosed safety switches or associated components.

**3.04 ADJUSTING**

A Adjust tightness of mechanical and electrical connections to manufacturer's recommended torque settings.

**3.05 CLEANING**

A Clean dirt and debris from switch enclosures and components according to manufacturer's instructions.

B Repair scratched or marred exterior surfaces to match original factory finish.

**END OF SECTION 26 28 16.16**