

PROJECT MANUAL FOR

# Renovations to Bogue Sound Elementary School

Carteret County Schools

*Carteret County, North Carolina*

**Hite associates**  
ARCHITECTURE / PLANNING / TECHNOLOGY

2600 Meridian Drive / Greenville, NC 27834 / tel 252.757.0333 / fax 252.757.1330 / [www.hiteassoc.com](http://www.hiteassoc.com)

**STRUCTURAL ENGINEERING CONSULTANT: Queen Engineering & Design, P.A.**

5530 Munford Road, Raleigh, NC 27612, (919) 420-0480

**MECHANICAL / ELECTRICAL ENGINEERING CONSULTANT: Engineering Source of NC, P.A.**

102-A2 Regency Blvd., Greenville, NC 27859, (252) 439-0338

November, 2024

## **NOTICE TO BIDDERS**

---

Sealed proposals from selected bidders will be received by Carteret County Schools, at the offices of Facilities Services, 601 Mulberry Street, Beaufort, NC 28516, on Wednesday, December 11, 2024. Single Prime Bids for all construction will be accepted up to 3:00 p.m. for the furnishing of labor, material and equipment entering into the construction of the Renovations to Bogue Sound Elementary School. Bids shall be marked "SEALED BID", addressed to the attention of Mr. Richard Paylor, Superintendent, Carteret County Schools, and shall include the Name, Address, and License Number of the Bidder, and the type proposal enclosed.

Bids will be received as follows:

1. Single Prime Contract (All Work)

Complete plans, specifications and contract documents are available on the Hite Associates website, [www.hiteassoc.com](http://www.hiteassoc.com) ; and will be open for inspection in the office of the Architect, Hite Associates, 2600 Meridian Drive, Greenville, North Carolina, 27834, and; may be obtained by purchased by calling Speedyblue Reprographics at (252) 758-1616, [print@speedyblue.com](mailto:print@speedyblue.com).

There will be a Mandatory Pre-Bid Conference and Open Meeting on Wednesday, November 20, 2024, at 3:00 p.m. at the project location, Bogue Sound Elementary School, 3323 NC-24, Newport, NC 28570. NOTICE – ALL GENERAL CONTRACT BIDDERS MUST ATTEND THE PRE-BID CONFERENCE. ALSO, ALL HVAC AND ELECTRICAL PRIME OR SUB-BIDDERS MUST ATTEND THE PRE-BID CONFERENCE.

All Contractors are hereby notified that they must have proper license under the State laws governing their respective trades.

Contractors are notified that Chapter 87, Article I, General Statutes of North Carolina, will be observed in receiving bids and awarding the Contracts. Contractors submitting bids on this project must have proper license classification.

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 such bonds, conditioned that the surety will, upon demand forthwith make payment to the obligee upon said bond if the bidder fails 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. In determining the value of the bid bond, additive or deductive alternates shall be considered as they are accepted by the Owner.

## **NOTICE TO BIDDERS**

---

A Performance Bond and a Labor and Materials Payment Bond will be required for one hundred percent (100%) of the contract price.

Payment will be made on the basis of 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 60 days after the bid date.

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

SIGNED: Mr. Richard Paylor, Superintendent  
Carteret County Schools  
Beaufort, North Carolina

DESIGNER: HITE ASSOCIATES, P.C.  
2600 Meridian Drive  
Greenville, North Carolina 27834

*GO TO NEXT PAGE*

## Instructions to Bidders

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

Renovations to Bogue Sound ES  
Bogue Sound Elementary School  
3323 HWY 24  
Newport, NC 28530

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

Carteret County Schools  
107 Safrit Drive  
Beaufort, NC 28516  
Telephone Number: 252-728-4583

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

Hite Associates, P.C.  
2600 Meridian Drive  
Greenville, NC 27834  
Telephone Number: 252-757-0333

### TABLE OF ARTICLES

- 1 DEFINITIONS
- 2 BIDDER'S REPRESENTATIONS
- 3 BIDDING DOCUMENTS
- 4 BIDDING PROCEDURES
- 5 CONSIDERATION OF BIDS
- 6 POST-BID INFORMATION
- 7 PERFORMANCE BOND AND PAYMENT BOND
- 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS

**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.)*

**§ 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 prior to the date for receipt of Bids.

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

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

**§ 3.3 Substitutions**

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

**§ 3.3.2 Substitution Process**

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

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

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

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

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

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

#### § 3.4 Addenda

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

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

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

§ 3.4.3 Addenda will be issued s prior to the date for receipt of Bids, except an Addendum withdrawing the request for Bids or one which includes postponement of the date for receipt of Bids.

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

### ARTICLE 4 BIDDING PROCEDURES

#### § 4.1 Preparation of Bids

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

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

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

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

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

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

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

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

#### § 4.2 Bid Security

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

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

§ 4.2.2 The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and shall, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount



of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. In the event the Owner fails to comply with Section 6.2, the amount of the bid security shall not be forfeited to the Owner.

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

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

### **§ 4.3 Submission of Bids**

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

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

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

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

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

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

### **§ 4.4 Modification or Withdrawal of Bid**

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

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

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

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

## **ARTICLE 5 CONSIDERATION OF BIDS**

### **§ 5.1 Opening of Bids**

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

### **§ 5.2 Rejection of Bids**

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

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

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

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

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

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

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

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

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

### **§ 6.3 Submittals**

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

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

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

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

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

**ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND**

**§ 7.1 Bond Requirements**

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

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

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

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

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

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

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

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

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

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

**ARTICLE 8 ENUMERATION OF THE PROPOSED CONTRACT DOCUMENTS**

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

- .1 AIA Document A101™–2017, Standard Form of Agreement Between Owner and Contractor, unless otherwise stated below.  
*(Insert the complete AIA Document number, including year, and Document title.)*
  
- .2 AIA Document A101™–2017, Exhibit A, Insurance and Bonds, unless otherwise stated below.  
*(Insert the complete AIA Document number, including year, and Document title.)*
  
- .3 AIA Document A201™–2017, General Conditions of the Contract for Construction, unless otherwise stated below.  
*(Insert the complete AIA Document number, including year, and Document title.)*
  
- .4 Building Information Modeling Exhibit, if completed:

**.5 Drawings**

<b>Number</b>	<b>Title</b>	<b>Date</b>
---------------	--------------	-------------

**.6 Specifications**

<b>Section</b>	<b>Title</b>	<b>Date</b>	<b>Pages</b>
----------------	--------------	-------------	--------------

**.7 Addenda:**

<b>Number</b>	<b>Date</b>	<b>Pages</b>
---------------	-------------	--------------

**.8 Other Exhibits:**

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

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

The Sustainability Plan:

<b>Title</b>	<b>Date</b>	<b>Pages</b>
--------------	-------------	--------------

Supplementary and other Conditions of the Contract:

<b>Document</b>	<b>Title</b>	<b>Date</b>	<b>Pages</b>
-----------------	--------------	-------------	--------------

**.9 Other documents listed below:**

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

# **Additions and Deletions Report for** **AIA® Document A701® – 2018**

This Additions and Deletions Report, as defined on page 1 of the associated document, reproduces below all text the author has added to the standard form AIA document in order to complete it, as well as any text the author may have added to or deleted from the original AIA text. Added text is shown underlined. Deleted text is indicated with a horizontal line through the original AIA text.

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 11:12:02 ET on 11/07/2024.

## **PAGE 1**

Renovations to Bogue Sound ES  
Bogue Sound Elementary School  
3323 HWY 24  
Newport, NC 28530

...

Carteret County Schools  
107 Safrit Drive  
Beaufort, NC 28516  
Telephone Number: 252-728-4583

...

Hite Associates, P.C.  
2600 Meridian Drive  
Greenville, NC 27834  
Telephone Number: 252-757-0333

## **PAGE 3**

**§ 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.

## **PAGE 4**

**§ 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.

## **Certification of Document's Authenticity**

**AIA® Document D401™ – 2003**

I, , hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 11:12:02 ET on 11/07/2024 under Order No. 4104247004 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A701™ - 2018, Instructions to Bidders, other than those additions and deletions shown in the associated Additions and Deletions Report.

---

*(Signed)*

---

*(Title)*

---

*(Dated)*

## **SUPPLEMENTARY INSTRUCTIONS TO BIDDERS**

---

### **ARTICLE 3**

ADD subparagraph 3.4: In addition to obtaining Bidding Documents from the Hite Associates website, qualified bidders, subcontractors, material suppliers may obtain complete or partial sets of the Drawings Bidding Documents and specifications from SpeedyBlue Printers for the cost of printing and mailing.

ADD subparagraph 3.5: All Bidders, subcontractors, and material suppliers are to use the Hite Associates website only, for accurate and complete Bid Documents. The Owner nor the Designers will be responsible for information accessed from any other source.

### **ARTICLE 4**

ADD: Bidders must identify the type of proposal clearly on the Bid Envelope, and include State License number thereon.

### **ARTICLE 7**

ADD: Furnish Performance Bond and Payment Bonds in the amount of the Contract Price, covering faithful performance of contract and payment of all obligations arising thereunder on AIA Document A312.

# FORM OF PROPOSAL

## Renovations to Bogue Sound Elementary School

From: \_\_\_\_\_ Contract: GENERAL

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

To: Carteret County Board of Education      Date: \_\_\_\_\_

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 attended the mandatory pre-bid conference, examined the site of the work and informed himself fully in regard to all conditions pertaining to the places where the work is to be done, that he has examined the specifications for 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 the Carteret County 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 the: Renovations to Bogue Sound Elementary School in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the Owner and / or Architect, 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, for the sum of:

### GENERAL CONSTRUCTION CONTRACT (ALL WORK)

Base Bid:

\_\_\_\_\_ Dollars(\$)

Plumbing Subcontractor: \_\_\_\_\_ (write in "N/A" if not applicable)

Mechanical Subcontractor: \_\_\_\_\_ (Pre-bid conference attendance mandatory)

Electrical Subcontractor: \_\_\_\_\_ (Pre-bid conference attendance mandatory)



**FORM OF PROPOSAL FOR CONSTRUCTION WORK    Renovations to Bogue Sound Elementary School**

---

**ALTERNATES:**

Should any of the alternates as described in the contract documents be accepted, the amount written below shall be the amount to be added to the base bid.

ALTERNATE NO. 1    Shall be the amount added to the Base Bid to provide door hardware and access control manufacturers as specified in Section 08700, in lieu of other, equivalent manufacturers:

(Add) \_\_\_\_\_ Dollars (\$)

ALTERNATE NO. 2:    Shall be the amount added to the Base Bid to provide Trane Air Handler Units, Belimo Valves, and B&G Pumps for the hydronic system in lieu of other, equivalent manufacturers.

(Add) \_\_\_\_\_ Dollars(\$)

ALTERNATE NO. 3:    Shall be the amount added to the Base Bid to provide, install, and program a new Tridium Niagara based front end with all required hardware, software, wiring, programming, graphics, etc. necessary to full replace the existing JCI system. Price shall also include any associated hardware, software and training required for the owner's personnel to be able to see and control the new Building Mgt System (BMS) from the CCS Facilities Maintenance Office located in Beaufort, NC. See specifications for acceptable Tridium compatible controls providers and plans for Sequences of Operation.

(Add) \_\_\_\_\_ Dollars (\$)

ALTERNATE NO. 4:    Shall be the amount added to the Base Bid to provide Square D electrical gear, as scheduled in lieu of other equivalent equipment manufacturers.

(Add) \_\_\_\_\_ Dollars (\$)

ALTERNATE NO. 5:    Shall be the amount added to the Base Bid to provide light fixtures by Lithonia, as scheduled in lieu of other equivalent equipment manufacturers.

(Add) \_\_\_\_\_ Dollars (\$)

**FORM OF PROPOSAL FOR CONSTRUCTION WORK      Renovations to Bogue Sound Elementary School**

---

**UNIT PRICES:**

---

---

Unit prices quoted and accepted shall apply throughout the life of the contract, except as otherwise specifically noted. Unit prices will include all costs, and shall be applied, as appropriate, to compute the total value of changes in the scope of the installed work, all in accordance with the contract documents. Unit prices listed shall include all overhead and profit costs.

<b>ITEM #</b>	<b>DESCRIPTION</b>	<b>UNIT PRICE</b>
1	Foundation Under Cut Excavation (Disposal <b>OFF</b> Site)	_____ c.y. (cubic yard)
2	#57 or #67 Stone (Building foundations)	_____ c.y. (cubic yard)
3	4" Thick Concrete Sidewalk	_____ s.y. (square yard)
4	Fire Alarm Voice/Strobe Notification device	_____ each
5	Fire Alarm Smoke/Heat Detector device	_____ each
6	Fire Alarm Multi Sensor Smoke/Carbon Monoxide device	_____ each
7	Duct Mounted Smoke Detector device	_____ each

**TIME**

The Bidder further proposes and agrees hereby to commence work on a date specified in the Architect's Notice to Proceed, and to complete all work according to the schedule of dates set under Article 8 "Time" of the Supplementary Conditions, WHICH ARE DATES CERTAIN, with no allowance for delays except as may be caused by the Owner. Applicable liquidated damages shall be as stated in the Supplementary General Conditions.

**HUB PARTICIPATION REQUIREMENTS:**

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

**Note:**

Bidders must always submit **with their bid** the Identification of HUB Participation Form listing all HUB contractors, vendors and suppliers that will be used. If there is no HUB 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.

## Proposal Signature Page

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 by the Designer, as agent for the Owner, 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.

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 / President / Vice President)

Address \_\_\_\_\_

ATTEST:

\_\_\_\_\_

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

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

Title: \_\_\_\_\_  
(Corp. Sec. or Asst. Sec. only)

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

(CORPORATE SEAL)

Addendum received and used in computing bid:

Addendum No. 1 \_\_\_\_\_ Addendum No. 3 \_\_\_\_\_ Addendum No. 5 \_\_\_\_\_ Addendum No. 6 \_\_\_\_\_

Addendum No. 2 \_\_\_\_\_ Addendum No. 4 \_\_\_\_\_ Addendum No. 6 \_\_\_\_\_ Addendum No. 7 \_\_\_\_\_

# **GUIDELINES FOR RECRUITMENT AND SELECTION OF MINORITY BUSINESSES FOR PARTICIPATION IN CONSTRUCTION CONTRACTS**

In accordance with G.S. 143-128.2 (effective January 1, 2002) these guidelines establish goals for minority participation in single-prime bidding, separate-prime bidding, construction manager at risk, and alternative contracting methods. The legislation provides that the Public Owner shall have a verifiable ten percent (10%) goal for participation by minority businesses in the total value of work for each project for which a contract or contracts are awarded. These requirements are published to accomplish that end.

## **SECTION A: INTENT**

It is the intent of these guidelines that the Owner, as awarding authority for construction projects, and the contractors and subcontractors performing the construction contracts awarded shall cooperate and in good faith do all things legal, proper and reasonable to achieve the statutory goal of ten percent (10%) for participation by minority businesses in each construction project as mandated by GS 143-128.2. Nothing in these guidelines shall be construed to require contractors or awarding authorities to award contracts or subcontracts to or to make purchases of materials or equipment from minority-business contractors or minority-business subcontractors who do not submit the lowest responsible, responsive bid or bids.

## **SECTION B: DEFINITIONS**

1. Minority - a person who is a citizen or lawful permanent resident of the United States and who is:
  - a. Black, that is, a person having origins in any of the black racial groups in Africa;
  - b. Hispanic, that is, a person of Spanish or Portuguese culture with origins in Mexico, South or Central America, or the Caribbean Islands, regardless of race;
  - c. Asian American, that is, a person having origins in any of the original peoples of the Far East, Southeast Asia and Asia, the Indian subcontinent, the Pacific Islands;
  - d. American Indian, that is, a person having origins in any of the original peoples of North America; or
  - e. Female
2. Minority Business - means a business:
  - a. In which at least fifty-one percent (51%) is owned by one or more minority persons, or in the case of a corporation, in which at least fifty-one percent (51%) of the stock is owned by one or more minority persons or socially and economically disadvantaged individuals; and
  - b. Of which the management and daily business operations are controlled by one or more of the minority persons or socially and economically disadvantaged individuals who own it.
3. Socially and economically disadvantaged individual - means the same as defined in 15 U.S.C. 637. "Socially disadvantaged individuals are those who have been subjected to racial or ethnic prejudice or cultural bias because of their identity as a member of a group without regard to their individual qualities". "Economically disadvantaged individuals are those socially disadvantaged individuals whose ability to compete in the free enterprise system has been impaired due to diminished capital and credit opportunities as compared to others in the same business area who are not socially disadvantaged".
4. Public Entity - means the Owner and all public subdivisions and local governmental units.
5. Owner - The public institution named in the contract.

6. Designer – Any person, firm, partnership, or corporation, which has contracted with the Owner to perform architectural or engineering work.
7. Bidder - Any person, firm, partnership, corporation, association, or joint venture seeking to be awarded a public contract or subcontract.
8. Contract - A mutually binding legal relationship or any modification thereof, obligating the seller to furnish equipment, materials or services, including construction, and obligating the buyer to pay for them.
9. Contractor - Any person, firm, partnership, corporation, association, or joint venture which has contracted with the State of North Carolina to perform construction work or repair.
10. Subcontractor - A firm under contract with the prime contractor or construction manager at risk for supplying materials or labor and materials and/or installation. The subcontractor may or may not provide materials in his subcontract.

### **SECTION C: RESPONSIBILITIES**

1. Office for Historically Underutilized Businesses, Department of Administration (hereinafter referred to as HUB Office).

The HUB Office has established a program, which allows interested persons or businesses qualifying as a minority business under G.S. 143-128.2, to obtain certification in the State of North Carolina procurement system. The information provided by the minority businesses will be used by the HUB Office to:

- a. Identify those areas of work for which there are minority businesses, as requested.
- b. Make available to interested parties a list of prospective minority business contractors and subcontractors.
- c. Assist in the determination of technical assistance needed by minority business contractors.

In addition to being responsible for the certification/verification of minority businesses that want to participate in the State construction program, the HUB Office will:

- (1) Maintain a current list of minority businesses. The list shall include the areas of work in which each minority business is interested.
- (2) Inform minority businesses on how to identify and obtain contracting and subcontracting opportunities through the State and other public entities.
- (3) Inform minority businesses of the contracting and subcontracting process for public construction building projects.
- (4) Work with the North Carolina trade and professional organizations to improve the ability of minority businesses to compete in the State construction projects.
- (5) The HUB Office also oversees the minority business program by:
  - a. Monitoring compliance with the program requirements.
  - b. Assisting in the implementation of training and technical assistance programs.
  - c. Identifying and implementing outreach efforts to increase the utilization of minority businesses.
  - d. Reporting the results of minority business utilization to the Secretary of the Department of Administration, the Governor, and the General Assembly.

2. The Owner  
The Owner will be responsible for the following:

- a. Reviewing the apparent low bidders' statutory compliance with the requirements listed in the proposal prior to award of contracts. The Owner reserves the right to reject any or all bids and to waive informalities.
  - b. Monitoring of contractors' compliance with minority business requirements in the contract documents during construction.
  - c. Providing statistical data and required reports to the HUB Office.
  - d. Resolving any protest and disputes arising after implementation of the plan.
3. Constituent Institutions of The State of North Carolina  
Before awarding a contract, a constituent institution shall do the following:
- a. Implement the constituent institution HUB plan.
  - b. Attend the scheduled prebid conference.
  - c. At least 10 days prior to the scheduled day of bid opening, notify minority businesses that have requested notices from the public entity for public construction or repair work and minority businesses that otherwise indicated to the Office for Historically Underutilized Businesses an interest in the type of work being bid or the potential contracting opportunities listed in the proposal. The notification shall include the following:
    1. A description of the work for which the bid is being solicited.
    2. The date, time, and location where bids are to be submitted.
    3. The name of the individual within the owner's organization who will be available to answer questions about the project.
    4. Where bid documents may be reviewed.
    5. Any special requirements that may exist.
  - d. Utilize other media, as appropriate, likely to inform potential minority businesses of the bid being sought.
  - e. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
  - f. Review, jointly with the designer, all requirements of G.S. 143-128.2(c) and G.S. 143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing good faith efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.
  - g. Evaluate documentation to determine good faith effort has been achieved for minority business utilization prior to recommendation of award.
  - h. Review prime contractors' pay applications for compliance with minority business utilization commitments prior to payment.
  - i. Document evidence of implementation of Owner's responsibilities.
4. Designer  
Under the single-prime bidding, separate prime bidding, construction manager at risk, or alternative contracting method, the designer will:
- a. Attend the scheduled prebid conference to explain minority business requirements to the prospective bidders.
  - b. Assist the owner to identify and notify prospective minority business prime and subcontractors of potential contracting opportunities.
  - c. Maintain documentation of any contacts, correspondence, or conversation with minority business firms made in an attempt to meet the goals.
  - d. Review jointly with the owner, all requirements of G.S. 143-128.2(c) and G.S.143-128.2(f) – (i.e. bidders' proposals for identification of the minority businesses that will be utilized with corresponding total dollar value of the bid and affidavit listing Good Faith Efforts, or affidavit of self-performance of work, if the contractor will perform work under contract by its own workforce) - prior to recommendation of award.

- e. During construction phase of the project, review “MBE Documentation for Contract Payment” – (Appendix E) for compliance with minority business utilization commitments. Submit Appendix E form with monthly pay applications to the owner and forward copies to the Owner.
- f. Make documentation showing evidence of implementation of Designer’s responsibilities available for review by the Owner and HUB Office, upon request.

5. Prime Contractor(s), CM at Risk, and Its First-Tier Subcontractors

Under the single-prime bidding, the separate-prime bidding, construction manager at risk and alternative contracting methods, contractor(s) will:

- a. Attend the scheduled prebid conference.
- b. Identify or determine those work areas of a subcontract where minority businesses may have an interest in performing subcontract work.
- c. At least ten (10) days prior to the scheduled day of bid opening, notify minority businesses of potential subcontracting opportunities listed in the proposal. The notification will include the following:
  - (1) A description of the work for which the subbid is being solicited.
  - (2) The date, time and location where subbids are to be submitted.
  - (3) The name of the individual within the company who will be available to answer questions about the project.
  - (4) Where bid documents may be reviewed.
  - (5) Any special requirements that may exist, such as insurance, licenses, bonds and financial arrangements.

If there are more than three (3) minority businesses in the general locality of the project who offer similar contracting or subcontracting services in the specific trade, the contractor(s) shall notify three (3), but may contact more, if the contractor(s) so desires.

- d. During the bidding process, comply with the contractor(s) requirements listed in the proposal for minority participation.
- e. Identify on the bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit listing good faith efforts as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).
- f. Make documentation showing evidence of implementation of PM, CM-at-Risk and First-Tier Subcontractor responsibilities available for review by the constituent institution and HUB Office, upon request.
- g. Upon being named the apparent low bidder, the Bidder shall provide one of the following: (1) an affidavit (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 applicable goal; (2) if the percentage is not equal to the applicable goal, then documentation of all good faith efforts taken to meet the goal. Failure to comply with these requirements is grounds for rejection of the bid and award to the next lowest responsible and responsive bidder.
- h. The contractor(s) shall identify the name(s) of minority business subcontractor(s) and corresponding dollar amount of work on the schedule of values. The schedule of values shall be provided as required in Article 31 of the General Conditions of the Contract to facilitate payments to the subcontractors.
- i. The contractor(s) shall submit with each monthly pay request(s) and final payment(s), “MBE Documentation for Contract Payment” – (Appendix E), for designer’s review.
- j. During the construction of a project, at any time, if it becomes necessary to replace a minority business subcontractor, immediately advise the Owner, and the Director of the HUB Office in writing, of the circumstances involved. The prime contractor shall make a good faith effort to replace a minority business subcontractor with another minority business subcontractor.
- k. If during the construction of a project additional subcontracting opportunities become available, make a good faith effort to solicit subbids from minority businesses.
- l. It is the intent of these requirements apply to all contractors performing as prime contractor and first tier subcontractor under construction manager at risk on state projects.



6. Minority Business Responsibilities

While minority businesses are not required to become certified in order to participate in the State construction projects, it is recommended that they become certified and should take advantage of the appropriate technical assistance that is made available. In addition, minority businesses who are contacted by owners or bidders must respond promptly whether or not they wish to submit a bid.

**SECTION D: DISPUTE PROCEDURES**

It is the policy of this state that disputes that involves a person's rights, duties or privileges, should be settled through informal procedures. To that end, minority business disputes arising under these guidelines should be resolved as governed under G.S. 143-128(g).

**SECTION E:** These guidelines shall apply upon promulgation on University construction projects.

Copies of these guidelines may be obtained from:

<http://www.NorthCarolina.edu/finance/projects/projects.cfm#attachments>

**SECTION F:** In addition to these guidelines, there will be issued with each construction bid package provisions for contractual compliance providing MBE participation in State building projects. An explanation of the process follows, titled “MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)” along with relevant forms for its implementation (“Identification of Minority Business Participation” form, Affidavits A, B, C, D and Appendix E).

## MINORITY BUSINESS CONTRACT PROVISIONS (CONSTRUCTION)

### APPLICATION:

The **Guidelines for Recruitment and Selection of Minority Businesses for Participation in State Construction Contracts** are hereby made a part of these contract documents. These guidelines shall apply to all contractors regardless of ownership. Copies of these guidelines may be obtained from: <http://www.NorthCarolina.edu/finance/projects/projects.cfm#attachments>

### MINORITY BUSINESS SUBCONTRACT GOALS:

The goals for participation by minority firms as subcontractors on this project have been set at 10%.

The bidder must identify on its bid, the minority businesses that will be utilized on the project with corresponding total dollar value of the bid and affidavit (Affidavit A) listing good faith efforts **or** affidavit (Affidavit B) of self-performance of work, if the bidder will perform work under contract by its own workforce, as required by G.S. 143-128.2(c) and G.S. 143-128.2(f).

The lowest responsible, responsive bidder must provide 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 applicable goal.

### **OR**

Provide 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, **with documentation of Good Faith Effort, if the percentage is not equal to the applicable goal.**

### **OR**

Provide Affidavit B, which includes sufficient information for the State to determine that the bidder does not customarily subcontract work on this type project.

**The above information must be provided as required. Failure to submit these documents is grounds for rejection of the bid.**

## **MINIMUM COMPLIANCE REQUIREMENTS:**

All written statements, affidavits or intentions made by the Bidder shall become a part of the agreement between the Contractor and the Owner for performance of this contract. Failure to comply with any of these statements, affidavits, or intentions, or with the minority business Guidelines shall constitute a breach of the contract. A finding by the Owner that any information submitted either prior to award of the contract or during the performance of the contract is inaccurate, false or incomplete, shall also constitute a breach of the contract. Any such breach may result in termination of the contract in accordance with the termination provisions contained in the contract. It shall be solely at the option of the Owner whether to terminate the contract for breach.

In determining whether a contractor has made Good Faith Efforts, the Owner will evaluate all efforts made by the Contractor and will determine compliance in regard to quantity, intensity, and results of these efforts. Good Faith Efforts include:

- (1) Contacting 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 or proposal date and notifying them of the nature and scope of the work to be performed.
- (2) Making 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 bid or proposals are due.
- (3) Breaking down or combining elements of work into economically feasible units to facilitate minority participation.
- (4) Working with minority trade, community, or contractor organizations identified by the Office for Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.
- (5) Attending any prebid meetings scheduled by the public owner.
- (6) Providing assistance in getting required bonding or insurance or providing alternatives to bonding or insurance for subcontractors.
- (7) Negotiating in good faith with interested minority businesses and not rejecting 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) Providing 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. Assisting minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.
- (9) Negotiating 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) Providing quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.



# AFFIDAVIT A – Listing of the Good Faith Effort

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

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

**I have made a good faith effort to comply under the following areas checked:**  
(A minimum of 5 areas must be checked in order to have achieved a "good faith effort")

- 1 - 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 - 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 - Broken down or combined elements of work into economically feasible units to facilitate minority participation.
- 4 - 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 - Attended prebid meetings scheduled by the public owner.
- 6 - Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.
- 7 - 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 - 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 - 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 - Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

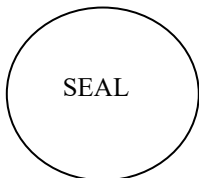
In accordance with GS143-128.2(d) the undersigned will enter into a formal agreement with the firms Listed, in the Identification of Minority Business Participation schedule conditional upon execution of a contract with the Owner. Failure to abide by this statutory provision will constitute a breach 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 North Carolina, County of \_\_\_\_\_  
Subscribed and sworn to before me this \_\_\_\_\_ day of \_\_\_\_\_ 20\_\_\_\_  
Notary Public \_\_\_\_\_  
My commission expires \_\_\_\_\_

# 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

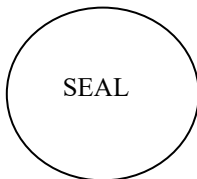
The Bidder agrees to provide any additional information or documentation requested by the owner in support of the above statement.

The 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 North Carolina, 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 Minority Firms

Project \_\_\_\_\_

\*\*\*\*\***(NOTE: THIS FORM IS NOT TO BE SUBMITTED WITH THE BID PROPOSAL)**\*\*\*\*\*

If the portion of the work to be executed by minority businesses as defined in GS143-128.2(g) 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  
(Bidder)

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

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	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**)

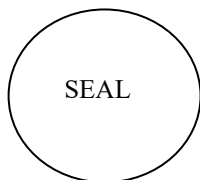
Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.

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

# AFFIDAVIT D – Good Faith Efforts

Project \_\_\_\_\_

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

(Bidder

Affidavit of: \_\_\_\_\_)

I do certify the attached documentation as true and accurate representation of my good faith efforts.

(Attach additional sheets if required)

Name and Phone Number	*Minority Category	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**)

Documentation of the Bidder's good faith efforts to meet the goals set forth in these provisions.

Examples of documentation shall include the following evidence:

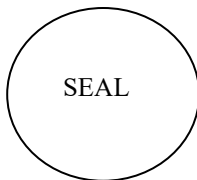
- A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to 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 businesses 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.

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

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

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



State of North Carolina, County of \_\_\_\_\_

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

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

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



# APPENDIX E

## MBE DOCUMENTATION FOR CONTRACT PAYMENTS

Prime Contractor/Architect: \_\_\_\_\_

Address & Phone: \_\_\_\_\_

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

Pay Application #: \_\_\_\_\_ Period: \_\_\_\_\_

The following is a list of payments to be made to minority business contractors on this project for the above-mentioned period.

Firm Name	*Minority Category	Payment Amount (List invoice number and amount)	Owner Use Only

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

Date: \_\_\_\_\_ Approved/Certified By: \_\_\_\_\_

Name

\_\_\_\_\_  
Title

\_\_\_\_\_  
Signature

**\*\*THIS DOCUMENT MUST BE SUBMITTED WITH EACH PAY REQUEST & FINAL PAYMENT\*\***

# Standard Form of Agreement Between Owner and Contractor

where the basis of payment is a  
STIPULATED SUM

**AGREEMENT** made as of the «  
» day of «  
» in the year «2024 »  
(In words, indicate day, month and year.)

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

«Carteret County Board of Education»  
«107 Safrit Drive »  
«Beaufort, NC 27516 »  
« »

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

«xyz »«CONTRACTOR »  
« »  
« »  
« »

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

«Renovations to Bogue Sound Elementary School»  
«3323 NC Hwy 24  
Newport, North Carolina 28570»

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

«Hite Associates, PC »  
«2600 Meridian Drive »  
«Greenville, NC 27834 »  
« »

The Owner and Contractor agree as follows.

## TABLE OF ARTICLES

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

### ARTICLE 1 THE CONTRACT DOCUMENTS

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

### ARTICLE 2 THE WORK OF THIS CONTRACT

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

“Each Prime Contractor shall execute the entire Work described in the Contract Documents and reasonably inferable from them as being necessary to produce the intended results. In general, the Work includes but is not limited to the furnishing of all labor, materials, equipment, tools, services and supervision to perform the Work for the project”.

### ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.

*(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)*

Seven days from receipt of Notice to Proceed.

If, prior to the commencement of the Work, the Owner requires time to file mortgages and other security interests, the Owner’s time requirement shall be as follows:

« »

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

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than « » ( « » ) days from the date of commencement, or as follows:

*(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)*

In accordance with the schedule of COMPLETION DATES set forth in the Supplementary Conditions, under "Time" Article, all of which are DATES CERTAIN, with no delays allowed except as caused by the Owner.

« »

**Portion of Work**

**Substantial Completion Date**

, subject to adjustments of this Contract Time as provided in the Contract Documents.

*(Insert provisions, if any, for liquidated damages relating to failure to achieve Substantial Completion on time or for bonus payments for early completion of the Work.)*

«  
Substantial Completion liquidated damages- \$1000 per day.  
  
Final Completion liquidated damages - \$1000 per day.  
  
See Section 9.11 of the General Conditions and the Liquidated Damages Articles of the Supplemental Conditions for additional provisions regarding liquidated damages.  
»

**ARTICLE 4 CONTRACT SUM**

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

§ 4.2 The Contract Sum is based upon the following alternates, if any, which are described in the Contract Documents and are hereby accepted by the Owner:

*(State the numbers or other identification of accepted alternates. If the bidding or proposal documents permit the Owner to accept other alternates subsequent to the execution of this Agreement, attach a schedule of such other alternates showing the amount for each and the date when that amount expires.)*

« »

§ 4.3 Unit prices, if any: See Form of Proposal

*(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable.)*

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

§ 4.4 Allowances included in the Contract Sum, if any: See Form of Proposal

*(Identify allowance and state exclusions, if any, from the allowance price.)*

Item	Price

**ARTICLE 5 PAYMENTS**

**§ 5.1 PROGRESS PAYMENTS**

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

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

« One calendar month ending on the twenty-fifth day of the month. »

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the « » day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the « » day of the « » month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than « » ( « » ) days after the Architect receives the Application for Payment. *(Federal, state or local laws may require payment within a certain period of time.)*

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

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

§ 5.1.6 Subject to other provisions of the Contract Documents, the amount of each progress payment shall be computed as follows:

- .1 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 retainage as outlined in Section 9.3.1.3 of the General and Supplemental Conditions . Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction, as amended;
- .2 Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage as outlined in Section 9.3.1.3 of the General and Supplemental Conditions;
- .3 Subtract the aggregate of previous payments made by the Owner; and
- .4 Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 9.5 of AIA Document A201–2007, as amended.

§ 5.1.7 The progress payment amount determined in accordance with Section 5.1.6 shall be further modified under the following circumstances:

- .1 Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and *(Section 9.8.5 of AIA Document A201–2007 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)*

- .2 Add, if final completion of the Work is thereafter materially delayed through no fault of the Contractor, any additional amounts payable in accordance with Section 9.10.3 of AIA Document A201–2007, as amended.

**§ 5.1.8** Reduction or limitation of retainage, if any, shall be as follows:

*(If it is intended, prior to Substantial Completion of the entire Work, to reduce or limit the retainage resulting from the percentages inserted in Sections 5.1.6.1 and 5.1.6.2 above, and this is not explained elsewhere in the Contract Documents, insert here provisions for such reduction or limitation.)*

«  
See Section 9.3 of the General Conditions and the Supplemental Conditions.  
»

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

**§ 5.2 FINAL PAYMENT**

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

- .1 the Contractor has fully performed the Contract except for the Contractor’s responsibility to correct Work as provided in Section 12.2.2 of AIA Document A201–2007, as amended, and to satisfy other requirements, if any, which extend beyond final payment; and
- .2 a final Certificate for Payment has been issued by the Architect.

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

« »

**ARTICLE 6 DISPUTE RESOLUTION**

**§ 6.1 INITIAL DECISION MAKER**

The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007, as amended, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.

*(If the parties mutually agree, insert the name, address and other contact information of the Initial Decision Maker, if other than the Architect.)*

«  
The Architect shall be the Initial Decision Maker as outlined in Article 15 of the General Conditions and the Supplemental Conditions.  
»  
« »  
« »  
« »

**§ 6.2 BINDING DISPUTE RESOLUTION**

For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A201–2007, as amended, the method of binding dispute resolution shall be as follows:

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

[  ] Litigation in a court of competent jurisdiction

« »

**ARTICLE 7 TERMINATION OR SUSPENSION**

§ 7.1 The Contract may be terminated by the Owner or the Contractor as provided in Article 14 of AIA Document A201–2007, as amended.

§ 7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007, as amended.

**ARTICLE 8 MISCELLANEOUS PROVISIONS**

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007, as amended or another Contract Document, the reference refers to that provision as amended or supplemented by other provisions of the Contract Documents.

§ 8.2 Payments due and unpaid under the Contract shall not bear interest.  
*(Insert rate of interest agreed upon, if any.)*

« Zero » % «0% »

§ 8.3 The Owner’s representative:  
*(Name, address and other information)*

« »  
« »  
« »  
« »  
« »  
« »

§ 8.4 The Contractor’s representative:  
*(Name, address and other information)*

« »  
« »  
« »  
« »  
« »  
« »

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

§ 8.6 Other provisions:

« »

**ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS**

§ 9.1 The Contract Documents, except for Modifications issued after execution of this Agreement, are enumerated in the sections below.

§ 9.1.1 The Agreement is this executed AIA Document A101–2007, Standard Form of Agreement Between Owner and Contractor.

§ 9.1.2 The General Conditions are AIA Document A201–2007, General Conditions of the Contract for Construction, as amended. The amended version of AIA Document A201-2007 is included in the Project Manual.

§ 9.1.3 The Supplementary and other Conditions of the Contract:

Document	Title	Date	Pages
Section 01010	General Conditions	June 7, 2016	pp. 1-54
Section 01012	Supplementary General	June 7, 2016	pp. 1-4

**§ 9.1.4** The Specifications:  
*(Either list the Specifications here or refer to an exhibit attached to this Agreement.)*

«See Exhibit A »

Section	Title	Date	Pages

**§ 9.1.5** The Drawings:  
*(Either list the Drawings here or refer to an exhibit attached to this Agreement.)*

«See Exhibit B »

Number	Title	Date

**§ 9.1.6** The Addenda, if any:

Number	Date	Pages

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

**§ 9.1.7** Additional documents, if any, forming part of the Contract Documents:

- .1 AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed by the parties, or the following:  
 « »
- .2 Other documents, if any, listed below:  
*(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2007 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor’s bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)*

«FORM OF PROPOSAL »

**ARTICLE 10 INSURANCE AND BONDS**

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007, as amended.

\_\_\_\_\_



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

Carteret County Board of Education  
107 Safrit Drive,  
Beaufort, NC 27516

\_\_\_\_\_  
**OWNER** *(Signature)*

\_\_\_\_\_  
**CONTRACTOR** *(Signature)*

\_\_\_\_\_  
« »«Board Chairperson »  
*(Printed name and title)*

\_\_\_\_\_  
« »«President »  
*(Printed name and title)*

APPROVED AS TO FORM:

BY: \_\_\_\_\_

Carteret County BOE Attorney

PRE-AUDIT CERTIFICATION:

This instrument has been preaudited in the manner required by the Local Government Budget and Fiscal Control act.

BY: \_\_\_\_\_

Carteret County Schools Finance Officer

**for the following PROJECT:**

*(Name and location or address)*

Renovations To Bogue Sound Elementary School  
Newport, North Carolina

**THE OWNER:**

*(Name and address)*

Carteret County Board of Education  
107 Safrit Drive  
Beaufort, NC 27516

**THE ARCHITECT:**

*(Name and address)*

Hite Associates, PC  
2600 Meridian Drive  
Greenville, NC 27834

**TABLE OF ARTICLES**

- 1 GENERAL PROVISIONS**
- 2 OWNER**
- 3 CONTRACTOR**
- 4 ARCHITECT**
- 5 SUBCONTRACTORS**
- 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS**
- 7 CHANGES IN THE WORK**
- 8 TIME**
- 9 PAYMENTS AND COMPLETION**
- 10 PROTECTION OF PERSONS AND PROPERTY**
- 11 INSURANCE AND BONDS**
- 12 UNCOVERING AND CORRECTION OF WORK**
- 13 MISCELLANEOUS PROVISIONS**
- 14 TERMINATION OR SUSPENSION OF THE CONTRACT**
- 15 CLAIMS AND DISPUTES**

## INDEX

(Numbers and Topics in Bold are Section Headings)

### **Acceptance of Nonconforming Work**

9.6.6, 9.9.3, **12.3**

Acceptance of Work

9.6.6, 9.8.2, 9.9.3, 9.10.1, 9.10.3, 12.3

### **Access to Work**

**3.16**, 6.2.1, 12.1

Accident Prevention

10

Acts and Omissions

3.2, 3.3.2, 3.12.8, 3.18, 4.2.3, 8.3.1, 9.5.1, 10.2.5, 10.2.8, 13.4.2, 13.7.1, 14.1, 15.2

Addenda

1.1.1, 3.11.1

Additional Costs, Claims for

3.7.4, 3.7.5, 6.1.1, 7.3.7.5, 10.3, 15.1.4

### **Additional Inspections and Testing**

9.4.2, 9.8.3, 12.2.1, **13.5**

Additional Insured

11.1.4

### **Additional Time, Claims for**

3.2.4, 3.7.4, 3.7.5, 3.10.2, 8.3.2, **15.1.5**

### **Administration of the Contract**

3.1.3, **4.2**, 9.4, 9.5

Advertisement or Invitation to Bid

1.1.1

Aesthetic Effect

4.2.13

### **Allowances**

**3.8**, 7.3.8

All-risk Insurance

11.3.1, 11.3.1.1

### **Applications for Payment**

4.2.5, 7.3.9, 9.2, **9.3**, 9.4, 9.5.1, 9.6.3, 9.7.1, 9.10, 11.1.3

Approvals

2.1.1, 2.2.2, 2.4, 3.1.3, 3.10.2, 3.12.8, 3.12.9, 3.12.10, 4.2.7, 9.3.2, 13.5.1

### **Arbitration**

8.3.1, 11.3.10, 13.1.1, 15.3.2, **15.4**

## **ARCHITECT**

### **4**

**Architect**, Definition of

#### **4.1.1**

Architect, Extent of Authority

2.4.1, 3.12.7, 4.1, 4.2, 5.2, 6.3.1, 7.1.2, 7.3.7, 7.4, 9.2.1, 9.3.1, 9.4, 9.5, 9.6.3, 9.8, 9.10.1, 9.10.3, 12.1, 12.2.1, 13.5.1, 13.5.2, 14.2.2, 14.2.4, 15.1.3, 15.2.1

Architect, Limitations of Authority and Responsibility

2.1.1, 3.12.4, 3.12.8, 3.12.10, 4.1.2, 4.2.1, 4.2.2, 4.2.3, 4.2.6, 4.2.7, 4.2.10, 4.2.12, 4.2.13, 5.2.1, 7.4.1, 9.4.2, 9.5.3, 9.6.4, 15.1.3, 15.2

Architect's Additional Services and Expenses

2.4.1, 11.3.1.1, 12.2.1, 13.5.2, 13.5.3, 14.2.4

Architect's Administration of the Contract

3.1.3, 4.2, 3.7.4, 15.2, 9.4.1, 9.5

Architect's Approvals

2.4.1, 3.1.3, 3.5.1, 3.10.2, 4.2.7

Architect's Authority to Reject Work

3.5.1, 4.2.6, 12.1.2, 12.2.1

Architect's Copyright

1.1.7, 1.5

Architect's Decisions

3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 4.2.14, 6.3.1, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2.1, 9.4.1, 9.5, 9.8.4, 9.9.1, 13.5.2, 15.2, 15.3

Architect's Inspections

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 13.5

Architect's Instructions

3.2.4, 3.3.1, 4.2.6, 4.2.7, 13.5.2

Architect's Interpretations

4.2.11, 4.2.12

Architect's Project Representative

4.2.10

Architect's Relationship with Contractor

1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.7.5, 3.9.2, 3.9.3, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.2, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.4.2, 13.5, 15.2

Architect's Relationship with Subcontractors

1.1.2, 4.2.3, 4.2.4, 4.2.6, 9.6.3, 9.6.4, 11.3.7

Architect's Representations

9.4.2, 9.5.1, 9.10.1

Architect's Site Visits

3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5

Asbestos

10.3.1

Attorneys' Fees

3.18.1, 9.10.2, 10.3.3

Award of Separate Contracts

6.1.1, 6.1.2

### **Award of Subcontracts and Other Contracts for Portions of the Work**

#### **5.2**

### **Basic Definitions**

#### **1.1**

Bidding Requirements

1.1.1, 5.2.1, 11.4.1

Binding Dispute Resolution

9.7.1, 11.3.9, 11.3.10, 13.1.1, 15.2.5, 15.2.6.1, 15.3.1, 15.3.2, 15.4.1

### **Boiler and Machinery Insurance**

#### **11.3.2**

Bonds, Lien

7.3.7.4, 9.10.2, 9.10.3

### **Bonds, Performance, and Payment**

7.3.7.4, 9.6.7, 9.10.3, 11.3.9, **11.4**

Building Permit

3.7.1

### **Capitalization**

#### **1.3**

Certificate of Substantial Completion

9.8.3, 9.8.4, 9.8.5

## **Certificates for Payment**

4.2.1, 4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7.1, 9.10.1, 9.10.3, 14.1.1.3, 14.2.4, 15.1.3

Certificates of Inspection, Testing or Approval  
13.5.4

Certificates of Insurance  
9.10.2, 11.1.3

## **Change Orders**

1.1.1, 2.4.1, 3.4.2, 3.7.4, 3.8.2.3, 3.11.1, 3.12.8, 4.2.8, 5.2.3, 7.1.2, 7.1.3, **7.2**, 7.3.2, 7.3.6, 7.3.9, 7.3.10, 8.3.1, 9.3.1.1, 9.10.3, 10.3.2, 11.3.1.2, 11.3.4, 11.3.9, 12.1.2, 15.1.3

**Change Orders**, Definition of  
**7.2.1**

## **CHANGES IN THE WORK**

2.2.1, 3.11, 4.2.8, **7**, 7.2.1, 7.3.1, 7.4, 7.4.1, 8.3.1, 9.3.1.1, 11.3.9

**Claims**, Definition of  
**15.1.1**

## **CLAIMS AND DISPUTES**

3.2.4, 6.1.1, 6.3.1, 7.3.9, 9.3.3, 9.10.4, 10.3.3, **15**, 15.4

Claims and Timely Assertion of Claims  
15.4.1

## **Claims for Additional Cost**

3.2.4, 3.7.4, 6.1.1, 7.3.9, 10.3.2, **15.1.4**

## **Claims for Additional Time**

3.2.4, 3.7.4.6.1.1, 8.3.2, 10.3.2, **15.1.5**

## **Concealed or Unknown Conditions, Claims for** **3.7.4**

Claims for Damages  
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6

Claims Subject to Arbitration  
15.3.1, 15.4.1

## **Cleaning Up**

**3.15**, 6.3

Commencement of the Work, Conditions Relating to  
2.2.1, 3.2.2, 3.4.1, 3.7.1, 3.10.1, 3.12.6, 5.2.1, 5.2.3, 6.2.2, 8.1.2, 8.2.2, 8.3.1, 11.1, 11.3.1, 11.3.6, 11.4.1, 15.1.4

**Commencement of the Work**, Definition of  
**8.1.2**

## **Communications Facilitating Contract Administration**

3.9.1, **4.2.4**

Completion, Conditions Relating to  
3.4.1, 3.11, 3.15, 4.2.2, 4.2.9, 8.2, 9.4.2, 9.8, 9.9.1, 9.10, 12.2, 13.7, 14.1.2

## **COMPLETION, PAYMENTS AND** **9**

Completion, Substantial  
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 13.7

Compliance with Laws  
1.6.1, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 10.2.2, 11.1, 11.3, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14.1.1, 14.2.1.3, 15.2.8, 15.4.2, 15.4.3

Concealed or Unknown Conditions  
3.7.4, 4.2.8, 8.3.1, 10.3

## Conditions of the Contract

1.1.1, 6.1.1, 6.1.4

Consent, Written

3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.3.1, 13.2, 13.4.2, 15.4.4.2

## **Consolidation or Joinder** **15.4.4**

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

1.1.4, **6**

**Construction Change Directive**, Definition of  
**7.3.1**

## **Construction Change Directives**

1.1.1, 3.4.2, 3.12.8, 4.2.8, 7.1.1, 7.1.2, 7.1.3, **7.3**, 9.3.1.1

Construction Schedules, Contractor's  
3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2

**Contingent Assignment of Subcontracts**  
**5.4**, 14.2.2.2

## **Continuing Contract Performance** **15.1.3**

**Contract**, Definition of  
**1.1.2**

## **CONTRACT, TERMINATION OR SUSPENSION OF THE** 5.4.1.1, 11.3.9, **14**

Contract Administration

3.1.3, 4, 9.4, 9.5

Contract Award and Execution, Conditions Relating to  
3.7.1, 3.10, 5.2, 6.1, 11.1.3, 11.3.6, 11.4.1

## **Contract Documents, The** **1.1.1**

Contract Documents, Copies Furnished and Use of  
1.5.2, 2.2.5, 5.3

**Contract Documents**, Definition of  
**1.1.1**

## **Contract Sum**

3.7.4, 3.8, 5.2.3, 7.2, 7.3, 7.4, **9.1**, 9.4.2, 9.5.1.4, 9.6.7, 9.7, 10.3.2, 11.3.1, 14.2.4, 14.3.2, 15.1.4, 15.2.5

**Contract Sum**, Definition of  
**9.1**

Contract Time

3.7.4, 3.7.5, 3.10.2, 5.2.3, 7.2.1.3, 7.3.1, 7.3.5, 7.4, 8.1.1, 8.2.1, 8.3.1, 9.5.1, 9.7.1, 10.3.2, 12.1.1, 14.3.2, 15.1.5.1, 15.2.5

**Contract Time**, Definition of  
**8.1.1**

## **CONTRACTOR** **3**

**Contractor**, Definition of  
**3.1**, **6.1.2**

## **Contractor's Construction Schedules**

**3.10**, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2

Contractor's Employees

3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1,

**Contractor's Liability Insurance**  
**11.1**

Contractor's Relationship with Separate Contractors and Owner's Forces  
3.12.5, 3.14.2, 4.2.4, 6, 11.3.7, 12.1.2, 12.2.4  
Contractor's Relationship with Subcontractors  
1.2.2, 3.3.2, 3.18.1, 3.18.2, 5, 9.6.2, 9.6.7, 9.10.2, 11.3.1.2, 11.3.7, 11.3.8  
Contractor's Relationship with the Architect  
1.1.2, 1.5, 3.1.3, 3.2.2, 3.2.3, 3.2.4, 3.3.1, 3.4.2, 3.5.1, 3.7.4, 3.10, 3.11, 3.12, 3.16, 3.18, 4.1.3, 4.2, 5.2, 6.2.2, 7, 8.3.1, 9.2, 9.3, 9.4, 9.5, 9.7, 9.8, 9.9, 10.2.6, 10.3, 11.3.7, 12, 13.5, 15.1.2, 15.2.1  
Contractor's Representations  
3.2.1, 3.2.2, 3.5.1, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.8.2  
Contractor's Responsibility for Those Performing the Work  
3.3.2, 3.18, 5.3.1, 6.1.3, 6.2, 9.5.1, 10.2.8  
Contractor's Review of Contract Documents  
3.2  
Contractor's Right to Stop the Work  
9.7  
Contractor's Right to Terminate the Contract  
14.1, 15.1.6  
Contractor's Submittals  
3.10, 3.11, 3.12.4, 4.2.7, 5.2.1, 5.2.3, 9.2, 9.3, 9.8.2, 9.8.3, 9.9.1, 9.10.2, 9.10.3, 11.1.3, 11.4.2  
Contractor's Superintendent  
3.9, 10.2.6  
Contractor's Supervision and Construction Procedures  
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.5, 7.3.7, 8.2, 10, 12, 14, 15.1.3  
Contractual Liability Insurance  
11.1.1.8, 11.2  
Coordination and Correlation  
1.2, 3.2.1, 3.3.1, 3.10, 3.12.6, 6.1.3, 6.2.1  
Copies Furnished of Drawings and Specifications  
1.5, 2.2.5, 3.11  
Copyrights  
1.5, **3.17**  
Correction of Work  
2.3, 2.4, 3.7.3, 9.4.2, 9.8.2, 9.8.3, 9.9.1, 12.1.2, **12.2**  
**Correlation and Intent of the Contract Documents 1.2**  
**Cost**, Definition of  
**7.3.7**  
Costs  
2.4.1, 3.2.4, 3.7.3, 3.8.2, 3.15.2, 5.4.2, 6.1.1, 6.2.3, 7.3.3.3, 7.3.7, 7.3.8, 7.3.9, 9.10.2, 10.3.2, 10.3.6, 11.3, 12.1.2, 12.2.1, 12.2.4, 13.5, 14  
**Cutting and Patching**  
**3.14**, 6.2.5  
Damage to Construction of Owner or Separate Contractors  
3.14.2, 6.2.4, 10.2.1.2, 10.2.5, 10.4, 11.1.1, 11.3, 12.2.4  
Damage to the Work  
3.14.2, 9.9.1, 10.2.1.2, 10.2.5, 10.4.1, 11.3.1, 12.2.4  
Damages, Claims for  
3.2.4, 3.18, 6.1.1, 8.3.3, 9.5.1, 9.6.7, 10.3.3, 11.1.1, 11.3.5, 11.3.7, 14.1.3, 14.2.4, 15.1.6

Damages for Delay  
6.1.1, 8.3.3, 9.5.1.6, 9.7, 10.3.2  
**Date of Commencement of the Work**, Definition of  
**8.1.2**  
**Date of Substantial Completion**, Definition of  
**8.1.3**  
**Day**, Definition of  
**8.1.4**  
Decisions of the Architect  
3.7.4, 4.2.6, 4.2.7, 4.2.11, 4.2.12, 4.2.13, 15.2, 6.3, 7.3.7, 7.3.9, 8.1.3, 8.3.1, 9.2.1, 9.4, 9.5.1, 9.8.4, 9.9.1, 13.5.2, 14.2.2, 14.2.4, 15.1, 15.2  
**Decisions to Withhold Certification**  
9.4.1, **9.5**, 9.7, 14.1.1.3  
Defective or Nonconforming Work, Acceptance, Rejection and Correction of  
2.3.1, 2.4.1, 3.5.1, 4.2.6, 6.2.5, 9.5.1, 9.5.2, 9.6.6, 9.8.2, 9.9.3, 9.10.4, 12.2.1  
**Defective Work**, Definition of  
**3.5.1**  
Definitions  
1.1, 2.1.1, 3.1.1, 3.5.1, 3.12.1, 3.12.2, 3.12.3, 4.1.1, 15.1.1, 5.1, 6.1.2, 7.2.1, 7.3.1, 8.1, 9.1, 9.8.1  
**Delays and Extensions of Time**  
3.2., 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4.1, **8.3**, 9.5.1, 9.7.1, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5  
Disputes  
6.3.1, 7.3.9, 15.1, 15.2  
**Documents and Samples at the Site**  
**3.11**  
**Drawings**, Definition of  
**1.1.5**  
Drawings and Specifications, Use and Ownership of  
3.11  
Effective Date of Insurance  
8.2.2, 11.1.2  
**Emergencies**  
**10.4**, 14.1.1.2, 15.1.4  
Employees, Contractor's  
3.3.2, 3.4.3, 3.8.1, 3.9, 3.18.2, 4.2.3, 4.2.6, 10.2, 10.3.3, 11.1.1, 11.3.7, 14.1, 14.2.1.1  
Equipment, Labor, Materials or  
1.1.3, 1.1.6, 3.4, 3.5.1, 3.8.2, 3.8.3, 3.12, 3.13.1, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2  
Execution and Progress of the Work  
1.1.3, 1.2.1, 1.2.2, 2.2.3, 2.2.5, 3.1, 3.3.1, 3.4.1, 3.5.1, 3.7.1, 3.10.1, 3.12, 3.14, 4.2, 6.2.2, 7.1.3, 7.3.5, 8.2, 9.5.1, 9.9.1, 10.2, 10.3, 12.2, 14.2, 14.3.1, 15.1.3  
Extensions of Time  
3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3, 7.4.1, 9.5.1, 9.7.1, 10.3.2, 10.4.1, 14.3, 15.1.5, 15.2.5  
**Failure of Payment**  
9.5.1.3, **9.7**, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2  
Faulty Work  
(See Defective or Nonconforming Work)  
**Final Completion and Final Payment**  
4.2.1, 4.2.9, 9.8.2, **9.10**, 11.1.2, 11.1.3, 11.3.1, 11.3.5, 12.3.1, 14.2.4, 14.4.3  
Financial Arrangements, Owner's

2.2.1, 13.2.2, 14.1.1.4  
Fire and Extended Coverage Insurance  
11.3.1.1  
**GENERAL PROVISIONS**  
**1**  
**Governing Law**  
**13.1**  
Guarantees (*See Warranty*)  
**Hazardous Materials**  
10.2.4, **10.3**  
Identification of Subcontractors and Suppliers  
5.2.1  
**Indemnification**  
3.17.1, **3.18**, 9.10.2, 10.3.3, 10.3.5, 10.3.6, 11.3.1.2, 11.3.7  
**Information and Services Required of the Owner**  
2.1.2, **2.2**, 3.2.2, 3.12.4, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2.1, 11.4, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3  
**Initial Decision**  
**15.2**  
**Initial Decision Maker, Definition of**  
1.1.8  
Initial Decision Maker, Decisions  
14.2.2, 14.2.4, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5  
Initial Decision Maker, Extent of Authority  
14.2.2, 14.2.4, 15.1.3, 15.2.1, 15.2.2, 15.2.3, 15.2.4, 15.2.5  
**Injury or Damage to Person or Property**  
**10.2.8**, 10.4.1  
Inspections  
3.1.3, 3.3.3, 3.7.1, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 12.2.1, 13.5  
Instructions to Bidders  
1.1.1  
Instructions to the Contractor  
3.2.4, 3.3.1, 3.8.1, 5.2.1, 7, 8.2.2, 12, 13.5.2  
**Instruments of Service, Definition of**  
**1.1.7**  
Insurance  
3.18.1, 6.1.1, 7.3.7, 9.3.2, 9.8.4, 9.9.1, 9.10.2, **11**  
**Insurance, Boiler and Machinery**  
**11.3.2**  
**Insurance, Contractor's Liability**  
**11.1**  
Insurance, Effective Date of  
8.2.2, 11.1.2  
**Insurance, Loss of Use**  
**11.3.3**  
**Insurance, Owner's Liability**  
**11.2**  
**Insurance, Property**  
10.2.5, **11.3**  
Insurance, Stored Materials  
9.3.2, 11.4.1.4  
**INSURANCE AND BONDS**  
**11**  
Insurance Companies, Consent to Partial Occupancy  
9.9.1, 11.4.1.5  
Insurance Companies, Settlement with

11.4.10  
Intent of the Contract Documents  
1.2.1, 4.2.7, 4.2.12, 4.2.13, 7.4  
**Interest**  
**13.6**  
**Interpretation**  
1.2.3, **1.4**, 4.1.1, 5.1, 6.1.2, 15.1.1  
Interpretations, Written  
4.2.11, 4.2.12, 15.1.4  
Judgment on Final Award  
15.4.2  
**Labor and Materials, Equipment**  
1.1.3, 1.1.6, **3.4**, 3.5.1, 3.8.2, 3.8.3, 3.12, 3.13, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1, 10.2.4, 14.2.1.1, 14.2.1.2  
Labor Disputes  
8.3.1  
Laws and Regulations  
1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13.1, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1.1, 11.3, 13.1.1, 13.4, 13.5.1, 13.5.2, 13.6.1, 14, 15.2.8, 15.4  
Liens  
2.1.2, 9.3.3, 9.10.2, 9.10.4, 15.2.8  
Limitations, Statutes of  
12.2.5, 13.7, 15.4.1.1  
Limitations of Liability  
2.3.1, 3.2.2, 3.5.1, 3.12.10, 3.17.1, 3.18.1, 4.2.6, 4.2.7, 4.2.12, 6.2.2, 9.4.2, 9.6.4, 9.6.7, 10.2.5, 10.3.3, 11.1.2, 11.2.1, 11.3.7, 12.2.5, 13.4.2  
Limitations of Time  
2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2.7, 5.2, 5.3.1, 5.4.1, 6.2.4, 7.3, 7.4, 8.2, 9.2.1, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7.1, 9.8, 9.9, 9.10, 11.1.3, 11.3.1.5, 11.3.6, 11.3.10, 12.2, 13.5, 13.7, 14, 15  
**Loss of Use Insurance**  
**11.3.3**  
Material Suppliers  
1.5, 3.12.1, 4.2.4, 4.2.6, 5.2.1, 9.3, 9.4.2, 9.6, 9.10.5  
**Materials, Hazardous**  
10.2.4, **10.3**  
Materials, Labor, Equipment and  
1.1.3, 1.1.6, 1.5.1, 3.4.1, 3.5.1, 3.8.2, 3.8.3, 3.12, 3.13.1, 3.15.1, 4.2.6, 4.2.7, 5.2.1, 6.2.1, 7.3.7, 9.3.2, 9.3.3, 9.5.1.3, 9.10.2, 10.2.1.2, 10.2.4, 14.2.1.1, 14.2.1.2  
Means, Methods, Techniques, Sequences and Procedures of Construction  
3.3.1, 3.12.10, 4.2.2, 4.2.7, 9.4.2  
Mechanic's Lien  
2.1.2, 15.2.8  
**Mediation**  
8.3.1, 10.3.5, 10.3.6, 15.2.1, 15.2.5, 15.2.6, **15.3**, 15.4.1  
**Minor Changes in the Work**  
1.1.1, 3.12.8, 4.2.8, 7.1, **7.4**  
**MISCELLANEOUS PROVISIONS**  
**13**  
**Modifications, Definition of**  
**1.1.1**  
Modifications to the Contract

1.1.1, 1.1.2, 3.11, 4.1.2, 4.2.1, 5.2.3, 7, 8.3.1, 9.7.1, 10.3.2, 11.3.1

## **Mutual Responsibility**

### **6.2**

#### **Nonconforming Work, Acceptance of**

9.6.6, 9.9.3, **12.3**

Nonconforming Work, Rejection and Correction of  
2.3.1, 2.4.1, 3.5.1, 4.2.6, 6.2.4, 9.5.1, 9.8.2, 9.9.3, 9.10.4, 12.2.1

#### **Notice**

2.2.1, 2.3.1, 2.4.1, 3.2.4, 3.3.1, 3.7.2, 3.12.9, 5.2.1, 9.7.1, 9.10, 10.2.2, 11.1.3, 11.4.6, 12.2.2.1, 13.3, 13.5.1, 13.5.2, 14.1, 14.2, 15.2.8, 15.4.1

#### **Notice, Written**

2.3.1, 2.4.1, 3.3.1, 3.9.2, 3.12.9, 3.12.10, 5.2.1, 9.7.1, 9.10, 10.2.2, 10.3, 11.1.3, 11.3.6, 12.2.2.1, **13.3**, 14, 15.2.8, 15.4.1

#### **Notice of Claims**

3.7.4, 4.5, 10.2.8, **15.1.2**, 15.4

#### **Notice of Testing and Inspections**

13.5.1, 13.5.2

#### **Observations, Contractor's**

3.2, 3.7.4

#### **Occupancy**

2.2.2, 9.6.6, 9.8, 11.3.1.5

#### **Orders, Written**

1.1.1, 2.3, 3.9.2, 7, 8.2.2, 11.3.9, 12.1, 12.2.2.1, 13.5.2, 14.3.1

## **OWNER**

### **2**

#### **Owner, Definition of**

##### **2.1.1**

#### **Owner, Information and Services Required of the**

2.1.2, **2.2**, 3.2.2, 3.12.10, 6.1.3, 6.1.4, 6.2.5, 9.3.2, 9.6.1, 9.6.4, 9.9.2, 9.10.3, 10.3.3, 11.2.1, 11.3, 13.5.1, 13.5.2, 14.1.1.4, 14.1.4, 15.1.3

#### **Owner's Authority**

1.5, 2.1.1, 2.3.1, 2.4.1, 3.4.2, 3.8.1, 3.12.10, 3.14.2, 4.1.2, 4.1.3, 4.2.4, 4.2.9, 5.2.1, 5.2.4, 5.4.1, 6.1, 6.3.1, 7.2.1, 7.3.1, 8.2.2, 8.3.1, 9.3.1, 9.3.2, 9.5.1, 9.6.4, 9.9.1, 9.10.2, 10.3.2, 11.1.3, 11.3.3, 11.3.10, 12.2.2, 12.3.1, 13.2.2, 14.3, 14.4, 15.2.7

#### **Owner's Financial Capability**

2.2.1, 13.2.2, 14.1.1.4

#### **Owner's Liability Insurance**

##### **11.2**

#### **Owner's Loss of Use Insurance**

##### **11.3.3**

#### **Owner's Relationship with Subcontractors**

1.1.2, 5.2, 5.3, 5.4, 9.6.4, 9.10.2, 14.2.2

#### **Owner's Right to Carry Out the Work**

**2.4**, 14.2.2

#### **Owner's Right to Clean Up**

##### **6.3**

#### **Owner's Right to Perform Construction and to Award Separate Contracts**

##### **6.1**

#### **Owner's Right to Stop the Work**

##### **2.3**

Owner's Right to Suspend the Work

14.3

#### **Owner's Right to Terminate the Contract**

14.2

#### **Ownership and Use of Drawings, Specifications and Other Instruments of Service**

1.1.1, 1.1.6, 1.1.7, **1.5**, 2.2.5, 3.2.2, 3.11.1, 3.17.1, 4.2.12, 5.3.1

#### **Partial Occupancy or Use**

9.6.6, **9.9**, 11.3.1.5

#### **Patching, Cutting and**

**3.14**, 6.2.5

#### **Patents**

3.17

#### **Payment, Applications for**

4.2.5, 7.3.9, 9.2.1, **9.3**, 9.4, 9.5, 9.6.3, 9.7.1, 9.8.5, 9.10.1, 14.2.3, 14.2.4, 14.4.3

#### **Payment, Certificates for**

4.2.5, 4.2.9, 9.3.3, **9.4**, 9.5, 9.6.1, 9.6.6, 9.7.1, 9.10.1, 9.10.3, 13.7, 14.1.1.3, 14.2.4

#### **Payment, Failure of**

9.5.1.3, **9.7**, 9.10.2, 13.6, 14.1.1.3, 14.2.1.2

#### **Payment, Final**

4.2.1, 4.2.9, 9.8.2, 9.10, 11.1.2, 11.1.3, 11.4.1, 11.4.5, 12.3.1, 13.7, 14.2.4, 14.4.3

#### **Payment Bond, Performance Bond and**

7.3.7.4, 9.6.7, 9.10.3, 11.4.9, **11.4**

#### **Payments, Progress**

9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3

## **PAYMENTS AND COMPLETION**

### **9**

#### **Payments to Subcontractors**

5.4.2, 9.5.1.3, 9.6.2, 9.6.3, 9.6.4, 9.6.7, 11.4.8, 14.2.1.2

#### **PCB**

10.3.1

#### **Performance Bond and Payment Bond**

7.3.7.4, 9.6.7, 9.10.3, 11.4.9, **11.4**

#### **Permits, Fees, Notices and Compliance with Laws**

2.2.2, **3.7**, 3.13, 7.3.7.4, 10.2.2

## **PERSONS AND PROPERTY, PROTECTION OF**

### **10**

#### **Polychlorinated Biphenyl**

10.3.1

#### **Product Data, Definition of**

**3.12.2**

#### **Product Data and Samples, Shop Drawings**

3.11, **3.12**, 4.2.7

#### **Progress and Completion**

4.2.2, **8.2**, 9.8, 9.9.1, 14.1.4, 15.1.3

#### **Progress Payments**

9.3, **9.6**, 9.8.5, 9.10.3, 13.6, 14.2.3, 15.1.3

#### **Project, Definition of the**

**1.1.4**

#### **Project Representatives**

4.2.10

#### **Property Insurance**

10.2.5, **11.3**

## **PROTECTION OF PERSONS AND PROPERTY**

### **10**

Regulations and Laws  
1.5, 3.2.3, 3.6, 3.7, 3.12.10, 3.13, 4.1.1, 9.6.4, 9.9.1, 10.2.2, 11.1, 11.4, 13.1, 13.4, 13.5.1, 13.5.2, 13.6, 14, 15.2.8, 15.4

Rejection of Work  
3.5.1, 4.2.6, 12.2.1

Releases and Waivers of Liens  
9.10.2

Representations  
3.2.1, 3.5.1, 3.12.6, 6.2.2, 8.2.1, 9.3.3, 9.4.2, 9.5.1, 9.8.2, 9.10.1

Representatives  
2.1.1, 3.1.1, 3.9, 4.1.1, 4.2.1, 4.2.2, 4.2.10, 5.1.1, 5.1.2, 13.2.1

Responsibility for Those Performing the Work  
3.3.2, 3.18, 4.2.3, 5.3.1, 6.1.3, 6.2, 6.3, 9.5.1, 10

Retainage  
9.3.1, 9.6.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3

**Review of Contract Documents and Field Conditions by Contractor**  
3.2, 3.12.7, 6.1.3

Review of Contractor's Submittals by Owner and Architect  
3.10.1, 3.10.2, 3.11, 3.12, 4.2, 5.2, 6.1.3, 9.2, 9.8.2

Review of Shop Drawings, Product Data and Samples by Contractor  
3.12

**Rights and Remedies**  
1.1.2, 2.3, 2.4, 3.5.1, 3.7.4, 3.15.2, 4.2.6, 4.5, 5.3, 5.4, 6.1, 6.3, 7.3.1, 8.3, 9.5.1, 9.7, 10.2.5, 10.3, 12.2.2, 12.2.4, 13.4, 14, 15.4

**Royalties, Patents and Copyrights**  
3.17

Rules and Notices for Arbitration  
15.4.1

**Safety of Persons and Property**  
10.2, 10.4

**Safety Precautions and Programs**  
3.3.1, 4.2.2, 4.2.7, 5.3.1, 10.1, 10.2, 10.4

**Samples, Definition of**  
3.12.3

**Samples, Shop Drawings, Product Data and**  
3.11, 3.12, 4.2.7

**Samples at the Site, Documents and**  
3.11

**Schedule of Values**  
9.2, 9.3.1

Schedules, Construction  
1.4.1.2, 3.10, 3.12.1, 3.12.2, 6.1.3, 15.1.5.2

Separate Contracts and Contractors  
1.1.4, 3.12.5, 3.14.2, 4.2.4, 4.2.7, 6, 8.3.1, 11.4.7, 12.1.2

**Shop Drawings, Definition of**  
3.12.1

**Shop Drawings, Product Data and Samples**  
3.11, 3.12, 4.2.7

**Site, Use of**  
3.13, 6.1.1, 6.2.1

Site Inspections  
3.2.2, 3.3.3, 3.7.1, 3.7.4, 4.2, 9.4.2, 9.10.1, 13.5

Site Visits, Architect's  
3.7.4, 4.2.2, 4.2.9, 9.4.2, 9.5.1, 9.9.2, 9.10.1, 13.5

Special Inspections and Testing  
4.2.6, 12.2.1, 13.5

**Specifications, Definition of the**  
1.1.6

**Specifications, The**  
1.1.1, 1.1.6, 1.2.2, 1.5, 3.11, 3.12.10, 3.17, 4.2.14

Statute of Limitations  
13.7, 15.4.1.1

Stopping the Work  
2.3, 9.7, 10.3, 14.1

Stored Materials  
6.2.1, 9.3.2, 10.2.1.2, 10.2.4, 11.4.1.4

**Subcontractor, Definition of**  
5.1.1

**SUBCONTRACTORS**  
5

Subcontractors, Work by  
1.2.2, 3.3.2, 3.12.1, 4.2.3, 5.2.3, 5.3, 5.4, 9.3.1.2, 9.6.7

**Subcontractual Relations**  
5.3, 5.4, 9.3.1.2, 9.6, 9.10, 10.2.1, 11.4.7, 11.4.8, 14.1, 14.2.1

Submittals  
3.10, 3.11, 3.12, 4.2.7, 5.2.1, 5.2.3, 7.3.7, 9.2, 9.3, 9.8, 9.9.1, 9.10.2, 9.10.3, 11.1.3

Submittal Schedule  
3.10.2, 3.12.5, 4.2.7

**Subrogation, Waivers of**  
6.1.1, 11.4.5, 11.3.7

**Substantial Completion**  
4.2.9, 8.1.1, 8.1.3, 8.2.3, 9.4.2, 9.8, 9.9.1, 9.10.3, 12.2, 13.7

**Substantial Completion, Definition of**  
9.8.1

Substitution of Subcontractors  
5.2.3, 5.2.4

Substitution of Architect  
4.1.3

Substitutions of Materials  
3.4.2, 3.5.1, 7.3.8

**Sub-subcontractor, Definition of**  
5.1.2

Subsurface Conditions  
3.7.4

**Successors and Assigns**  
13.2

**Superintendent**  
3.9, 10.2.6

**Supervision and Construction Procedures**  
1.2.2, 3.3, 3.4, 3.12.10, 4.2.2, 4.2.7, 6.1.3, 6.2.4, 7.1.3, 7.3.7, 8.2, 8.3.1, 9.4.2, 10, 12, 14, 15.1.3

Surety  
5.4.1.2, 9.8.5, 9.10.2, 9.10.3, 14.2.2, 15.2.7

Surety, Consent of  
9.10.2, 9.10.3

Surveys  
2.2.3

**Suspension by the Owner for Convenience**



## **14.3**

Suspension of the Work

5.4.2, 14.3

Suspension or Termination of the Contract

5.4.1.1, 11.4.9, 14

### **Taxes**

3.6, 3.8.2.1, 7.3.7.4

### **Termination by the Contractor**

**14.1**, 15.1.6

### **Termination by the Owner for Cause**

5.4.1.1, **14.2**, 15.1.6

### **Termination by the Owner for Convenience**

## **14.4**

Termination of the Architect

4.1.3

Termination of the Contractor

14.2.2

## **TERMINATION OR SUSPENSION OF THE CONTRACT**

## **14**

### **Tests and Inspections**

3.1.3, 3.3.3, 4.2.2, 4.2.6, 4.2.9, 9.4.2, 9.8.3, 9.9.2, 9.10.1, 10.3.2, 11.4.1.1, 12.2.1, **13.5**

### **TIME**

## **8**

### **Time, Delays and Extensions of**

3.2.4, 3.7.4, 5.2.3, 7.2.1, 7.3.1, 7.4.1, **8.3**, 9.5.1, 9.7.1, 10.3.2, 10.4.1, 14.3.2, 15.1.5, 15.2.5

Time Limits

2.1.2, 2.2, 2.4, 3.2.2, 3.10, 3.11, 3.12.5, 3.15.1, 4.2, 4.4, 4.5, 5.2, 5.3, 5.4, 6.2.4, 7.3, 7.4, 8.2, 9.2, 9.3.1, 9.3.3, 9.4.1, 9.5, 9.6, 9.7, 9.8, 9.9, 9.10, 11.1.3, 11.4.1.5, 11.4.6, 11.4.10, 12.2, 13.5, 13.7, 14, 15.1.2, 15.4

### **Time Limits on Claims**

3.7.4, 10.2.8, **13.7**, 15.1.2

Title to Work

9.3.2, 9.3.3

### **Transmission of Data in Digital Form**

## **1.6**

## **UNCOVERING AND CORRECTION OF WORK**

## **12**

### **Uncovering of Work**

## **12.1**

Unforeseen Conditions, Concealed or Unknown

3.7.4, 8.3.1, 10.3

Unit Prices

7.3.3.2, 7.3.4

Use of Documents

1.1.1, 1.5, 2.2.5, 3.12.6, 5.3

### **Use of Site**

**3.13**, 6.1.1, 6.2.1

### **Values, Schedule of**

**9.2**, 9.3.1

Waiver of Claims by the Architect

13.4.2

Waiver of Claims by the Contractor

9.10.5, 11.4.7, 13.4.2, 15.1.6

Waiver of Claims by the Owner

9.9.3, 9.10.3, 9.10.4, 11.4.3, 11.4.5, 11.4.7, 12.2.2.1, 13.4.2, 14.2.4, 15.1.6

Waiver of Consequential Damages

14.2.4, 15.1.6

Waiver of Liens

9.10.2, 9.10.4

### **Waivers of Subrogation**

6.1.1, 11.4.5, **11.3.7**

### **Warranty**

3.5, 4.2.9, 9.3.3, 9.8.4, 9.9.1, 9.10.4, 12.2.2, 13.7.1

Weather Delays

15.1.5.2

### **Work, Definition of**

## **1.1.3**

Written Consent

1.5.2, 3.4.2, 3.7.4, 3.12.8, 3.14.2, 4.1.2, 9.3.2, 9.8.5, 9.9.1, 9.10.2, 9.10.3, 11.4.1, 13.2, 13.4.2, 15.4.4.2

Written Interpretations

4.2.11, 4.2.12

Written Notice

2.3, 2.4, 3.3.1, 3.9, 3.12.9, 3.12.10, 5.2.1, 8.2.2, 9.7, 9.10, 10.2.2, 10.3, 11.1.3, 11.4.6, 12.2.2, 12.2.4, **13.3**, 14, 15.4.1

Written Orders

1.1.1, 2.3, 3.9, 7, 8.2.2, 11.4.9, 12.1, 12.2, 13.5.2, 14.3.1, 15.1.2

**ARTICLE 1 GENERAL PROVISIONS**

**§ 1.1 BASIC DEFINITIONS**

**§ 1.1.1 THE CONTRACT DOCUMENTS**

The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect.

**§ 1.1.2 THE CONTRACT**

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

**§ 1.1.3 THE WORK**

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

**§ 1.1.4 THE PROJECT**

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

**§ 1.1.5 THE DRAWINGS**

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

**§ 1.1.5.1** Dimensions indicated on the Drawings shall be followed. Do not scale drawings. Conflicts, discrepancies, and omissions shall be resolved prior to ordering or installing materials and equipment.

**§ 1.1.5.2** The Contractor shall provide critical clearances, tolerances, and dimensions as indicated on the Drawings. These critical dimensions are not optional. The Architect shall be advised immediately if existing conditions do not permit critical dimensions as shown. No consideration will be given to any claim based on differences between the actual dimensions and those indicated on the drawings.

**§ 1.1.5.3** Any modifications to the Drawings shall be approved by the Architect. The Architect's decision in matters relating to artistic effect and structural integrity will be final if consistent with the intent of the Contract Documents.

**§ 1.1.5.4** The Drawings are developed to communicate design intent. Assemblies or components required to achieve this design intent are subject to approval by the Architect.

**§ 1.1.6 THE SPECIFICATIONS**

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

**§ 1.1.7 INSTRUMENTS OF SERVICE**

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

**§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS**

**§ 1.2.1** The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and with terms reasonably inferable from them, though not expressly included in them, as being necessary to produce the indicated results.

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

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

**§ 1.3 CAPITALIZATION**

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

**§ 1.4 INTERPRETATION AND EXECUTION OF THE CONTRACT DOCUMENTS**

**§ 1.4.1** In the interest of brevity the Contract Documents frequently omit modifying words such as "all" and "any" and articles such as "the" and "an," but the fact that a modifier or an article is absent from one statement and appears in another is not intended to affect the interpretation of either statement. These Contract Documents periodically refer to 2007 Editions of AIA Documents A201 and/or B101. In the interest of brevity, the Contract Documents may not always specify that each such reference is to AIA Documents A201 and/or B101 only as modified and amended by the Owner. Nonetheless, each reference to AIA Documents A201 and/or B101 is only to those documents as modified and amended by the Owner.

**§ 1.4.2** The Contract Documents shall be signed by the Owner and Contractor in the places designated for their signatures. If either the Owner or Contractor or both do not sign all Contract Documents, the Architect shall identify such unsigned Documents and notify the Owner and Contractor.

**§ 1.4.3** In the Contract Documents, where discrepancies are apparent, detailed information is lacking, or interpretation is not clear, the Contractor shall secure required information from the Architect in writing before proceeding with the work. Items that are detailed and/or specified, but not distinctly located on the drawings shall be located by the Architect upon the written request of the Contractor.

**§ 1.5**

**OWNERSHIP AND USE OF DRAWINGS, SPECIFICATIONS AND OTHER INSTRUMENTS OF SERVICE**

**§ 1.5.1** The Architect and the Architect's consultants shall be deemed the authors and joint owners with the Owner of their respective Instruments of Service, including the Drawings and Specifications, and will retain, with the Owner, all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or

claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

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

**§ 1.6 TRANSMISSION OF DATA IN DIGITAL FORM**

If the parties intend to transmit Instruments of Service or any other information or documentation in digital form, they shall do so as provided in the Agreement or the Contract Documents.

**ARTICLE 2 OWNER**

**§ 2.1 GENERAL**

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

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

**§ 2.2.1** Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner's obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner's ability to make payment when due. The Owner shall furnish such evidence within fifteen (15) days after its receipt of a request demonstrating the existence of one or more of the contractual bases for the request.

**§ 2.2.2** Payment for permits and fees is the responsibility of the Contractor under the Contract Documents, including the payment of fees specified under Section 3.7.1. The Owner shall only pay for necessary approvals, easements, assessments and charges required for construction, use or occupancy of permanent structures or for permanent changes in existing facilities about which the Contractor notified the Owner in writing in advance of the execution of this Agreement..

**§ 2.2.3** The Owner shall furnish surveys describing physical characteristics, legal limitations and any known utility locations for the site of the Project, and a legal description of the site. The information shown on the Drawings is based upon field surveys, plans from previous construction projects, and other information provided by the Owner. It is the Contractor's responsibility to verify locations of items that may impact the construction of the work. The Contractor shall exercise proper precautions relating to the safe performance of the Work.

**§ 2.2.4** The Owner shall furnish information or services required of the Owner by the Contract Documents with reasonable promptness. The Owner shall also furnish other relevant information or services under the Owner's exclusive control, not also under the Architect's and/or Contractor's control, after the Contractor demonstrates to the Owner's satisfaction in writing that such other information or service under the Owner's exclusive control is necessary to the Contractor's performance of the Work and provides the Owner with a written request for such information or service. .

**§ 2.2.4.1** The Owner shall not be responsible or have control over or charge of the construction means, methods, techniques, sequences, or procedures or for safety precautions and programs in connection

with the work, and the Owner will not be responsible for the Contractor's failure to carry out the Work in accordance with the contract documents.

**§ 2.2.5** Unless otherwise provided in the Contract Documents, the Owner shall furnish to the Contractor one copy of the Contract Documents for purposes of making reproductions pursuant to Section 1.5.2. Additional sets will be furnished at the cost of reproduction, postage and handling.

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

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

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

If the Contractor defaults or neglects to carry out the Work in accordance with the Contract Documents and fails within a ten-day period after service of written notice from the Owner to commence and continue correction of such default or neglect with diligence and promptness, the Owner may, without prejudice to other remedies the Owner may have, correct such deficiencies. In such case an appropriate Change Order shall be issued deducting from payments then or thereafter due the Contractor the reasonable cost of correcting such deficiencies, including Owner's expenses and compensation for the Architect's additional services made necessary by such default, neglect or failure. Such action by the Owner and amounts charged to the Contractor are both subject to prior approval of the Architect. If payments then or thereafter due the Contractor are not sufficient to cover such amounts, the Contractor or surety shall pay the difference to the Owner.

**ARTICLE 3 CONTRACTOR**

**§ 3.1 GENERAL**

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

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

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

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

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

**§ 3.2.2** Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Specifications, Drawings and other Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents. The Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor's

review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

**§ 3.2.2.1** The Contractor shall verify all grades, lines, levels and dimensions indicated or shown on the plans and specifications prior to beginning the Work and shall immediately report in writing any errors or inconsistencies to the Architect before commencing the Work.

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

**§ 3.2.4** If the Contractor believes that additional cost or time is involved because of clarifications or instructions the Architect issues in response to the Contractor's notices or requests for information pursuant to Sections 3.2.2 or 3.2.3, the Contractor shall make Claims as provided in Article 15. If the Contractor fails to perform the obligations of Sections 3.2.2 or 3.2.3, the Contractor shall pay such costs and damages to the Owner as would have been avoided if the Contractor had performed such obligations. If the Contractor performs those obligations and makes the reports required in Sections 3.2.2 and 3.2.3, the Contractor shall not be liable to the Owner or Architect for damages resulting from errors, inconsistencies or omissions in the Contract Documents, for differences between field measurements or conditions and the Contract Documents, or for nonconformities of the Contract Documents to applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities.

### **§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES**

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

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

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

**§ 3.3.4** The general contractor shall be the project expeditor for the project. In addition to the duties and responsibilities stated in this Agreement, the general contractor/project expeditor shall perform the duties and obligations imposed on the general contractor and project expeditor by State law.

### **§ 3.4 LABOR AND MATERIALS**

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

§ 3.4.1.1 The Contractor shall use only new materials for the work of this Project. Reuse of existing materials or the use of other salvaged materials is acceptable only where specifically noted in the Construction Documents.

§ 3.4.1.2 The Contractor shall provide all special trims, moldings, and special shaped materials which are required for the satisfactory completion of the work. The Contractor shall provide all necessary fasteners, bracing, and supports required for the stable and secure installation of the Work.

§ 3.4.2 The Contractor may make substitutions only with the written consent of the Owner, after evaluation and approval by the Architect and in accordance with a Change Order or Construction Change Directive.

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

§ 3.4.4 After the contract has been executed, the Owner and the Architect will consider a formal request for the substitution of products in place of those specified only under the conditions set forth in the Contract Documents.

§ 3.4.5 By making request for substitutions based on subparagraphs 3.4.3 above, the Contractor: (1) represents that the Contractor has personally investigated the proposed substitute product and determined that it is equal or superior in all respects to that specified; (2) represents that the Contractor will provide the same warranty for the substitution that the Contractor would for that specified; (3) certifies that the cost data presented is complete and includes all related costs under this contract except the Architect's redesign costs, and waives all claims for additional costs related to the substitution which subsequently become apparent; and (4) will coordinate the installation of the accepted substitute, making such changes as may be required for the work to be complete in all respects.

§ 3.4.6 The Contractor shall provide the Owner at least two copies of all manufacturer's literature and operating manuals for all equipment and materials installed on the Project. The Contractor shall also demonstrate operation and maintenance of all mechanical and electrical equipment or apparatus installed as part of the contract.

§ 3.4.7. Contractor shall comply with all applicable laws and regulations in providing services under this Agreement. Contractor represents that it is aware of and in compliance with the Immigration Reform and Control Act, and that it will collect properly verified I-9 forms from each employee providing services under this Agreement. 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.

### **§ 3.5 WARRANTY**

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

**§ 3.6 TAXES**

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

**§ 3.6.2** The Contractor shall provide documentation of all sales tax paid in a format acceptable to the Owner with each pay application.

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

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

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

**§ 3.7.2.1** While the Contractor is not responsible for ensuring that the Contract Documents are in accordance with applicable laws, statutes, ordinances, codes, rules, regulations, and lawful orders of public authorities, if the Contractor observes that portions of the Contract Documents are at variance with applicable laws, statutes, ordinances, codes, rules, regulations, or lawful orders of public authorities, the Contractor shall promptly notify the Architect and Owner in writing, and the Architect shall make necessary changes through an appropriate modification.

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

**§ 3.7.4 Concealed or Unknown Conditions.** If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than ten (10) days after first observance of the conditions. The Architect will promptly investigate such conditions and, if they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If the Contractor disputes the Architect's determination or recommendation, the Contractor may proceed as provided in Article 15, giving the required notice of his/her dispute and stating a claim in writing to the Owner and the Architect within 21 days after the Architect has given notice of its decision. . The Contractor's failure to submit said claim in strict conformance with Article 15 shall be deemed a waiver of the claim and the Contractor shall not be entitled to any compensation associated with the claim.

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



and Contract Time arising from the existence of such remains or features may be made as provided in Article 15. The Contractor's failure to submit said claim in strict conformance with Article 15 shall be deemed a waiver of the claim and the Contractor shall not be entitled to any compensation associated with the claim.

**§ 3.8 ALLOWANCES**

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

**§ 3.8.2** Unless otherwise provided in the Contract Documents,

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

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

**§ 3.8.4** In any situations in which the Contractor has provided a unit price for an allowance quantity for soil, rock or any other item identified in the bid documents, the unit price shall include all of the costs identified in Section 3.8.2.1. and the costs for unloading and handling at the site, installation, overhead, profit and other expenses associated with the item. If the quantity of the items included in the allowance is not used or exceeded during the Project, the Contract Sum shall be decreased or increased based upon the unit price amount by Change Order.

**§ 3.9 SUPERINTENDENT**

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

**§ 3.9.2** The Contractor, as soon as practicable after award of the Contract but not more than 14 days after the award of the Contract, shall furnish in writing to the Owner through the Architect the name and qualifications of the proposed project manager and superintendent. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to the proposed project manager or superintendent or (2) that the Architect requires additional time to review. Failure of the Architect to reply within the 14 day period shall constitute notice of no reasonable objection. Notwithstanding the above, the Owner and Architect reserve the right to notify the Contractor of their reasonable objection to the project manager and/or superintendent after the 14-day period based upon their performance or failure to perform their duties and responsibilities.

**§ 3.9.3** The Contractor shall not employ a proposed superintendent to whom the Owner or Architect has made reasonable and timely objection and shall promptly replace a project manager and/or superintendent subsequently objected to by the Owner and Architect pursuant to Section 3.9.2.. The Contractor shall not change the superintendent without the Owner's consent, which shall not unreasonably be withheld or delayed.

**§ 3.10 CONTRACTOR'S CONSTRUCTION SCHEDULES**

**§ 3.10.1** The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information and use and for the Owner's and Architect's approval as to the completion date a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for coordinated, expeditious and practicable execution of the Work and Project in cooperation with the other prime contractors on the Project. In the event the Project has been awarded as a multi-prime project, each of the prime contractors shall provide initial and updated schedule information to the Project Expediter as often and in any format reasonably requested by the Project Expediter.

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

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

**§ 3.10.4** The general contractor shall be the project expeditor for the Project. In addition to the duties and obligations stated in this Agreement, the general contractor/project expeditor shall perform all duties and obligations imposed on the general contractor and project expeditor by state law. It shall be the responsibility of the general contractor to integrate the construction schedules of the prime contractors into a project progress schedule that will show graphically, by a detailed bar chart, CPM, or other acceptable and approved methods, the projected progress of the Project from start to finish. The general contractor shall be responsible for providing adequate notice to all prime contractors to insure efficient continuity of all phases of the Project Work. All prime contractors shall review and conform their work to the approved progress schedule and fully inform the Project Expediter as to his work progress, including immediate notification of any work progress changes. The general contractor shall promptly notify Architect in writing of any Contractor's failure to progress the work in accordance with the schedule.

**§ 3.10.5** All prime contractors shall be required to cooperate and consult with each other during the construction of this Project. Each prime contractor shall schedule and execute his work so as to cause no delay to other Contractors. Each prime contractor shall be financially responsible to the other prime contractors for delay caused by him to the other prime contractors on the Project.

**§ 3.10.6** Each prime contractor is required to attend monthly job site progress conference called or scheduled by the Architect. Each prime contractor shall be represented at these job progress conferences by both home office and site personnel. These meetings shall be open to the subcontractors, materials suppliers, any others who can contribute toward maintaining required job progress. It shall be the principal purpose of these meetings, or conferences, to effect coordination, cooperation, and assistance in every practical way toward the end of maintaining progress the project on schedule and to complete the Project within the specified contract time. Each prime contractor shall be prepared to assess progress of the work as required in his particular contract and to recommend remedial measures for correction of progress as may be appropriate. The Architect or his representative shall be the coordinator of and preside over the conferences.

**§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE**

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

delivered to the Architect for inclusion in the submittal to the Owner upon completion of the Work as a record of the Work as constructed.

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

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

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

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

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

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

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

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

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

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

**§ 3.12.10** The Contractor shall not be required to provide professional services that constitute the practice of architecture or engineering unless such services are specifically required by the Contract Documents for a portion of the Work or unless the Contractor needs to provide such services in order to carry out the

Contractor's responsibilities for construction means, methods, techniques, sequences and procedures. The Contractor shall not be required to provide professional services in violation of applicable law. If professional design services or certifications by a design professional related to systems, materials or equipment are specifically required of the Contractor by the Contract Documents, the Architect will specify all performance and design criteria that such services must satisfy. The Contractor shall cause such services or certifications to be provided by a properly licensed design professional, whose signature and seal shall appear on all drawings, calculations, specifications, certifications, Shop Drawings and other submittals prepared by such professional. Shop Drawings and other submittals related to the Work designed or certified by such professional, if prepared by others, shall bear such professional's written approval when submitted to the Architect. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of the services, certifications and approvals performed or provided by such design professionals, provided the Owner and Architect have specified to the Contractor all performance and design criteria that such services must satisfy. Pursuant to this Section 3.12.10, the Architect will review, approve or take other appropriate action on submittals only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents, but shall provide written notification to the Owner and Architect regarding any concerns or objections the Contractor may have regarding the design criteria.

**§ 3.13 USE OF SITE**

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

**§ 3.14 CUTTING AND PATCHING**

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

**§ 3.14.2** The Contractor shall not damage or endanger a portion of the Work or fully or partially completed construction of the Owner or separate contractors by cutting, patching or otherwise altering such construction, or by excavation. The Contractor shall not cut or otherwise alter such construction by the Owner or a separate contractor except with written consent of the Owner and of such separate contractor; such consent shall not be unreasonably withheld. The Contractor shall not unreasonably withhold from the Owner or a separate contractor the Contractor's consent to cutting or otherwise altering the Work.

**§ 3.14.3** All patching shall be performed by mechanics of the trades dictated by the materials used in the patching operations.

**§ 3.15 CLEANING UP**

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

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

**§ 3.15.3** The general construction contractor shall leave the completed work in conditions for occupancy by the Owner such that no cleaning, waxing, polishing, or other janitorial operations are required.

**§ 3.16 ACCESS TO WORK**

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

**§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS**

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

**§ 3.18 INDEMNIFICATION**

**§ 3.18.1** The Contractor shall indemnify and hold harmless the Owner, Architect, and their agents and consultants, for damages, losses, or claims, including attorneys' fees and costs incurred in the defense of such claims, that arise solely from the negligent acts, errors and/or omissions, or failures to perform, by the Contractor, its employees, agents, or consultants. The parties agree that this indemnification clause is an "evidence of indebtedness" for purpose of N.C. Gen. Stat. § 6-21.2. The parties also specifically acknowledge that the Owner is a public body and it is the intent of the parties that the Owner not incur any expenses when the Contractor is solely responsible for the claims.

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

**§ 3.19 CONTRACTOR'S REPRESENTATIONS**

**§ 3.19.1** By entering into this contract with the Owner, the Contractor represents and warrants the following, together with all other representations and warranties in the Contract Documents:

- .1 that he is experienced in and competent to perform the type of work required and to furnish the materials, supplies or equipment to be so performed or furnished by him;
- .2 that he is financially solvent, able to pay his debts as they mature, and possessed of sufficient working capital to initiate and complete the work required under the contract;
- .3 that he is familiar with all federal, state, county, and local laws, ordinances, permits, regulations, and resolutions which may in any way affect the work or those employed therein, including but not limited to any special laws or regulations relating to the work or any part thereof;
- .4 that such temporary and permanent work required by the Contract Documents which is to be done by him will be satisfactorily constructed and fit for use for its intended purpose and that such construction will not injure any person, or damage any property;
- .5 that he has carefully examined the Contract Documents and the site of the work and that from his own investigations, he has satisfied himself and made himself familiar with: (1) the nature and location of the work; (2) the character, quality, and quantity of surface and subsurface materials likely to be encountered, including but not limited to, all structures and obstructions on or at the project site, both natural and man-made; (3) the character of equipment and other facilities needed for the performance of the work; (4) the general and local conditions including without limitation its climatic conditions, the availability and cost of labor and the availability and cost of materials, tools, equipment, labor, and professional services necessary to complete the work in the manner required by the Contract Documents; and (6) all other matters or things which could in any manner affect the performance of the work;
- .6 that he will fully comply with all requirements of the Contract Documents;
- .7 that he will perform the work consistent with good workmanship, sound business practice, and in the most expeditious manner consistent with the best interests of the Owner;
- .8 that he will furnish efficient business administration and experienced superintendence and an adequate supply of workmen/women, equipment, tools, and materials at all times;
- .9 that he has carefully reviewed the work required and that the work can be planned and executed in a normal and orderly sequence of work and reasonably scheduled so as to ensure

completion of the project in accordance with the Contract Documents, allowing for normal and reasonably foreseeable weather, labor and other delays, interruptions and disruptions of the work;

.10 that he will complete the work within the contract time and all portions thereof within any required contract deadlines;

.11 that his contract price is based upon the labor, materials, systems and equipment required by the contract documents, without exception;

.12 that he will make a good faith effort to utilize minority business enterprises (MBEs) per N.C. Gen. Stat. § 143-128, et seq., and the Owner's policy, as subcontractors for the work; and

.13 that he and all others acting on his behalf and/or pursuant to a contract with the him have obtained and shall retain throughout the duration of this Agreement all required licenses and certifications required in order to perform the work identified in the Contract Documents, that he will not permit any such licenses or certifications to lapse at any time during the course of his work on this Project, and that he and all others acting on his behalf and/or pursuant to a contract with him are fully licensed and certified to perform all work required by the Contract Documents and this Agreement.

#### **ARTICLE 4 ARCHITECT**

##### **§ 4.1 GENERAL**

§ 4.1.1 The Architect shall be lawfully licensed to practice architecture or shall be an entity lawfully practicing architecture in the jurisdiction where the Project is located. That lawfully-licensed person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

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

§ 4.1.3 If the employment of the Architect is terminated, the Owner shall in its sole discretion employ a successor architect whose status under the Contract Documents shall be that of the Architect.

##### **§ 4.2 ADMINISTRATION OF THE CONTRACT**

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate For Payment. The Architect will also be the Owner's representative from time to time during the period for correction of Work. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents, unless otherwise modified in writing in accordance with the other provisions of the Contract.

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

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

**§ 4.2.4 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION**

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

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

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

**§ 4.2.7** The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance with information given and the design concept expressed in the Contract Documents. The Architect's action will be taken in accordance with an appropriate submittal schedule approved by the Architect such that the Architect's action will be taken with such reasonable promptness as to cause no delay in the Work or activities of the Owner, Contractor, or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review, or, in the absence of an approved submittal schedule, with reasonable promptness as to cause no delay in the Work or activities of the Owner, Contractor, or separate contractors while allowing sufficient time in the Architect's professional judgment to permit adequate review. Review of such submittals is not conducted for the purpose of substantiating instructions for installation or performance of equipment or systems, all of which remain the responsibility of the Contractor as required by the Contract Documents. The Architect's review of the Contractor's submittals shall not relieve the Contractor of the obligations under Sections 3.3, 3.5 and 3.12. The Architect's review shall not constitute approval of safety precautions or, unless otherwise specifically stated by the Architect, of any construction means, methods, techniques, sequences or procedures. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

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

**§ 4.2.9** The Architect will conduct inspections to determine the date or dates of Substantial Completion when in the Architect's professional opinion the Work or portion of Work is substantially complete and the date of final completion when in the Architect's professional opinion the Work or portion of the Work is finally complete; issue Certificates of Substantial Completion pursuant to Section 9.8; receive and forward to the Owner, for the Owner's review and records, written warranties and related documents required by the Contract and assembled by the Contractor pursuant to Section 9.10; and issue a final Certificate for Payment pursuant to Section 9.10 and upon compliance with all other requirements of the Contract Documents.

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

§ 4.2.11 The Architect will interpret and decide matters concerning performance under, and requirements of, the Contract Documents on written request of either the Owner or Contractor. The Architect's response to such requests will be made in writing within any time limits agreed upon in writing or otherwise with reasonable promptness as to cause no delay in the Work or activities of the Owner, Contractor, or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review.

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

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

§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect's response to such requests will be made in writing within any time limits agreed upon in writing or otherwise with reasonable promptness as to cause no delay in the Work or activities of the Owner, Contractor, or separate contractors, while allowing sufficient time in the Architect's professional judgment to permit adequate review. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

## **ARTICLE 5 SUBCONTRACTORS**

### **§ 5.1 DEFINITIONS**

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

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

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

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

§ 5.2.1.1 Notwithstanding Section 5.2.1, the Contractor shall identify in the list of names of the subcontractors proposed, those subcontractors that are minority business enterprises and the date each is planned to begin work on the Project. This list of subcontractors and materials suppliers shall be submitted to the Architect not later than 10 calendar days after the date the Contractor executes the Contract. The Contractor shall not use a different Contractor to perform the work of any subcontractor identified pursuant to this section without providing written notice to the Owner and Architect regarding the reason for the change and only after complying with any requirements in G.S. 143-128.2 to 128.4.



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

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

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

**§ 5.2.5** If during the duration of the Project the Contractor effects a substitution for any subcontractor per subparagraph 5.2, or if additional subcontract opportunities become available, the Contractor shall make a good faith effort to utilize minority business enterprises. The Contractor shall provide written notification of all new subcontractors.

### **§ 5.3 SUBCONTRACTUAL RELATIONS**

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

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

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

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

When the Owner accepts the assignment of a subcontract agreement, the Owner assumes the Contractor's rights and future obligations under the subcontract, but the Owner does not assume liability for obligations incurred by the Contractor prior to assignment of the subcontract.

**§ 5.4.3** Upon such assignment to the Owner under this Section 5.4, the Owner may further assign the subcontract to a successor contractor or other entity. If the Owner assigns the subcontract to a successor contractor or other entity, the Owner shall not be legally responsible for any of the successor contractor's obligations under the subcontract.

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

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

**§ 6.1.1** The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these. Failure by the Contractor to make a claim in any way associated with the Owner's right to perform construction and to award separate contracts in accordance with Article 15 shall forever waive the Contractor's right to pursue the claim against the Owner.

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

**§ 6.1.3** The general contractor/Project Expediter shall provide or designate who shall provide for coordination of the activities of the general contractor's own forces and of each separate contractor with the Work of the Contractor, who shall cooperate with them. The Contractor shall participate with other separate contractors and the general contractor/Project Expediter in reviewing their construction schedules. The Contractor shall make any revisions to the construction schedule deemed necessary after a joint review and mutual agreement. The construction schedules shall then constitute the schedules to be used by the Project Expediter, Contractor, separate contractors and the Owner until subsequently revised.

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

**§ 6.2 MUTUAL RESPONSIBILITY**

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

**§ 6.2.2** If part of the Contractor's Work depends for proper execution or results upon construction or operations by the Owner or a separate contractor, the Contractor shall, prior to proceeding with that portion of the Work, promptly report to the Project Expediter and Architect apparent discrepancies or defects in such other construction that would render it unsuitable for such proper execution and results. Failure of the Contractor so to report shall constitute an acknowledgment that the Owner's or separate contractor's completed or partially completed construction is fit and proper to receive the Contractor's Work, except as to defects not then reasonably discoverable.

**§ 6.2.3** Damages and costs caused by delays or by improperly timed activities or defective construction shall be borne by the party responsible therefor. The Contractor shall reimburse the Owner for any costs the Owner incurs that are payable to a separate contractor because of the Contractor's delays, improperly timed activities or defective construction. The Contractor shall also reimburse the Owner for any other damages incurred by the Owner as a result of the Contractor's delays, improperly timed activities or defective construction.

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

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

**§ 6.2.6** In accordance with N.C. Gen. Stat. § 143-128, the Contractor shall be directly liable to the Owner and to the other separate prime contractors for the full performance of all duties and obligations due respectively under the terms of the separate contracts and in accordance with the plans and specifications of the Project.

**§ 6.3 OWNER'S RIGHT TO CLEAN UP**

If a dispute arises among the Contractor, separate contractors and the Owner as to the responsibility under their respective contracts for maintaining the premises and surrounding area free from waste materials and rubbish, the Owner may clean up and the Architect will allocate the cost among those responsible. This provision shall not impose any obligation on the Owner to clean up the site if the Owner is not performing separate construction activities related to the Project.

**ARTICLE 7 CHANGES IN THE WORK**

**§ 7.1 GENERAL**

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

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

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

**§ 7.2 CHANGE ORDERS**

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

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

**§ 7.2.2** The execution of a Change Order by the parties shall represent a final resolution to all issues addressed by the Change Order and shall constitute a waiver of any claim the Contractor may have to additional compensation or any adjustment to the Contract Time. The Owner, however, reserves the right to audit and confirm that the quantity of work performed was equal to the quantity contained in any Change Order in which payment is based upon unit prices or time and materials. The Owner shall be entitled to receive a credit for any overage contained in the Change Order. In order to receive the credit, the Owner must initiate the audit within thirty (30) days of substantial completion of the Project. The Contractors shall provide the Owner with reasonable access to any documents required to conduct the audit.

**§ 7.2.3** The methods used in determining adjustments to the Contract Sum shall be the same as noted in Section 7.3.3 below.

**§ 7.3 CONSTRUCTION CHANGE DIRECTIVES**

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

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

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

- .1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
- .2 Unit prices stated in the Contract Documents or subsequently agreed upon;
- .3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
- .4 As provided in Section 7.3.7.

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

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

**§ 7.3.7** If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an allowance for overhead and profit in accordance with paragraph 7.3.11 and subparagraphs 7.3.11.1 through 7.3.11.6 below. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

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

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

**§ 7.3.9** Pending final determination of the total cost of a Construction Change Directive to the Owner, the Contractor may request payment in amounts not in dispute for Work completed under the Construction Change Directive in Applications for Payment accompanied by a Change Order indicating the parties' agreement with part or all of such costs. For any portion of such cost that remains in dispute, the Architect will make an interim determination for purposes of monthly certification for payment for those costs and certify for payment the amount that the Architect determines, in the Architect's professional judgment, to be reasonably justified. The Architect's interim determination of cost shall adjust the Contract Sum on the same basis as a Change Order, subject to the right of either party to disagree and assert a Claim in accordance with Article 15.

**§ 7.3.10** When the Owner and Contractor agree with a determination made by the Architect concerning the adjustments in the Contract Sum and Contract Time, or otherwise reach agreement upon the adjustments, such agreement shall be effective immediately and the Architect shall prepare a Change

Order accurately recording the agreement. Change Orders may be issued for all or any part of a Construction Change Directive.

**§ 7.3.11** In subparagraphs 7.3.6 and 7.3.7, the allowance for the combined overhead and profit included in the total cost to the Owner, including bonds, insurance, bookkeeping, clerical, estimating, superintendence, project management, and all other indirect or overhead costs shall not exceed the following:

- .1 for the Contractor, for work performed by the Contractor's own forces, 15 percent of the cost;
- .2 for the Contractor, for work performed by the Contractor's subcontractor, 10 percent of the amount due the subcontractor;
- .3 for each subcontractor or sub-subcontractor involved, for work performed by that subcontractor's or sub-subcontractor's own forces, 10 percent of the cost;
- .4 for each subcontractor, for work performed by the subcontractor's sub-subcontractor, 10 percent of the amount due the sub-subcontractor;
- .5 cost to which overhead and profit is to be applied shall be determined in accordance with subparagraph 7.3.7;
- .6 in order to facilitate checking of quotations for extras for credits, all proposals, except those so minor that their propriety can be seen by inspection, shall be accompanied by complete itemization of costs including labor, materials, and subcontracts utilizing a format approved by the Architect. Labor and materials shall be itemized in the manner described above. Where major cost items are subcontracts, they shall be itemized also. In no case will a change involving over \$100 be approved without such itemization.

#### **§ 7.4 MINOR CHANGES IN THE WORK**

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

### **ARTICLE 8 TIME**

#### **§ 8.1 DEFINITIONS**

**§ 8.1.1** Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

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

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

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

#### **§ 8.2 PROGRESS AND COMPLETION**

**§ 8.2.1** Time limits stated in the Contract Documents and Contractor's construction schedule, as integrated by the general contractor and as approved by the Architect as to completion date, are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

**§ 8.2.2** The Contractor shall not knowingly, except by agreement or instruction of the Owner in writing, prematurely commence operations on the site or elsewhere prior to the effective date of insurance required by Article 11 to be furnished by the Contractor. The date of commencement of the Work shall not be changed by the effective date of such insurance.

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

**§ 8.3 DELAYS AND EXTENSIONS OF TIME**

**§ 8.3.1** The time during which the Contractor is delayed in the performance of the work by the acts or omissions of the Owner, Architect or their employees or agents, acts of God, unusually severe and abnormal climatic conditions, fires, floods, epidemics, quarantine restrictions, strikes, riots, civil commotions or freight embargoes, issuance of building permits by authorities having jurisdiction over the Project, or other conditions beyond the Contractor's control and which the Contractor could not reasonably have foreseen and provided against, shall be added to the time for completion of the Work (i.e. the contract time) stated in the Agreement; provided, however, that no claim by the Contractor for an extension of time for delays will be considered or allowed unless made in compliance with the requirements of the Contract Documents, including Article 15 of this Agreement.

**§ 8.3.1.1** Should a time extension be granted for substantial completion, an equal extension shall be applied to the date for final completion, unless specifically stated otherwise.

**§ 8.3.1.2** Neither the Owner nor the Architect shall be obligated or liable to the Contractor for, and the Contractor hereby expressly waives, any claims against the Owner and the Architect on account of any indirect or direct damages, costs, or expenses of any nature (including extended overhead or additional personnel costs) which the Contractor, its subcontractors, or sub-subcontractors or any other person may incur as a result of any delays, interferences, changes in sequence or the like, which are identified in Section 8.3.1 above or which are reasonable, foreseeable, contemplated, or avoidable by Contractor, arising from or out of any act or omission of any governmental representative (excluding the Owner) or any of the other multiple prime contractors, it being understood and agreed that the Owner's only obligation in any such events shall be an extension of the contract time, but only as determined in accordance with the provisions of the Contract Documents, including Article 15, unless said delay, interference or change in sequence is solely caused by the Owner and/or Architect. Under no circumstances shall the Contractor be entitled to additional compensation from the Owner or Architect for any claim for delays, interferences, changes in sequence or the like, unless said delay, interference or change in sequence is solely caused by the Owner and/or Architect, except under no circumstances shall the Contractor be entitled to additional compensation for lost profits, home office overhead or lost business opportunity.

**§8.3.2.** Subject to other provisions of the contract, the Contractor may be entitled to an extension of the contract time (but no increase in the contract sum) for delays arising from unforeseeable causes beyond the control and without the fault or negligence of the Contractor, his subcontractors, or suppliers as follows:

.1 labor disputes and strikes (including strikes affecting transportation) that do, in fact, directly and critically affect the progress of the Work; however, and extension of contract time on account of an individual labor strike shall not exceed the number of days of said strike;

.2 acts of God, tornado, fire, hurricane, blizzard, earthquake, typhoon, or flood that damages completed work or stored materials;

.3 abnormal inclement weather; however, the contract time will not be extended due to normal inclement weather. The time for performance of this contract, as stated in the contract documents, includes an allowance for calendar days which may not be available for construction out-of-doors (prior to building dry-in), unless the Contractor can substantiate to the satisfaction of the Owner that there was greater than normal inclement weather considering the full term of the contract time for work to be performed out of doors (prior to building dry-in) using a ten year average of accumulated record mean values from climatological data compiled by the U.S. Department of Commerce National Oceanic and Atmospheric Administration for the locale of the Project and that such alleged greater than normal inclement weather actually delayed the work or portions thereof which had an effect upon the contract time, the Contractor shall only be entitled to an extension of time if the total accumulated number of calendar days lost due to inclement weather, from the start of work until building dry-in exceeds the total accumulated number to be expected for the same period based on the ten-year average. Time for completion will be extended by the number of calendar days needed to include the excess number of calendar days lost.

.4 Acts of the public enemy, acts of the State, federal, or local government in its sovereign capacity, and acts of another Contractor in the performance of a contract with the Owner relating to the Project.

**§ 8.3.3** The burden of proof to substantiate a claim for an extension of the contract time shall rest with the Contractor, including evidence that the cause was beyond his control. The Architect shall base its findings of fact and decision on such justification and supporting evidence and shall advise the Contractor in writing thereof. If the Architect finds that the Contractor was delayed on activities that were on the schedule's critical path, the Architect's determination of the total number of days extension shall be based upon the currently approved progress schedule and on all data relevant to the extension. Such data will be incorporated into the schedule in the form of a revision thereto, accomplished in a timely manner. The Contractor acknowledges and agrees that delays in activities which, according to the schedule, do not affect the contract time of the schedule's critical path, do not have any effect upon the Project's contract time and therefore will not be the basis for an extension of time. The Contractor acknowledges and agrees that time extensions will be granted only to the extent that excusable delays adversely impact critical path activities on the Contractor's schedule. Notwithstanding the above, the Contractor further agrees that if the currently approved schedule is a recovery schedule intended to address delays caused by the Contractor or for which the Contractor was not entitled to an extension of time, the Architect shall be allowed to assess the impact of the delays caused by the Contractor in determining whether the Contractor shall be granted an extension to the contract times.

**§ 8.3.4.** Extensions in the contract time by Change Orders are subject to an extension-of-time audit by the Owner as follows: (1) The Contractor agrees that, even though the Owner, Contractor, and Architect have previously signed a Change Order containing an extension of time resulting from a change in or addition to the Work that extension in the contract time may be adjusted by an audit after the fact by the Owner. If such an audit is to be made, the Owner must undertake the audit and make a ruling within 30 days after the completion of the Work under the Change Order. (2) The Contractor agrees that any extension of the contract time to which he is entitled arising out of a Change Order undertaken on a force accounting (labor and materials) basis shall be determined by an extension-of-time audit by the Owner or Architect after the work of the Change Order is completed. Such rulings shall be made by the Owner or Architect within 30 days after a request for same is made, except said 30 days will not start until the work under the Change Order is completed.

**§ 8.3.5.** The Contractor shall not be entitled to and hereby expressly waives any extension of time resulting from any condition or cause unless said claim for extension of time is made in writing to the Architect as required by Article 15.2. Circumstances and activities leading to such claim shall be indicated or referenced in a daily field inspection report for the day(s) affected; otherwise, all such claims are waived by the Contractor. In every such written claim, the Contractor shall provide the following information: (1) nature of delay; (2) date (or anticipated date) of commencement of delay; (3) activities on the progress schedule affected by the delay and/or new activities created by the delay and their relationship with existing activities; (4) identification of person(s) or organization(s) or event(s) responsible for the delay; (5) anticipated extent of the delay; and (6) recommended action to avoid or minimize the delay.

## **ARTICLE 9 PAYMENTS AND COMPLETION**

### **§ 9.1 CONTRACT SUM**

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

### **§ 9.2 SCHEDULE OF VALUES**

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

**§ 9.3 APPLICATIONS FOR PAYMENT**

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

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

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

**§ 9.3.1.3** The Owner will retain five percent of the amount of each progress payment on the Project for as long as is authorized by N.C. Gen. Stat. § 143-134.1. At all times during the Project, the Owner shall retain the maximum funds allowed by N.C. Gen. Stat. § 143-134.1. The Owner specifically reserves the right to withhold additional funds as authorized by this Agreement or N.C. Gen. Stat. § 143-134.1.

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

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

**§ 9.3.4** The Contractor with each application for payment submitted shall include a list of those minority business enterprises subcontractors whose work is included in the application and the amount due each. By including the minority business enterprises on the list, the contractor certifies that the minority business enterprise performed the work or services or provided supplies under the contract and was not acting as a mere conduit.

**§ 9.3.5** The Contractor shall submit with each application for payment documentation in a form acceptable to the Owner showing all sales tax paid by the Contractor for all work and materials covered by the application for payment.

**§ 9.4 CERTIFICATES FOR PAYMENT**

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

**§ 9.4.2** The issuance of a Certificate for Payment will constitute a representation by the Architect to the Owner, based on the Architect's observations and evaluation of the Work and the data comprising the



Contractor's Application for Payment, that, to the best of the Architect's knowledge, information and belief, the Work has progressed to the point indicated in the Application for Payment; that the quality of the Work is in accordance with the Contract Documents; and that the Work has been performed in a good workmanlike fashion, subject (1) to an evaluation of the Work for conformance with the Contract Documents upon Substantial Completion, (2) to results of subsequent tests and inspections required by or performed under the Contract Documents, (3) to correction of minor deviations from the Contract Documents prior to completion, and (4) to specific qualifications expressed by the Architect in the Certificate for Payment. The issuance of a Certificate for Payment will further constitute a representation by the Architect that the Contractor is entitled to payment in the amount certified. However, the issuance of a Certificate for Payment will not be a representation that the Architect has reviewed construction means, methods, techniques, sequences or procedures or made examination to ascertain how or for what purpose the Contractor has used money previously paid on account of the Contract Sum.

**§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION**

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

- .1 defective Work not remedied;
- .2 third party claims filed or reasonable evidence indicating probable filing of such claims unless security acceptable to the Owner is provided by the Contractor;
- .3 failure of the Contractor to make payments properly to Subcontractors or for labor, materials or equipment;
- .4 reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;
- .5 damage to the Owner or another contractor;
- .6 reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance would not be adequate to cover actual or liquidated damages for the anticipated delay;
- .7 failure to carry out the Work in accordance with the Contract Documents;
- .8 failure to provide sales tax documentation in accordance with subparagraph 9.3.5;
- .9 failure or refusal of the Contractor to submit the required information on minority business enterprises;
- .10 additional services provided by the Architect pursuant to paragraph 9.6.8; or
- .11 any other reason deemed necessary by the Architect to protect the Owner.

**§ 9.5.2** When the above reasons for withholding certification are removed, certification will be made for amounts previously withheld. No interest shall be added to any amounts withheld pursuant to Article 9.5.

**§ 9.5.3** If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option and in its sole discretion, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment. No interest shall be added to any amounts withheld pursuant to this provision.

**§ 9.6 PROGRESS PAYMENTS**

**§ 9.6.1** After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents, and shall so notify the Architect.

**§ 9.6.2** The Contractor shall pay each Subcontractor no later than seven days after receipt of payment from the Owner and in accordance with N.C. Gen. Stat. § 143-134.1 the amount to which the Subcontractor is entitled, reflecting percentages actually retained from payments to the Contractor on account of the Subcontractor's portion of the Work. The Contractor shall, by appropriate agreement with each Subcontractor, require each Subcontractor to make payments to Sub-subcontractors in a similar manner and in accordance with N.C. Gen. Stat. § 143-134.1.

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

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

**§ 9.6.5** Contractor payments to material and equipment suppliers shall be treated in a manner similar to that provided in Sections 9.6.2, 9.6.3 and 9.6.4.

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

**§ 9.6.8** The Contractor shall reimburse the Owner or the Owner will retain from the compensation otherwise to be paid to the Contractor funds sufficient to cover the payment of the following additional services performed by the Architect: (1) services required pursuant to the Owner's dispute resolution policy; (2) expense of overtime work requiring higher than regular rates when such work is required due to the failure of the Contractor to perform in accordance with the Contract Documents; (3) review of the Contractor's submittal or shop drawing out of sequence of the submittal schedule agreed to by the Contractor and Architect; (4) responses to the Contractor's requests for information where such information is available to the Contractor from a careful study and comparison of the Contract Documents, field conditions, other Owner-provided information, Contractor-prepared coordination drawings, or prior project correspondence or documentation; (5) evaluation of an extensive number of substitutions proposed by the Contractor and making subsequent revisions to instruments of service resulting therefrom; (6) design services related to the default of the Contractor; (7) contract administration services provided 60 days after the date of substantial completion of the work if required due to the Contractor's failure to complete its punchlist work in a timely fashion; (8) more than two inspections or reviews of the same area or areas for the purpose of determining substantial completion of the area or areas; (9) more than two inspection or reviews of the same area or areas for the purpose of determining final completion of the area or areas; and (10) multiple reviews of an incomplete or deficient submittal or shop drawing from the Contractor.

**§ 9.7 FAILURE OF PAYMENT**

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

**§ 9.8 SUBSTANTIAL COMPLETION**

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

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

**§ 9.8.3** Upon receipt of the Contractor's list, the Architect will make an inspection to determine whether the Project or designated portion thereof is substantially complete. The Architect shall have no obligation to make an inspection to determine whether the Project is substantially complete until the Contractor prepares the Contractor's comprehensive list of items to be completed or corrected prior to final payment. If the Architect determines that the Contractor's list is excessive or through its observations it determines that the Project is not substantially complete, the Architect may require the Contractor to perform additional work prior to the Architect's inspection of the Project. If the Architect's inspection discloses any item, whether or not included on the Contractor's list, which is not sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Project or designated portion thereof for its intended use, the Contractor shall, before issuance of the Certificate of Substantial Completion, complete or correct such item upon notification by the Architect. In such case, the Contractor shall then submit a request for another inspection by the Architect to determine Substantial Completion.

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

**§ 9.8.5** The Certificate of Substantial Completion shall be submitted to the Owner and Contractor for their written acceptance of responsibilities assigned to them in such Certificate. Upon such acceptance and consent of surety, if any, the Owner shall make payment of retainage applying to such Project or designated portion thereof. Such payment shall be adjusted for instances when the Project is incomplete or not in accordance with the requirements of the Contract Documents.

**§ 9.9 PARTIAL OCCUPANCY OR USE**

**§ 9.9.1** The Owner may occupy or use any completed or partially completed portion of the Project at any stage when such portion is designated by separate agreement with the Contractor, provided such occupancy or use is consented to by the insurer as required under Section 11.3.1.5 and authorized by public authorities having jurisdiction over the Project. Such partial occupancy or use may commence whether or not the portion of the Project is substantially complete, provided the Owner and Contractor have accepted in writing the responsibilities assigned to each of them for payments, retainage, if any, security, maintenance, heat, utilities, damage to the Project and insurance, and have agreed in writing concerning the period for correction of the Project and commencement of warranties required by the Contract Documents. When the Contractor considers a portion of the Project substantially complete, the Contractor shall prepare and submit a list to the Architect as provided under Section 9.8.2. Consent of the Contractor to partial occupancy or use shall not be unreasonably withheld. The stage of the progress of the Project shall be determined by written agreement between the Owner and Contractor or, if no agreement is reached, by decision of the Architect.

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

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

**§ 9.9.4** The Owner's partial use or occupancy of the Project shall not be construed as a declaration by the Owner or Architect that the building is substantially complete unless specifically stated in writing by the Owner or Architect. The Owner's partial occupancy or use of the Project shall not prevent the Owner from assessing liquidated damages for the entire Project through the actual date of substantial completion of the Project.

**§ 9.10 FINAL COMPLETION AND FINAL PAYMENT**

**§ 9.10.1** Upon receipt of the Contractor's written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Architect finds the Work acceptable under the Contract Documents and the Contract fully performed, the Architect will promptly issue a final Certificate for Payment stating that to the best of the Architect's knowledge, information and belief and in his/her professional opinion, and on the basis of the Architect's on-site visits and inspections, the Work has been completed in accordance with terms and conditions of the Contract Documents and that the entire balance found to be due the Contractor and noted in the final Certificate is due and payable. The Architect's final Certificate for Payment will constitute a further representation that conditions listed in Section 9.10.2 as precedent to the Contractor's being entitled to final payment have been fulfilled.

**§ 9.10.2** Neither final payment nor any remaining retained percentage shall become due until the Contractor submits to the Architect (1) an affidavit that payrolls, bills for materials and equipment, and other indebtedness connected with the Work for which the Owner or the Owner's property might be responsible or encumbered (less amounts withheld by Owner) have been paid or otherwise satisfied, (2) a certificate evidencing that insurance required by the Contract Documents to remain in force after final payment is currently in effect and will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner, (3) a written statement that the Contractor knows of no substantial reason that the insurance will not be renewable to cover the period required by the Contract Documents, (4) consent of surety, if any, to final payment, (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner and (6) documentation regarding all of the sales tax paid by the Contractor in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

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

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

- .1 liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;
- .2 failure of the Work to comply with the requirements of the Contract Documents;
- .3 terms of special warranties required by the Contract Documents;
- .4 failure of the work to be performed in a good workmanlike manner;
- .5 conditions not recognized by the Owner at the time of payment; or
- .6 those claims reserved by the Owner at or before the time of payment.

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

**§ 9.10.6** Application for final payment for each prime contract shall be accompanied by executed and notarized copies of AIA Document G706, Contractor's Affidavit of Payment of Debts and Claims, AIA Documents G706A, Contractor's Affidavit of Release of Liens, and AIA Document G707, Consent of Surety Company to Final Payment, and an affidavit that no materials containing asbestos were used on the Project. In addition, each prime contractor shall furnish separate releases or liens from each subcontractor and materials and equipment supplier involved in its portion of the Work.

### **§ 9.11 LIQUIDATED DAMAGES**

**§9.11.1** The damages incurred by the Owner due to the Contractor's failure to complete the work within the required contract time, including any extensions thereof, shall be in the amount set forth in the Contract Documents, for each consecutive day beyond the established contract time (Saturdays, Sundays and all holidays included) for which the Contractor shall fail to complete the work. Should the Contractor fail to substantially complete the Project 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, or the Owner will retain as liquidated damages, the sum identified in the Contract Documents for substantial completion for each consecutive calendar day that terms of the contract remain unfulfilled beyond the date allowed by the contract, 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 the Project 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.

**§ 9.11.2** For each consecutive calendar day that the Work and/or Project remains incomplete after the date established for final completion, the Contractor shall pay or Owner will retain from the compensation otherwise paid to the Contractor the sum identified in the Contract Documents as final completion liquidated damages for each consecutive day that the Project remains incomplete. 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 deficient work, the disruption to the school and the learning environment, and the inability to use the facilities fully. This amount is in addition to the liquidated damages prescribed above for substantial completion.

**§ 9.11.3** If it is determined that the Contractor was delayed at any time in the progress of the work by acts or omissions of the Owner, Architect or their employees or agents and no time extension was granted for the delay, then the Contractor shall not be assessed liquidated damages for any delay caused by the Owner, Architect or their employees or agents.

**§ 9.11.4** The liquidated damages set forth in Articles 9.11.1 and 9.11.2 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.

**§ 9.11.5** The liquidated damages set forth in Articles 9.11.1 and 9.11.2 above shall not include legal or additional design professional fees that result from termination for cause of the Contractor's contract. If

such legal or additional design professional fees are incurred by the Owner, the Contractor shall be liable to the Owner for those costs in addition to the liquidated damages amount set forth above and in the Contract Documents.

**§ 9.11.6** The liquidated damages set forth in Articles 9.11.1 and 9.11.2 above shall not include legal or additional design professional costs that are incurred by the Owner in responding to concerns with the Contractor's performance that result in the Owner sending notice of consideration of the termination of the Contractor's contract to the Surety and Contractor. If such legal or additional design professional costs are incurred by the Owner, the Contractor shall be liable to the Owner for those costs in addition to the liquidated damages amount set forth above and in the Contract Documents.

**§ 9.11.7** The Owner's entitlement to liquidated damages shall not be considered a "Claim" subject to any time limitation for asserting Claims, but rather accrues automatically upon the Contractor's failure to meet the substantial completion date and/or final completion date.

**§ 9.11.8** The Owner's partial use or partial occupancy of the Project shall not be construed as a declaration by the Owner or Architect that the building is substantially or finally complete, unless specifically stated in writing by the Owner or Architect. The Owner's partial occupancy or use of the Project shall not prevent the Owner from assessing liquidated damages for the entire Project through the actual dates of substantial and final completion.

## **ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY**

### **§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS**

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

### **§ 10.2 SAFETY OF PERSONS AND PROPERTY**

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

- .1 employees on the Project and other persons who may be affected thereby;
- .2 the Project and all Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor's Subcontractors or Sub-subcontractors; and
- .3 other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.

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

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

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

**§ 10.2.4.1** When use or storage of explosives or other hazardous materials or equipment or unusual methods are necessary, the Contractor shall give the applicable State and local government officials and the Owner reasonable advance notice.

**§ 10.2.5** The Contractor shall promptly remedy damage and loss to property referred to in Sections 10.2.1.2 and 10.2.1.3 caused in whole or in part by the Contractor, a Subcontractor, a Sub-subcontractor,

or anyone directly or indirectly employed by any of them, or by anyone for whose acts they may be liable and for which the Contractor is responsible under Sections 10.2.1.2 and 10.2.1.3, except damage or loss attributable to acts or omissions of the Owner or Architect or anyone directly or indirectly employed by either of them, or by anyone for whose acts either of them may be liable, and not attributable to the fault or negligence of the Contractor. The foregoing obligations of the Contractor are in addition to the Contractor's obligations under Section 3.18.

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

**§ 10.2.7** The Contractor shall not permit any part of the construction or site to be loaded so as to cause damage, create an unsafe condition, or create a risk of endangering its safety.

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

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

**§ 10.2.9** Contractor acknowledges that he will be performing the Work on a school site and that a construction site might be an "attractive nuisance" which might draw children to said site. Contractor agrees that it will take reasonable precautions necessary to prevent children from entering the construction site or an area where materials are stored.

**§ 10.2.10** Contractor and its subcontractors shall not bring any weapons, firearms or alcoholic beverages on any of the Owner's property.

**§ 10.2.11** The Contractor will comply with the Occupational Safety and Health Act of 1970 (OSHA) including all federal and State standards and regulations which have been or shall be promulgated thereunder or in accordance therewith. The Contractor shall be responsible for all citations, assessments, fines, penalties, and delays in the performance of any work on the Project incurred by reason of failure or failure on the part of its agents, employees, assignees or subcontractors to comply. The Contractor shall also comply with all applicable laws, ordinances, rules, regulations, and lawful orders of any public authority having jurisdiction for the safety of persons or property.

**§ 10.3 HAZARDOUS MATERIALS**

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

**§ 10.3.2** Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such hazardous material or substance is found to be present, to cause it to be rendered harmless or to verify that it has already been rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has a reasonable objection to a person or entity proposed by the Owner, the

Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

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

**§ 10.3.4** The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor or its subcontractor brings to the site.

**§ 10.3.5** The Contractor shall indemnify the Owner for the cost and expense the Owner incurs (1) for remediation of a material or substance the Contractor brings to the site and/or negligently handles, or (2) where the Contractor fails to perform its obligations under Section 10.3.1, unless the cost and expense are due to the Owner's fault or negligence.

#### **§ 10.4 EMERGENCIES**

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

### **ARTICLE 11 INSURANCE AND BONDS**

#### **§ 11.1 CONTRACTOR'S LIABILITY INSURANCE**

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

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

**§ 11.1.2** The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages shall be written on an occurrence basis and, shall be maintained without interruption from the date of



commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

**§ 11.1.2.1** Liability insurance shall include all major divisions of coverage and be on a comprehensive basis including:

- .1 premises operations (including X, C, and U coverages as applicable).
- .2 independent contractor's protective.
- .3 products and completed operations.
- .4 personal injury liability with employment exclusion deleted.
- .5 contractual, including specified provision for Contractor's obligation under Paragraph 3.18.
- .6 owned, non-owned and hired motor vehicles.
- .7 broad form property damage including completed operations.

**§ 11.1.2.2** If the general liability coverages are provided by a commercial general liability policy on a claims-made basis, the policy date or retroactive date shall predate the contract; the termination date of the policy or applicable extended reporting period shall be no earlier than the termination date of coverages required to be maintained after final payment, certified in accordance with subparagraph 9.10.2.

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

1. Worker's Compensation:
  - a. State: Statutory
  - b. Applicable Federal: Statutory
  - c. Employer's liability:
    - i. \$1,000,000 each accident
    - ii. \$1,000,000 disease policy limit
    - iii. \$1,000,000 disease, each employee
2. Comprehensive or Commercial General Liability
  - a. Limits of Insurance (CSL)
    - i. \$1,000,000 each occurrence
    - ii. \$1,000,000 aggregate
  - b. Products and Completed Operations to be Maintained for One Year After Final Payment
    - i. \$1,000,000 aggregate
  - c. Property Damage Liability Insurance Shall Provide X, C, and U Coverage
  - d. Broad Form Property Damage Coverage Shall Include Completed Operations
3. Contractual Liability (Hold Harmless Coverage):
  - a. Limits of Insurance (CSL):
    - i. \$1,000,000 each occurrence
    - ii. \$1,000,000 aggregate
4. Personal Injury, with Employment Exclusion Deleted: \$1,000,000 aggregate
5. Business Auto Liability (Including Owned, Non-Owned, and Hired Vehicles):
  - a. Limits of Insurance (CLS):
    - i. \$500,000
6. If the General Liability Coverages are Provided by a Commercial Liability Policy, The:
  - a. General aggregates shall be not less than \$1,000,000 and it shall apply, in total, to this Project only;
  - b. Fire damage limit shall be not less than \$50,000 on any one fire; and
  - c. Medical expense limit shall be not less than \$5,000 on any one person.
7. Umbrella Excess Liability:
  - a. \$1,000,000 over primary insurance;
  - b. \$10,000 retention.

**§ 11.1.3** Certificates of insurance acceptable to the Owner shall be filed with the Owner prior to commencement of the Work and thereafter upon renewal or replacement of each required policy of insurance. These certificates and the insurance policies required by this Section 11.1 shall contain a provision that coverages afforded under the policies will not be canceled or allowed to expire until at least 30 days' prior written notice has been given to the Owner. An additional certificate evidencing continuation of liability coverage, including coverage for completed operations, shall be submitted with the final Application for Payment as required by Section 9.10.2 and thereafter upon renewal or replacement of such coverage until the expiration of the time required by Section 11.1.2. Information concerning reduction of coverage on account of revised limits or claims paid under the General Aggregate, or both, shall be furnished by the Contractor with reasonable promptness. If this insurance is written on the comprehensive liability policy, the certificates shall be AIA Document G705, Certificate of Insurance. If this insurance is written on a commercial general liability policy form, accord form 25S will be acceptable.

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

**§ 11.1.5** Each prime contractor shall either require each of his subcontractors to procure and maintain during the life of his subcontract insurance of the types and amounts described in Paragraph 11.1.2.1 above or he shall insure the activities of his subcontractors in his own policy.

**§ 11.1.6** The Contractor shall not commence work under this contract until he has obtained all the insurance and bonds required hereunder and such insurance and bonds have been accepted by the Owner. Nor shall the Contractor allow any subcontractor to commence work on his subcontract until all similar insurance and bonds required of the subcontractor have been so obtained and accepted. Acceptance of the insurance by the Owner shall not constitute an approval of the insurance as meeting the requirements of the Contract Documents nor relieve or decrease the liability of the Contractor hereunder.

#### **§ 11.2 OWNER'S LIABILITY INSURANCE**

The Owner may purchase and maintain the Owner's usual liability insurance, and the Contractor shall purchase and maintain insurance covering the Owner's contingent liability for claims which may arise from operations under the contract.

#### **§ 11.3 PROPERTY INSURANCE**

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

**§ 11.3.1.1** Property insurance shall be on an "all-risk" or equivalent policy form and shall include, without limitation, insurance against the perils of fire (with extended coverage) and physical loss or damage including, without duplication of coverage, theft, vandalism, malicious mischief, collapse, earthquake, flood, windstorm, falsework, testing and startup, temporary buildings and debris removal including

demolition occasioned by enforcement of any applicable legal requirements, and shall cover reasonable compensation for Architect's and Contractor's services and expenses required as a result of such insured loss.

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

**§ 11.3.1.4** This property insurance shall cover portions of the Work stored off the site, and also portions of the Work in transit.

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

**§ 11.3.2 BOILER AND MACHINERY INSURANCE**

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

**§ 11.3.3 LOSS OF USE INSURANCE**

The Owner, at the Owner's option, may purchase and maintain such insurance as will insure the Owner against loss of use of the Owner's property due to fire or other hazards, however caused.

**§ 11.3.6** Prior to commencement of the Work, the Contractor shall file with the Owner a certificate of insurance for the policy or policies providing the property insurance coverage required for this Project. The certificate of insurance shall contain a provision that the policy will not be cancelled or allowed to expire until at least 30 days prior written notice has been given to the Owner.

**§ 11.3.7 WAIVERS OF SUBROGATION**

The Owner and Contractor waive all rights against (1) each other and any of their subcontractors, sub-subcontractors, agents and employees, each of the other, and (2) the Architect, Architect's consultants, separate contractors described in Article 6, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss to the extent covered and reimbursed by property insurance obtained pursuant to this Section 11.3 or other property insurance applicable to the Work, except such rights as they have to proceeds of such insurance held by the Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors described in Article 6, if any, and the subcontractors, sub-subcontractors, agents and employees of any of them, by appropriate agreements, written where legally required for validity, similar waivers each in favor of other parties enumerated herein. The policies shall provide such waivers of subrogation by endorsement or otherwise. A waiver of subrogation shall be effective as to a person or entity even though that person or entity would otherwise have a duty of indemnification, contractual or otherwise, did not pay the insurance premium directly or indirectly, and whether or not the person or entity had an insurable interest in the property damaged.

**§ 11.3.8** A loss insured under this property insurance shall be adjusted by the Contractor as fiduciary and made payable to the Contractor as fiduciary for the insureds, as their interests may appear, subject to requirements of any applicable mortgagee clause and of Section 11.3.10. The Contractor shall pay Subcontractors their just shares of insurance proceeds received by the Contractor, and by appropriate agreements, written where legally required for validity, shall require Subcontractors to make payments to their Sub-subcontractors in similar manner.

**§ 11.3.9** If required in writing by a party in interest, the Contractor as fiduciary shall, upon occurrence of an insured loss, give bond for proper performance of the Contractor's duties. The cost of required bonds

shall be charged against proceeds received as fiduciary. The Contractor shall deposit in a separate account proceeds so received, which the Contractor shall distribute in accordance with such agreement as the parties in interest may reach, or as determined in accordance with the method of binding dispute resolution selected in the Agreement between the Owner and Contractor. If after such loss no other special agreement is made and unless the Owner terminates the Contract for convenience, replacement of damaged property shall be performed by the Contractor after notification of a Change in the Work in accordance with Article 7.

**§ 11.3.10** The Owner as fiduciary shall have power to adjust and settle a loss with insurers unless one of the parties in interest shall object in writing within five days after occurrence of loss due to the Owner's exercise of this power; if such objection is made, the dispute shall be resolved in the manner selected by the Owner and Contractor as the method of binding dispute resolution in the Agreement.

**§ 11.4 PERFORMANCE BOND AND PAYMENT BOND**

**§ 11.4.1** The Contractor shall furnish bonds satisfactory to the Owner and from a company licensed by the State of North Carolina to issue such bonds covering the faithful performance of the contract and payment of obligations arising thereunder as required by law. The cost of the Contractor's bonds shall be included in the contract sum. The amount of the performance bond and the labor and material payment bonds shall each be equal to 100 percent of the contract sum. These bonds shall be maintained in full force and effect throughout the full term of the contract.

**§ 11.4.1.1** The Contractor shall deliver the required bonds to the Owner when he delivers the executed contracts to the Architect, or if the work is to be commenced prior thereto, in response to a letter of intent, the Contractor shall, prior to the commencement of the work, submit evidence satisfactory to the Owner that such bonds will be furnished.

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

**§ 11.4.2** Upon the request to the Contractor of any person or entity appearing to be a potential beneficiary of bonds covering payment of obligations arising under the Contract, the Contractor shall promptly furnish a copy of the bonds or shall authorize a copy to be furnished.

**§ 11.5 INSURANCE COMPANY QUALIFICATIONS**

**§ 11.5.1** All insurance and bonds required by this contract shall be written by a company or companies having a rating of "A" or above by A.M. Best Company and which are licensed and authorized to do business in North Carolina.

**ARTICLE 12 UNCOVERING AND CORRECTION OF WORK**

**§ 12.1 UNCOVERING OF WORK**

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

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

**§ 12.2 CORRECTION OF WORK**

**§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION**

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

**§ 12.2.2 AFTER SUBSTANTIAL COMPLETION**

**§ 12.2.2.1** In addition to the Contractor's obligations under Sections 3.5 and 12.2.1, if, within one year after the date of Substantial Completion of the Project or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

**§ 12.2.2.2** The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

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

**§ 12.2.3** The Contractor shall remove from the site portions of the Work that are not in accordance with the requirements of the Contract Documents and are neither corrected by the Contractor nor accepted by the Owner.

**§ 12.2.4** The Contractor or its surety shall bear the cost of correcting destroyed or damaged construction, whether completed or partially completed, of the Owner or separate contractors caused by the Contractor's or its surety's correction or removal of Work that is not in accordance with the requirements of the Contract Documents.

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

**§ 12.3 ACCEPTANCE OF NONCONFORMING WORK**

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

**ARTICLE 13 MISCELLANEOUS PROVISIONS**

**§ 13.1 GOVERNING LAW**

**§ 13.1.1** The Contract shall be governed by the law of the State of North Carolina.

**§ 13.1.2** Each and every provision of law and clause required by law to be inserted in this contract shall be deemed to be inserted herein and the contract shall be read and enforced as though it were included herein. If, through mistake or otherwise, any such provisions are not inserted or are not correctly or fully

inserted, then upon the application of either party, the contract shall forthwith be physically amended to make such insertion.

**§ 13.1.3** Whenever possible, each provision of this Agreement shall be interpreted in a manner as to be effective and valid under applicable law. If, however, any provision of this Agreement, or portion thereof, is prohibited by law or found invalid under any law, only such provision or portion thereof shall be ineffective, without in any manner invalidating or affecting the remaining provisions of this Agreement or valid portions of such provisions, which are hereby deemed severable.

**§ 13.2 SUCCESSORS AND ASSIGNS**

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

**§ 13.2.2** The Owner may, without consent of the Contractor, assign the Contract to the local board of county commissioners or a lender providing construction financing for the Project, if the party assumes the Owner's rights and obligations under the Contract Documents. The Contractor shall execute all consents reasonably required to facilitate such assignment.

**§ 13.3 WRITTEN NOTICE**

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

**§ 13.4 RIGHTS AND REMEDIES**

**§ 13.4.1** Duties and obligations imposed by the Contract Documents and rights and remedies available thereunder shall be in addition to and not a limitation of duties, obligations, rights and remedies otherwise imposed or available by law.

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

**§ 13.4.3** Each party hereto agrees to do all acts and things and to make, execute and deliver such written instruments, as shall from time to time be reasonably required to carry out the terms and provisions of the Contract Documents.

**§ 13.4.4** Any specific requirements in this Contract that the responsibilities or obligations of the Contractor also apply to a Subcontractor is added for emphasis and are also hereby deemed to include a Subcontractor to any tier. The omission of a reference to a Subcontractor in connection with any of the Contractor's responsibilities or obligations shall not be construed to diminish, abrogate, or limit any responsibilities or obligations of a Subcontractor of any tier under the Contract Documents or the applicable subcontract.

**§ 13.5 TESTS AND INSPECTIONS**

**§ 13.5.1** Tests, inspections and approvals of portions of the Work shall be made as required by the Contract Documents and by applicable laws, statutes, ordinances, codes, rules and regulations or lawful orders of public authorities. Unless otherwise provided, the Contractor shall make arrangements for such tests, inspections and approvals with an independent testing laboratory or entity acceptable to the Owner, or with the appropriate public authority, and shall bear all related costs of tests, inspections and approvals. The Contractor shall give the Architect timely notice of when and where tests and inspections

are to be made so that the Architect may be present for such procedures. The Owner shall bear costs of (1) tests, inspections or approvals that do not become requirements until after bids are received or negotiations concluded, and (2) tests, inspections or approvals for which applicable laws or regulations expressly prohibit the Owner from delegating their cost to the Contractor.

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

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

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

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

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

**§ 13.6 INTEREST**

Payments due and unpaid under the Contract Documents shall not bear interest.

**§ 13.8 CONDUCT ON SITE**

**§ 13.8.1** In accordance with N.C. Gen. Stat. § 14-269.2, the Contractor, its subcontractors and employees shall not possess or carry, whether openly or concealed, any gun, rifle, pistol, or explosive on any property owned by the Owner. This includes firearms locked in containers, vehicles or firearm racks within vehicles. The Contractor, its subcontractors and employees shall not cause, encourage or aid a minor, who is less than 18 years old to possess or carry, whether openly or concealed, any weapons on any property owned by the Owner.

**§ 13.8.2** The Contractor, its subcontractors and employees, are prohibited from profane, lewd, obscene or offensive conduct or language, including engaging in sexual harassment.

**§ 13.8.3** The Contractor and its subcontractors and their employees shall not manufacture, transmit, conspire to transmit, possess, use or be under the influence of any alcoholic or other intoxicating beverage, narcotic drug, hallucinogenic drug, amphetamine, barbiturate, marijuana or anabolic steroids, or possess, use, transmit or conspire to transmit drug paraphernalia on any property owned by the Owner.

**§ 13.8.4** The Contractor, its subcontractors and employees shall not solicit from or sell to students or staff within the Owner's facilities or campuses, and shall not give gifts of any value to school system employees.

**§ 13.8.5** The Contractor, its subcontractors and employees are prohibited from using access to the site pursuant to this Contract as a means to date, court, or enter into a romantic or sexual relationship with any student enrolled in the Owner's school system. The Contractor agrees to indemnify the Owner for claims against the Owner resulting from relationships which have occurred or may occur between a student and an employee of the Contractor or subcontractor.

§ 13.8.6 The Contractor, its subcontractors and employees shall not interact with any students. However, nothing in this section shall be construed to prevent the Contractor, its subcontractors and employees from taking necessary measures to protect the safety of students, staff, or other employees.

§ 13.8.7 The Contractor shall at all times enforce strict discipline and good order among its employees and shall not employ any unfit person or anyone not skilled in the task assigned to it. The Owner may require the Contractor to remove any employee the Owner deems incompetent, careless or otherwise objectionable.

**§ 13.9 COMPLIANCE WITH APPLICABLE LAWS**

§ 13.9.1 Lunsford Act/Criminal Background Checks. The Contractor shall conduct at its own expense sexual offender registry checks on each of its owners, employees, agents, or subcontractors (“contractual personnel”) who will engage in any service on or delivery of goods to school system property or at a school-system sponsored event, except checks shall not be required for individuals who are solely delivering or picking up equipment, materials, or supplies at: (1) the administrative office or loading dock of a school; (2) non-school sites; (3) schools closed for renovation; or (4) school construction sites.. The checks shall include at a minimum checks of the State Sex Offender and Public Protection Registration Program, the State Sexually Violent Predator Registration Program, and the National Sex Offender Registry (“the Registries”). For the Contractor’s convenience only, all of the required registry checks may be completed at no cost by accessing the United States Department of Justice Sex Offender Public Website at [http:// www. nsopw.gov/](http://www.nsopw.gov/). The Contractor shall provide certification that the registry checks were conducted on each of its contractual personnel providing services or delivering goods under this Agreement prior to the commencement of such services or the delivery of such goods. The Contractor shall conduct a current initial check of the registries (a check done more than 30 days prior to the date of this Agreement shall not satisfy this contractual obligation). In addition, Contractor agrees to conduct the registry checks and provide a supplemental certification before any additional contractual personnel are used to deliver goods or provide services pursuant to this Agreement. Contractor further agrees to conduct annual registry checks of all contractual personnel and provide annual certifications at each anniversary date of this Agreement. Contractor shall not assign any individual to deliver goods or provide services pursuant to this Agreement if said individual appears on any of the listed registries. Contractor agrees that it will maintain all records and documents necessary to demonstrate that it has conducted a thorough check of the registries as to each contractual personnel, and agrees to provide such records and documents to the school system upon request. Contractor specifically acknowledges that the school system retains the right to audit these records to ensure compliance with this section at any time in the school system’s sole discretion. Failure to comply with the terms of this provision shall be grounds for immediate termination of the Agreement. In addition, the Owner may conduct additional criminal records checks at the Owner’s expense. If the school system exercises this right to conduct additional criminal records checks, Contractor agrees to provide within seven (7) days of request the full name, date of birth, state of residency for the past ten years, and any additional information requested by the school system for all contractual personnel who may deliver goods or perform services under this Agreement. Contractor further agrees that it has an ongoing obligation to provide the school system with the name of any new contractual personnel who may deliver goods or provide services under the Agreement. The Owner reserves the right to prohibit any contractual personnel of Contractor from delivering goods or providing services under this Agreement if the Owner determines, in its sole discretion, that such contractual personnel may pose a threat to the safety or well-being of students, school personnel or others.

§ 13.9.2. Compliance with Applicable Laws. Contractor shall comply with all applicable laws and regulations in providing services under this Agreement. In particular, 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 shall also ensure that any of its subcontractors (of any tier) will remain in compliance with these laws at all times while providing subcontracted services in connection with this Agreement. Contractor is responsible for providing affordable health care coverage to all of its full-time employees providing services to the School System. The definitions of "affordable coverage" and "full-time employee" are governed by the Affordable Care Act and accompanying IRS and Treasury Department regulations.

**ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT**

**§ 14.1 TERMINATION BY THE CONTRACTOR**

**§ 14.1.1** The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

- .1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;
- .2 An act of government, such as a declaration of national emergency that requires all Work to be stopped;
- .3 Because the Architect has not issued a Certificate for Payment and has not notified the Contractor of the reason for withholding certification as provided in Section 9.4.1, or because the Owner has not made payment in the amount approved by the Architect on a Certificate for Payment within the time stated in the Contract Documents and after an additional 30 days notice to the Owner and Architect and an opportunity to cure; or
- .4 The Owner has failed to furnish to the Contractor promptly, upon the Contractor's request, reasonable evidence as required by Section 2.2.1.

**§ 14.1.2** The Contractor may terminate the Contract if, through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, repeated suspensions, delays or interruptions of the entire Work solely by the Owner as described in Section 14.3 constitute in the aggregate more than 100 percent of the total number of days scheduled for completion, or 120 days in any 365-day period, whichever is less.

**§ 14.1.3** If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon fifteen (15) days' written notice to the Owner and Architect and a reasonable opportunity to cure, terminate the Contract and recover from the Owner payment for Work executed prior to the date of termination as allowed in the Contract, including reasonable overhead and profit to the date of termination as allowed in the Contract, and actual and verifiable costs incurred by reason of such termination as allowed in the Contract and proven by the Contractor through valid documentation of such expenses incurred..

**§ 14.1.4** If the Work is stopped for a period of 120 consecutive days through no act or fault of the Contractor or a Subcontractor or their agents or employees or any other persons performing portions of the Work under contract with the Contractor because the Owner has repeatedly failed to fulfill the Owner's obligations under the Contract Documents with respect to matters important to the progress of the Work, the Contractor may, upon fourteen (14) additional days' written notice to the Owner and the Architect and an opportunity to cure, terminate the Contract and recover from the Owner as provided in Section 14.1.3.

**§ 14.2 TERMINATION BY THE OWNER FOR CAUSE**

**§ 14.2.1** The Owner may terminate the Contract if the Contractor

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

- .5 refuses or fails to prosecute the work or any separable part thereof with such diligence as will ensure the Substantial or Final Completion of the Work within the Contract Time or fails to complete the Work or remedy a default within said period; or
6. refuses or fails to properly schedule, plan coordinate and execute the Work, as specified herein, so as to perform the Work within the specified milestone and completion dates, or to provide scheduling or related information, revisions and updates as required by the Contract Documents;
7. fails to comply with (1) the provisions of the Sedimentation and Pollution Control Act (N.C. Gen. Stat. §113A-50 *et seq.*), and/or (2) any Notice of Violation issued by the North Carolina Department of Natural Resources.

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Architect that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- .1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished, and the Contractor shall reimburse the Owner for any legal or architectural fees incurred by the Owner as a result of the Contractor's default.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's and legal services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor or its Surety. If such costs and damages exceed the unpaid balance, the Contractor or its Surety shall pay the difference to the Owner. The amount to be paid to the Contractor, Surety or Owner, as the case may be, shall be certified by the Architect, upon application, and this obligation for payment shall survive termination of the Contract.

§14.2.5 If the Owner terminates the whole or any part of the Work pursuant to Section 14.2, the Owner may procure, upon such terms and in such manner as the Owner may deem appropriate, supplies or services similar to those so terminated, and the Contractor shall be liable to the Owner for any excess costs for such similar supplies or services. The Contractor shall continue the performance of the Contract to the extent not terminated hereunder.

### § 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

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

§ 14.3.2 If a suspension, delay, or interruption ordered by the Owner pursuant to Section 14.3.1 exceeds fourteen consecutive days, an adjustment shall be made for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent

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

### § 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

**§ 14.4.2** Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall

- .1 cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders to the extent they relate to the Work terminated and enter into no further subcontracts and purchase orders.

**§ 14.4.3** If the Owner terminates the whole or any portion of the Work pursuant to Section 14.4, then the Owner shall only be liable to the Contractor for those costs reimbursable to the Contractor in accordance with Section 14.4.4, plus a markup of 10 percent for profit and overhead on the actual fully accounted costs recovered under 14.4.4; provided however, that if there is evidence that the Contractor would have sustained a loss on the entire Contract had it been completed, no profit shall be included or allowed hereunder and an appropriate adjustment shall be made reducing the amount of the settlement to reflect the indicated rate of loss.

**§ 14.4.3.1** After receipt of a Notice of Termination for Convenience, the Contractor shall submit to the Owner its termination claim in the form and with certification prescribed by the Owner. Such claims shall be submitted promptly but in no event later than three (3) months from the effective date of termination, unless one or more extensions in writing are granted by the Owner upon request of the Contractor made in writing within such three (3) month period or authorized extension thereof. However, if the Owner determines that the facts justify such action, it may receive and evaluate any such termination claim at any time after such three (3) month period or any extension thereof. Upon failure of the Contractor to submit its termination claim within the time allowed, the Owner may determine, on the basis of information available to it, the amount, if any, due to the Contractor by reason of the termination.

**§14.4.4** If the Owner terminates the whole or any portion of the Work pursuant to Section 14.4, the Owner shall pay the Contractor the amounts determined by the Owner as follows:

- 14.4.4.1** an amount for supplies, services, or property accepted by the Owner pursuant to Subparagraph 14.5.1.6 or sold or acquired pursuant to Subparagraph 14.5.1.7 and not heretofore paid for, and to the extent provided in the Contract such amount shall be equivalent to the aggregate price for such supplies or services computed in accordance with the price or prices specified in the Contract appropriately adjusted for any saving of freight or other charges;
- 14.4.4.2** the total of the cost incurred in the performance of the Work through the date of termination including initial costs and preparatory expense allocable thereto but exclusive of any costs attributable to supplies or services paid or to be paid for under Section 14.4.4.1; and
- 14.4.4.3** Provided, however, that neither the Owner nor the Design Consultant will be liable for payments to subcontractors pursuant to Section 14.4.4.2 unless each subcontractor contains termination provisions identical to those set forth in Article 14. The Owner and the Design Consultant will not be liable to the Contractor or any of its subcontractors for any costs associated with termination if the subcontract of the party involved does not include the proper termination clauses.

**§ 14.4.5** In arriving at any amount due the Contractor pursuant to Section 14.4, there shall be deducted the following:

- 14.4.5.1** all unliquidated advance or other payments on account theretofore made to the Contractor applicable to the terminated portion of the Contract;

- 14.4.5.2** any claim which the Owner may have against the Contractor;
- 14.4.5.3** such amount as the Owner determines to be necessary to protect the Owner against loss because of outstanding or potential liens or claims; and
- 14.4.5.4** the agreed price for, or the proceeds of sale of, any materials, supplies or other things acquired by the Contractor or sold pursuant to the provision of Section 14.5.1.7 and not otherwise recovered by or credited to the Owner.

**§14.4.6.** The total sum to be paid to the Contractor and Section 14.4 shall not exceed the Contract Sum as reduced by the amount of payments otherwise made or to be made for Work not terminated and as otherwise permitted by the Contract. Except for normal spoilage, and except to the extent that the Owner shall have otherwise expressly assumed the risk of loss, there shall be excluded from the amounts payable to the Contractor, as provided in Section 14.4.4, the fair value, as determined by the Owner, of property which is destroyed, lost, stolen or damaged so as to become undeliverable to the Owner, or to a buyer pursuant to Section 14.5.1.7

**§14.5 GENERAL TERMINATION FOR CONVENIENCE PROVISIONS**

**§ 14.5.1** After receipt of a notice of termination for convenience from the Owner, pursuant to Section 14.4, and except as otherwise directed by the Owner, the Contractor shall:

**§ 14.5.1.1** stop work under the Contract on the date and to the extent specified in the notice of termination;

**§14.5.1.2** place no further orders or subcontracts for materials, services or facilities, except as may be necessary for completion of such portion of the work under the Contract as is not terminated;

**§14.5.1.3** terminate all orders and subcontracts to the extent that they relate to the performance of work terminated by the notice of termination;

**§ 14.5.1.4** at the option of the Owner, assign to the Owner in the manner, at the times and to the extent directed by the Owner, all of the rights in the contracts so terminated, in which case the Owner shall have the right, at its discretion, to settle or pay any or all claims arising out of the termination of such orders and subcontracts;

**§ 14.5.1.5** settle all outstanding liabilities and all claims arising out of such termination or orders and subcontracts, with the approval or ratification of the Owner, to the extent it may require, which approval or ratification shall be final for all the purposes of this Article;

**§ 14.5.1.6** transfer title and deliver to the entity or entities designated by the Owner, in the manner, at the times and to the extent directed by the Owner to the extent specifically produced or specifically acquired by the Contractor for the performance of such portion of the Work as had been terminated, the following:

- (1)** the fabricated or unfabricated parts, work in process, partially completed supplies and equipment, materials, parts, tools, dies, jigs and other fixtures, completed Work, supplies and other material produced as part of, or acquired in connection with the performance of, the Work terminated by the notice of termination; and
- (2)** the completed or partially completed plans, drawings, information, releases, manuals and other property related to the Work and which, if the Contract had been completed, would have been required to be furnished to the Owner;

**§ 14.5.1.7** use its best efforts to sell, in the manner, at the times, to the extent and at the price or prices directed or authorized by the Owner, any property of the types referred to in Subparagraph 14.5.1.6; provided, however, that the Contractor:

- (1) shall not be required to extend credit to any buyer, and
- (2) may acquire any such property under the conditions prescribed by and at a price or prices approved by the Owner; and provided further that the proceeds of any such transfer or disposition shall be applied in reduction of any payments to be made by the Owner to the Contractor under the Contract or shall otherwise be credited to the Contract Sum covered by the Contract or paid in such other manner as the Owner may direct;

§ 14.5.1.8 complete performance of such part of the Work as shall not have been terminated by the notice of termination; and

§ 14.5.1.9 take such action as may be necessary, or as the Owner may direct, for the protection and preservation of the property related to the Contract which is in the possession of the Contractor and in which the Owner has or may acquire an interest.

§ 14.5.2 The Contractor shall, from the effective date of termination until the expiration of three (3) years after final settlement under the Contract, preserve and make available to the Owner, at all reasonable times at the office of the Contractor, but without direct charge to the Owner, all its books, records, documents and other evidence bearing on the costs and expenses of the Contractor under the Contract and relating to the Work terminated hereunder, or, to the extent approved by the Owner, photographs, micro-photographs or other authentic reproductions thereof.

§ 14.5.3 If the termination for convenience, pursuant to Section 14.4, be partial, the Contractor may file with the Owner a claim for an equitable adjustment of the price or prices specified in the Contract relating to the continued portion of the Contract (the portion not terminated by the notice of termination), and such equitable adjustment as may be agreed upon shall be made in such price or prices. Any claim by the Contractor for an equitable adjustment under this Subparagraph must be asserted within three (3) months from the effective date of the notice of termination.

§ 14.5.4 The Contractor shall refund to the Owner any amounts paid by the Owner to the Contractor in excess of costs reimbursable under Section 14.4.

§ 14.5.5 The Contractor shall be entitled to only those damages and that relief from termination by the Owner as specifically provided in Section 14.4.

## **ARTICLE 15 CLAIMS AND DISPUTES**

### **§ 15.1 CLAIMS**

#### **§ 15.1.1 DEFINITION**

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, adjustment of Contract terms, extension of time, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

#### **§ 15.1.2 TIME LIMITS ON AND NOTICE OF CLAIMS**

Claims by the Contractor must be initiated by written notice to the Owner and the Architect. Claims by the contractor must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later. The Contractor's failure to submit a claim in accordance with these time limits shall forever waive the Contractor's right to pursue the claim. The Contractor shall indemnify and hold the Owner harmless from any claims by the Contractor's subcontractors arising out of the Contractor's failure to submit the claim in a timely fashion.

§ 15.1.2.1 The resolution of a claim by change order shall finally resolve any and all claims arising from the event giving rise to the claim.

**§ 15.1.3 CONTINUING CONTRACT PERFORMANCE**

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments as requests for payment are substantiated by the Contractor and approved by the Architect. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with his/her exercise of professional judgment and the requirements of the Contract Documents, this Agreement, and AIA Document B101, 2007 Edition, as modified. The Contractor shall not slow or stop the progress of the Work while a claim or dispute is pending or under negotiation.

**§ 15.1.4 CLAIMS FOR ADDITIONAL COST**

If the Contractor wishes to make a Claim for an increase in the Contract Sum, written notice as provided herein shall be given before proceeding to execute the Work. The Contractor's failure to provide written notice of the Claim before proceeding to execute the Work shall be grounds for the denial of the Claim by the Architect and/or Owner. Prior notice is not required for Claims relating to an emergency endangering life or property arising under Section 10.4.

**§ 15.1.5 CLAIMS FOR ADDITIONAL TIME**

**§ 15.1.5.1** If the Contractor wishes to make a Claim for an increase in the Contract Time, written notice as provided herein shall be given. The Contractor's Claim shall include an estimate of cost and of probable effect of delay on progress of the Work. In the case of a continuing delay, only one Claim is necessary. The Contractor's claim shall specifically show the impact of the delay on the Project's critical path. The Contractor's failure to submit a claim in accordance with the time limits shall forever waive the Contractor's right to pursue the Claim.

**§ 15.1.5.2** If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled critical path construction.

**§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES**

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

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

This mutual waiver is applicable, without limitation, to all consequential damages due to either party's termination in accordance with Article 14 except it shall not apply to limit the Owner's ability to recover additional architectural and legal fees resulting from a default by the Contractor. Nothing contained in this Section 15.1.6 shall be deemed to preclude an award of liquidated damages, when applicable, in accordance with the requirements of the Contract Documents.

**§ 15.2 INITIAL DECISION**

**§ 15.2.1** Claims by the Contractor, including those alleging an error or omission by the Architect but excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Architect for initial decision. The Architect will serve as the Initial Decision Maker. Except for those Claims excluded by this Section 15.2.1, an initial decision by the Architect shall be required as a condition precedent to litigation or mediation of any Claim by the Contractor arising prior to the date final payment is made, unless 30 days have passed after the Claim has been referred to the Architect with no decision having been rendered. The Architect may be granted an extension of time to render a decision by mutual agreement of the parties. The Owner may, in its sole discretion, submit its claims to the Architect for an initial decision before instituting mediation or litigation.

**§ 15.2.2** The Architect will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Architect is unable to resolve the Claim if the Architect lacks sufficient information to evaluate the merits of the Claim or if the Architect concludes that, in the Architect's sole discretion, it would be inappropriate for the Architect to resolve the Claim.

**§ 15.2.3** In evaluating Claims, the Architect may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Architect in rendering a decision. The Architect may request the Contractor to authorize retention of such persons at the Contractor's expense.

**§ 15.2.4** If the Architect requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Architect when the response or supporting data will be furnished or (3) advise the Architect that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Architect will either reject or approve the Claim in whole or in part.

**§ 15.2.5** The Architect will render an initial decision approving or rejecting the Claim, or indicating that the Architect is unable to resolve the Claim. This initial decision shall (1) be in writing; (2) state the reasons therefor; and (3) notify the parties of any change in the Contract Sum or Contract Time or both. The initial decision shall be final and binding on the parties but subject to mediation and/ or litigation.

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

**§ 15.3 MEDIATION**

**§ 15.3.2** The parties shall endeavor to resolve their Claims by voluntary mediation which, unless the parties mutually agree otherwise, shall be administered by the American Arbitration Association in accordance with its Construction Industry Mediation Procedures in effect on the date of the Agreement. A request for voluntary mediation shall be made in writing, delivered to the other party to the Contract.

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

**NOTE: THESE CONDITIONS SUPERCEDE ANY CONFLICTING CONDITIONS IN THE GENERAL CONDITIONS.**

#### SALES TAX

Itemized sales tax expenditures by the Contractor will be reimbursed to the Owner. BIDS MUST INCLUDE SALES TAX.

#### DELAYS / CLAIMS

Any contractor whose work is delayed for reasons beyond his control shall immediately notify the Architect as to the nature of the delay, the cause of the delay, and the immediate effect on the project, including cost effects. Verbal notification shall be followed with written notification to the Architect no later than 10 days following the delay; otherwise, no consideration for a claim will be given. For delays claimed by reason of weather, the Contractor shall be required to substantiate such claim by the submission of weather reports for the time period of the delay as well as national weather service reports for the project area for the last ten years, the average of which shall become the basis to determine the validity of such claim. Time extensions granted for reasons of weather or other reasons except as caused by the Owner, with exceptions and time limits for convenience of the Owner as indicated under Section 01011, do not entitle the Contractor to "extended overhead" or "lost profit" recovery.

Delays which do not affect activities on the Critical Path of the approved CPM Construction Schedule will not be considered reason to allow time extensions. Time extensions granted for reasons other than natural weather disasters do not entitle the Contractor to "lost profit" recovery. Time extensions granted for reasons other than natural weather disasters do not entitle the Contractor to "extended overhead" recovery.

#### CLEAN UP AND PROTECTION OF WORK

The Contractor shall replace any broken glass, remove stains, spots and dirt from decorated work, clean hardware, remove paint spots and smears from all surfaces, clean plumbing fixtures and wash all concrete, and clean and wax resilient tile floors and clean hard tile floors. The Contractor shall be responsible for leaving his work clean in all respects, and shall be responsible for protecting his work from damage by other parties.

#### CHANGES IN THE WORK

The cost or credit to the Owner resulting from a Change in the work shall be determined as follows:

1. Allowances for overhead and profit combined shall not exceed 15 percent of net cost except when the change involves a Subcontractor, in which case allowances shall not exceed 15 percent for the Subcontractor and 7-1/2 percent for the Prime Contractor.
2. The profit and overhead rates proposed by the Contractor for the initial Change in the Work shall not be changed or modified for the duration of the Contract, and shall apply equally for additive and / or deductive changes.
3. The term "net cost" as used herein shall mean the difference between all proper cost additions and deductions. The "cost" as used herein may include all items of material and labor, the use of power tools and equipment, and such items of cost as Workmen's Compensation Insurance, Social Security and Old Age Benefit, Performance Bond Adjustment and pro-rata charges for foreman. The following items shall be considered as overhead: insurance other than mentioned above, supervision, superintendents, timekeepers, clerks, watchmen, small tools, incidental job burdens and general office expense, and all other items not included in "cost" as above defined.



4. Price requests for changes in the Work furnished to the Architect shall include individual costs for materials, labor, subcontractor work (if applicable), and profit and overhead unless otherwise noted.
5. Unit Prices listed on Bid Form of Proposal, Sitework Material allowances, and Form of Contract shall include all overhead and profit costs. Overhead and profit shall not be listed as a separate or added cost when unit prices and materials allowances are used or credited.

#### TIME

The Contractor shall fully complete the Work in accordance with the schedule of COMPLETION DATES which are DATES CERTAIN, with no time extensions granted for any reason other than delays caused by the Owner (see below).

#### WEATHER

Weather is by its nature not "normal", and rain fall varies from year to year. Weather delays are to be accommodated within the schedule as specified, however, "natural disasters", such as caused by severe hurricanes, are excepted. In making his bid, the bidder acknowledges that provisions to accelerate the schedule will be provided as required to meet the scheduled dates, to accommodate abnormal weather conditions, or other delays, except as caused by the Owner.

PROJECT PHASING (note: "Prime" contractor means "sub" contractor under a Single Prime contracting method)

1. The General Contractor is responsible as the project coordinator for all the Prime Contractors. It is the General Contractor's responsibility to schedule the work of all Contractors, to maintain weekly reports to the Architect and the Owner regarding the status of activities of all Contractors, and to submit plans to the Architect and Owner for recovery of any scheduled activity by any Contractor, to the Owner and Architect, for review and immediate implementation.
2. Each Prime Contractor shall be required to coordinate their schedule of activities with the General Contractor, and, in submitting a bid, agree to execute a construction schedule in conformance with the required completion dates. All parts of this schedule will be binding on each Contractor, and it is agreed by all Contractors that liquidated damages will be withheld for any delays caused by them which affect the completion date directly or indirectly, in the sole opinion of the Architect, as further described and defined under the Contract for Construction.
3. All Contractors agree that maintaining the scheduled completion of individual activities is essential for the overall completion of the project schedule, and understand that many activities by other Contractors are dependent on timely completion of their own activities. As such, it is understood and agreed by all Contractors that liquidated damages will be withheld, at the time of delay, for any delays which impact the completion of activities by other Contractors and cause the schedule to be revised to a later completion date. For example, the Sitework Contractor must complete various aspects of sitework in a timely manner to allow the other Prime Contractors to store and stage materials on stoned parking areas, or that finish grading, seeding, mulching, and fertilizing operations shall be completed in a manner which will allow the other Prime Contractors to complete their exterior finish work on time, to provide the project with a completed, full stand of grass on the completion date and not afterwards. As an additional example, General Contractor shall schedule his work and make all provisions to allow the Mechanical Contractor to complete his work in a timely manner to meet his scheduled completion date, which is prior to the General Contractor's completion date, in order for the General Contractor to utilize the HVAC system for conditioning of the building. The foregoing illustrative examples are not intended to imply a listing of issues possible but only to serve as examples.

4. It is understood by all bidders that they will cooperate with each other to formulate and agree on a construction schedule detailing all significant activities of the project within 30 days of award.

#### COMPLETION DATES (ALL DATES CERTAIN)

The Start Date for commencement of the project will be on or before Wednesday, January 15, 2025.

1. 30 days: Friday, February 14, 2025: General Contractor shall submit construction schedule to Owner reflecting required dates and confirm that all subcontractors and material suppliers are in agreement.
2. 300 days: Tuesday, November 11, 2025: The General Contractor shall complete their own construction review list and provide written statement stating as such to the Architect for all work, including finish grading, seeding, fertilizing and mulching all areas disturbed by construction activities.
3. 330 days: Thursday, December 11, 2025: The General Contractor will confirm in writing to the Architect that they have completed the Architect's construction review list (liquidated damages incurred).
4. 390 days: Monday, February 9, 2026: General Contractor shall complete any remaining construction review items issued by Architect's (additional liquidated damages incurred).

#### LIQUIDATED DAMAGES

For each day in excess of the number of days allowed to complete construction under 8.1.5, for each scheduled date, the Contractor shall pay to the Owner the sum of \$500.00 as liquidated damages reasonably estimated in advance to cover the costs and/or losses incurred by the Owner by the failure of the Contractor to complete the Work of any Phase indicated in the time specified, such time being in the essence of this Contract and a material consideration thereof. Liquidated damages for days in excess of completion date shall be held as retainage from monthly payments by the Owner, and released from subsequent payments only if delay days are made up and no damages have been incurred by the Owner. The Architect shall be the sole judge as to the division of responsibility between the prime contractors, and shall apportion the amount of liquidated damages to be paid by each of them, according to delay caused by any or all of them. Issuance of a Certificate of Occupancy by any Building Official DOES NOT constitute Substantial Completion or completion of construction under this paragraph. Substantial Completion is defined as suitable for use, in the opinion of the Owner and the Architect.

#### ADDITIONAL LIQUIDATED DAMAGES

For each day in excess of sixty days beyond the date of Substantial Completion that any corrective or incompleting items remain to be done, for each scheduled date, the Contractor shall pay to the Owner the sum of \$500.00 as liquidated damages reasonably estimated in advance to cover the costs and/or losses incurred by the Owner by the failure of the Contractor to complete such corrective work or incomplete items for any Phase listed, such time being in the essence of this Contract and a material consideration thereof.

#### OWNER'S RIGHT TO COMPLETE WORK TO MAINTAIN SCHEDULE

The Contractor agrees that if the Architect determines, at his sole discretion, that the Contractor has repeatedly or persistently failed or refused to implement such measures as will bring the progress of the Work into conformity with the Construction Schedule, then the Owner may contract with others or use the Owner's own forces to perform the Work to bring the progress into conformity with the Construction Schedule. The Contractor agrees that the Owner will be entitled to a set off for the cost thereof including, but not limited to , actual costs, legal fees, and additional overhead costs, which will be charged against the Contract Sum due the Contractor.

**COST INFORMATION FOR INSURANCE PURPOSES**

During the course of the construction, the contractor will be required to provide written cost breakdowns for various parts of the work for insurance purposes.

**PAY APPLICATIONS AND RETAINAGE**

Contractor shall submit Applications for Payments to the Architect monthly for work completed and materials stored ending the twenty-fifth day of the month. Retainage shall be five percent (5%) of monthly estimates. The Architect may, at any time after fifty percent of the work has been completed, if he finds that satisfactory progress is being made and with written consent of Contractor's Surety, recommend to the Owner that retainage be reduced to two and one-half percent (2.5%) of monthly estimates.

Sales tax expenditures shall be substantiated with a certified statement by the Contractor and each of his Subcontractors individually showing total purchases of material from each separate vendor and total sales taxes paid each vendor. Certified statement must have the invoice number or numbers covered and inclusive dates of such invoices.

Materials used from Contractor's or Subcontractor's warehouse stock shall be shown in certified statement at warehouse stock prices and amount of tax paid.

The Contractor shall not be required to certify the Sub-Contractor's statements.

The Contractor and each of his Sub-Contractors shall also show purchases of materials from each separate vendor and the cost of same for which no sales tax has been paid.

When applicable, file a Form E-589CI, Affidavit Of Capital Improvement.

**BUILDERS RISK INSURANCE**

Contractor shall provide Builder's Risk Insurance, payable to the Contractor and Owner as their interest may appear upon the amount of the bid and upon all materials in or adjacent thereto which are to be made apart of the insured structure to 100% of the insurable value thereof covering fire, extended coverage, vandalism and Malicious mischief.

*END OF SUPPLEMENTARY CONDITIONS*

### **SUMMARY OF WORK**

This project involves the furnishing of all labor, materials, and services necessary to complete the construction of the RENOVATIONS TO BOGUE SOUND ELEMENTARY SCHOOL, Carteret County Schools, North Carolina as shown by the drawings and as specified herein.

### **CONSTRUCTION SCHEDULE**

Each Prime Contractor shall coordinate his work with the others to complete his work, on schedule, within the specified time allowed. Within thirty days of award of Contracts to the successful Bidders, the General Contractor will prepare, with the assistance of each Prime Contractor, a Master Construction Schedule, in both bar chart and critical path method form, which shall be signed by each Contractor and become a requirement and part of the Contract Documents.

The Schedule shall include work by Architect and Owner, as may be required by the contractor (i.e. Critical shop drawing review, color selection, inspections, etc.).

The Master Schedule shall be created in electronic computer form using an industry-recognized "Critical Path Method" software program, and continuously maintained for the benefit and use of all Contractors and the Owner/Architect. The General Contractor shall submit to all parties, at each monthly meeting, printed reports, generated from the computer program file, indicating the current status of all project activities, including those of the other Contractors.

### **CONTRACTS**

Contracts will be executed for each Prime Contractor on AIA Document A101, Standard Form of Agreement Between Owner and Contractor, as amended herein.

### **PAYMENTS**

Payments to the Contractor will be made on the basis of ninety-five percent (95%) of monthly estimates approved by the Architect.

Bids shall include North Carolina sales and Use Tax or local sales and use tax. The Owner shall be entitled to reimbursement of taxes paid by Contractor on basis shown separately on monthly request for payment. At the time of delivery of the periodic monthly estimate and request for progress payments, the Contractor shall attach to such requests a statement which shall show the amount of sales tax paid by the Contractor upon purchases of building materials during the period covered by the progress payment request. A sworn statement by the Contractor shall be attached stating that the property upon which such sales taxes were paid was or will be used in the performance of the contract. Sales tax on purchases or rental of tools and equipment is taxable to the Contractor and shall not be included in the sworn statement. When applicable, file a Form E-589CI, Affidavit Of Capital Improvement. Refer to Section 01011, Supplementary Conditions, subparagraph 9.3.4 for additional requirements.

### **CONSTRUCTION PROCEDURES**

The following Construction Procedures are to be implemented for this project:

1. The General Contractor shall be the Project Coordinator, and as such shall schedule and manage the entire work. Notify the Architect immediately upon any conflict with separate Prime Contractors.
2. The General Contractor shall coordinate with all Prime Contractors to prepare and submit to the Architect within two weeks following the date of the Notice to Proceed his proposed Progress Schedule for completing the Project in the specified time. Include critical shop drawing reviews, inspections, or other work to be scheduled with Architect or Engineer.

3. Approved Schedule shall be distributed to all other Prime Contractors by the General Contractor. Also, post copy in Contractor's field office. General Contractor shall keep other contractors, including his subcontractors, informed of his planned and actual progress, so that the Project Schedule can be maintained.
4. All other prime and sub-contractors shall organize their work to conform to this Schedule and see that all phases of the work progress as smoothly and efficiently as possible.
5. The General Contractor will coordinate the location of tool sheds and storage areas for all contractors within the limits of the site area designated or approved by the Owner.
6. All Contractors shall submit within twenty (20) days from the date of the Notice to Proceed a complete list of all subcontractors and material suppliers (including addresses), that they propose to use on this Project for Architect's and Engineer's approval.
7. All Contractors are requested to furnish the Architect with the name of their project manager, safety manager, and job foreman or superintendent who will be in charge of the work. These men will not be changed during the course of construction without prior notice to the Architect. Furnish Architect and Owner with name and home telephone number of job superintendent and project manager for emergency contact.
8. Architect will hold monthly meetings at the project site on a day and time to be determined. Each Contractor shall have his job superintendent and project manager present. The purpose of these meetings is to evaluate progress, resolve problems, and in general to help expedite construction. Meeting representatives must have authority to act on behalf of the Contractor.
9. See Specifications, Division 1, General Requirements, for information relative to the following:
  - a. Schedules and Reports
  - b. Samples and Shop Drawings
  - c. LEED Requirements (THIS IS NOT A LEED PROJECT)
  - d. Temporary Facilities and Controls
  - e. Cleaning Up
  - f. Project Close Out
10. To expedite handling paperwork, the following procedures shall be used:
  - a. Shop drawings and submittals shall be submitted electronically individually via e-mail, in non-editable format PDFs, each with its own transmittal. Electronic submittals e-mail subject line will contain the project name, specification number, and product name. Each submittal will bear the contractor's review stamps and a statement of deviations.
  - b. Each Contractor shall submit to the Architect a cost breakdown of his contract on standard AIA form. Breakdown shall show labor and material. Upon approval by Architect and Engineer, this breakdown shall be used for progress payments.
  - c. Contractor's payment period shall be from the twenty-fifth day of the month to the twenty-fifth day of the following month. Contractor shall forward to the Architect by the first of the following month his Application for Payment in PDF format, submitted electronically, with ink professional seals. Owner will make payments by the fifteenth of the month. Professional seals shall be ink stamped, not embossed.

- d. Sales tax expenditures for each pay period shall be substantiated with an attached certified statement by the Contractor and each of his Subcontractors individually showing total purchases of material from each separate vendor and total sales taxes paid each vendor for the applicable period.
  - e. Payment for material stored on site will be approved upon verification of material and quantity. Payment will also be approved if material is stored in a bonded warehouse approved by the Architect and Owner and insured for its full value. Include insurance certificates and certificates verifying storage in bonded warehouse with Application for Payment of such materials.
  - f. Submit copy of Building Permit prior to or with submission of first Pay Application. Payments will be withheld until permit copy is submitted.
11. All materials and submittal data must be approved before Contractor proceeds with installing such items in the Project. All materials requiring color selection shall be submitted together. Contractor shall confirm in writing that color samples provided are current and available to select from. An incomplete color schedule will not be issued. All material samples must be submitted in order to make a complete, coordinated schedule.
  12. Materials and compaction testing company shall be selected by the Owner. The Architect will notify the Contractor of the company and of the specific testing to be done. Based on these instructions, the Contractor will be responsible for notifying the testing company of individual tests to be made.
  13. The Contractor shall issue daily electronic update reports, in PDF format, via e-mail, with descriptions of day's work performed, 3 photos minimum, weather conditions, parties on site with manpower counts, and equipment on site.
  14. Notify Architect, Structural Engineer, and Testing Laboratory twenty-four (24) hours prior to pouring footings. Pours shall always be the maximum that can be properly handled in a day.
  15. Inspection Reports from Architect or Engineers pointing up defective or unacceptable work shall be corrected immediately. Failure to do so will be cause to withhold monthly progress payments.
  16. Each Separate Prime Contractor shall be responsible for removing his own waste material and job debris from the all construction areas and the site, fully coordinated with requirements of the Construction Waste Management Plan (CWMP). This shall be done continually. Failure to keep job site clean and safe for maximum working efficiency will be cause to withhold monthly progress payments. Failure to comply with the Construction Waste Management Plan (CWMP) will be cause to withhold monthly progress payments.
  17. Construction workers will be properly dressed at all times on the site (shirts, shoes, etc.), and the use of foul language, vulgar or lewd gestures, or any other conduct deemed inappropriate by the Owner will be cause for immediate dismissal.
  18. Working Schedule: Working hours shall be coordinated among all Prime Contractors. Advise Owner and Architect.
  19. Claims: Follow General Conditions, as amended, for any claims for additional money or time. Claim must be made at time of discovery, time limits in accordance with these Conditions.
  20. Final Inspection of Projects: It is the Contractor's responsibility to notify the Architect that the project is complete and to submit a list of discrepancies to be corrected. Following such notification, the Architect shall make a preliminary review of the project to verify completion. From the preliminary review, the Architect shall prepare a punch list of discrepancies for the

Contractor. Upon notification by the Contractor that the discrepancies have been rectified, the Architect shall schedule a formal final inspection with the Owner.

21. Record Drawings: One (1) complete set of working drawings will be maintained on the job site by the General Contractor. If any changes or deviations from these drawings are made by any Contractor, such Contractor shall indicate the change on the drawings using colored pencils or ink.
22. Safety Regulations: All Contractors shall abide by current OSHA Regulations at all times. Be advised that the Owner is obligated by these Regulations to report any known violations to OSHA.
23. Smoking is prohibited and not allowed on the construction site property.

### **DRAWINGS AND SPECIFICATIONS**

The following principles shall govern the settlement of disputes which may arise over discrepancies in the contract documents.

1. As between written figures given on drawings and the scale measurements, the figures shall govern.
2. As between large-scale drawings, and small scale drawings, the larger scale drawings shall govern. Discrepancies noted shall be reported to the Architect before commencing work.
3. Where more than one item or procedure is specified or indicated, the Contractor shall provide the item of greatest expense or most stringent procedure.

Titles to divisions and paragraphs in the contract documents are introduced merely for convenience and shall not be taken as a correct or complete segregation of the several units of materials and labor. The Contractor shall see that each subcontractor is familiar with the entire work under this contract to the extent that it affects his portion of the work, as no responsibility is assumed by the Architect for omissions or duplications by the Contractor or his subcontractors due to real or alleged error in arrangement of material in these documents.

The plans and specifications are both a part of this contract and shall be considered cooperative. Any work called for by the plans and not hereinafter specified or vice versa, shall be executed by the Contractor as if specifically mentioned in both.

The drawings and specifications are to be used for this building only and are the property of the Architect; they are to be returned to him before the final certificates are given.

After award of Contract, drawings and specifications shall be obtained and /or downloaded by the General Contractor from the Hite Associates website, [www.hiteassoc.com](http://www.hiteassoc.com). Additional drawings and / or specifications may be purchased by contacting Speedyblue Reprographics at (252) 758-1616, [print@speedyblue.com](mailto:print@speedyblue.com).

### **INTENT OF DRAWINGS**

In making a Proposal, the Contractor acknowledges that the drawings are diagrammatic in nature, and agrees to provide complete and finished construction assemblies to comply with the Architect's intent and pertinent Building Codes, whether all parts or components of such assemblies are shown or not (for example, doors or frames shown on plan drawings but not scheduled or detailed otherwise shall be furnished, consistent with other doors or frames of type and material as would be reasonably inferable, complete with hardware).

For renovations and additions, the plans and specifications are intended to convey the broad scope of work that is to be included in the demolition scope and/or renovations scope of existing areas in the contract, they do not show every item or detail to be installed or removed. Provide complete and finished construction assemblies.

Bidders and their subcontractors must visit the site prior to bid to verify all existing conditions in areas to be renovated, including equipment platforms, to ascertain items to be removed or relocated to perform the work as shown and specified, and to provide complete assemblies. When available, existing building drawings are to be reviewed for concealed conditions. No allowance will be made for claims for additional cost or time based on conditions that are accessible for inspection.

#### **STANDARD OF QUALITY, CONTRACT DEFINITION**

The Standard of quality for all work shall be first class in all respects, in the opinion of the Project Architect and Project Engineer. In submitting a Bid, the Contractor agrees to abide by this Standard, and no other. Any work considered less than first class by the Architect/Engineer shall be corrected or removed and replaced as directed.

#### **PROJECT MANAGER AND SUPERINTENDENTS, APPROVAL OF PERSONNEL**

The Contractor shall provide resumes of proposed Project Manager and Superintendents to Owner, through Architect, for review and approval prior to assignment. Contractor shall submit only those candidates with a minimum of five years experience in the respective capacities proposed, with projects of similar size and scope.

#### **FIELD SUPERVISION REQUIREMENTS**

The Contractor is required to provide a full time Field Superintendent to supervise the work of their Contract and to be present, in the field, and not in a field office, at all times work is being performed by that Contractor or his Subcontractors, for the express purpose of providing continuous control of the quality and correctness of construction. In addition, the Contractor's Field Superintendent is required to provide general supervision and coordination of the work of all other Prime Contractors. This person is required to be equipped with a mobile telephone at all times. The Contractor shall issue daily electronic update reports, in PDF format, via e-mail, with descriptions of day's work performed, 3 photos minimum, weather conditions, parties on site with manpower counts, and equipment on site.

#### **FIRE RATED CONSTRUCTION ASSEMBLIES**

Where U.L., F.M., W.H.I., or other independent testing agency fire rated construction assemblies are referenced on the drawings, it shall be the Contractor's responsibility to meet the specific requirements of the assembly, as defined by State and Local Building Authorities.

#### **MEASUREMENTS AND DIMENSIONS**

Before ordering material or doing work which is dependent for proper size or installation upon coordination with building conditions, the Contractor shall verify all dimensions by taking measurements at the building and shall be responsible for the correctness of same. No consideration will be given to any claim based on differences between the actual dimensions and those indicated on the drawings. Any discrepancies between the drawings and/or the specifications and the existing conditions shall be referred to the Architect for adjustment before any work affected thereby is begun.

#### **SAMPLES AND SHOP DRAWINGS**

Each Contractor shall submit such samples of materials and examples of workmanship as are requested by the Architect to show quality and kind of material and work he proposes to deliver or perform in executing his contract.



Shop drawings and submittals shall be submitted electronically, in non-editable format PDFs, submitted via e-mail. Electronic submittals e-mail subject line will contain the project name, specification number, and product name.

Coordinate LEED submittals with general submittal requirements. Refer to Section 01405 LEED Requirements.

Contractors shall make all submittals promptly after award of contract. Submittals requiring color selection shall be made no later than 60 days after award of contract. Contractor and manufacturer shall confirm in writing that color samples provided are up-to-date, current and can be provided.

All material requiring color selection shall be submitted for review before any colors are selected. The Contractor shall allow 45 days after all submittals are made and all color samples received for the Owner to make selections, and schedule his submittals accordingly.

### **OWNER SYSTEM TRAINING SESSIONS**

Each Contractor shall have factory trained and certified product representatives provide equipment and system training sessions for the Owner for each product and system. Sufficient training shall be provided to the extent that each Owner attendee is fully versed on the product and/or system and can be a designated "trained" participant, and that each participant can demonstrate the ability to operate each product and system in total variety of operations. Provide multiple training sessions if such is required to be certified as fully trained personnel. An Owner Training Certification is to be provided. Submit an affidavit that each required Owner training session has been performed. Submitted affidavit to include sign-up log of attendees/trainees and description of system or product, cross referenced to the specific contract document.

### **TEMPORARY FACILITIES**

This section covers the furnishing of all appliances, labor, materials, tools, transportation and services required to perform and complete all preliminary work and temporary construction required for the building and site as indicated.

Storage - Each Contractor shall provide such temporary structures as are required for the protection of persons and property. On barricades where necessary, lights shall be maintained at night.

Field Office - General Contractor shall provide and maintain a full time field office construction trailer at the site, equipped with heat, lights, plan desks and telephones. Office shall be sufficient size for use by this Contractor and for on-site meetings with a separate office provided specifically for the Architect's Representatives.

Scaffolds, Tolls, etc. - Each Contractor shall erect and provide all necessary platforms and scaffolds of ample strength required for the handling of materials and equipment such as ladders, horses, poles, planks, ropes, wedges, centers, etc.

Staging: The location of trailers and material storage areas shall be approved by the Architect. Each Prime Contractor will be responsible for repair and testing of the paving base if damaged by his staging activities.

Working Hours: Single or separate prime contractors may set their own working hours, provided, however, that the Project is under supervision by the General Contractor at all times work is being performed.

Sanitation: The General Contractor shall provide and maintain temporary toilets as necessary for use of all workmen. Locate toilets where directed, keep in sanitary condition, and comply with the requirements of the local public health authority.

## OSHA

It shall be the responsibility of all contractors to conform to the latest edition of Safety Standards for construction by "OSHA".

## CUTTING AND PATCHING / REPLACE

All cutting and patching throughout Project shall be done by the trade requiring the cut. Patching of work or areas affected by cutting, digging and fitting shall be done by mechanics skilled in the applicable trades and shall match surrounding or adjoining similar work. If the quality of the cutting and patching work is not first class and, in the opinion of the Architect, not acceptable, the Contractor will be required to have this work done by the General Contractor, who will be reimbursed for the cost thereof.

Where documents indicate the terms "replace" or "replacing" of any item or system, the items or system called out to be replaced shall be removed in their entirety complete, by the trade performing the replacement.

## CLEANING UP

Each Prime Contractor shall be responsible for keeping the project clean and free of hazardous working conditions. Remove scrap or surplus materials and keep stored materials in a neat and orderly fashion, minimum once weekly.

The General Contractor shall advise all subcontractors and separate prime contractors of their responsibility to keep their part of the project clear and free of accumulated debris.

After completion of Utility Platforms and Main Boiler and Electrical Room construction by all contractors, the General Contractor shall provide a complete vacuuming and wipe down of all mechanical and electrical equipment, including ductwork. The General Contractor shall then provide two coats of clear polyurethane floor sealer as specified to these spaces, after approval of the condition of each space by the Architect.

At the completion of work, the entire project shall be left clean and ready for occupancy. All finished surfaces shall be cleaned, polished, waxed and left in first class condition.

## CONSTRUCTION WASTE MANAGEMENT: WASTE AND RECYCLING

The General Contractor shall be responsible for developing and implementing a Construction Waste Management Plan (CWMP) that identifies the materials to be diverted from disposal and their quantities by weight in order to divert a minimum of 75% of all construction and demolition debris. The GC shall submit monthly progress reports indicating quantities disposed and quantities diverted along with each Payment Application. The GC shall also be responsible for providing separate recycling collection containers for disposal and recycling of non hazardous construction and demolition waste. All containers must be clearly labeled with a list of acceptable and unacceptable materials that meet the requirements of the recovery facility or recycling processor, to which the materials shall be hauled. The General Contractor shall provide on site instruction of appropriate separation, handling, and recycling, and return methods to be used by all contractors. These containers shall be maintained on a regular schedule by either the GC or a GC contracted service. If the contracted service provides off-site sorting services, then waste may be commingled on site per the contracted services specifications. If commingling on site is not permitted, then containers are to be provided for the following materials:

1. Concrete waste
2. Brick and CMU (shall be recycled)
3. Wood and Wood Products
4. Cardboard (shall be recycled)
5. Steel and Metals (shall be recycled)

**PROJECT CLOSEOUT**

Prior to issuance of a Certificate of Final Payment, unless otherwise noted, each Prime Contractor will be required to deliver to the Architect the following items, in encrypted electronic PDF format, indexed with a hyperlinked Table of Contents. All professional seals shall be stamps, not embossed. Files to be submitted on an electronic storage device. All warranties requiring signatures for execution, shall be submitted in paper format.

1. Certificate Of Occupancy issued by the jurisdiction having authority.
2. Fully executed final Change Order, reconciling all project allowances.
3. Submit five copies of Final Application for Payment, AIA Documents and Final Sales Tax Report collated and stapled together.
4. AIA Document G 706/Contractors Affidavit of Payment of Debts and Claims, and AIA Document G 706 A/Contractors Affidavit of Release of Liens, properly executed, notarized, with no exceptions.
5. Consent of Surety to Final Payment.
6. Certificate of Compliance. Each Prime Contractor shall furnish the Architect a certificate, duly notarized, stating that he has constructed his part of the work of the project in complete compliance with the Drawings and Specifications.
7. Each Prime Contractor shall furnish to the Owner through the Architect a certificate, duly notarized, stating that "no hazardous materials, including lead, asbestos, or PCBs, have been used in the work of the Contract".
8. Each Prime Contractor shall furnish to the Owner through the Architect in triplicate, duly notarized, an unconditional Warranty to guarantee his work free from defects in materials and workmanship for a period of one year following Substantial Completion.
9. Operations and Maintenance Manuals indexed, shall be submitted in electronic format with items and sections hyperlinked to the O&M's Table of Contents. Provide paper copies of product warranties.
10. As-Built drawings. Each prime contractor shall deliver to Architect one complete set of as-built drawings. Changes in the work shall be marked in red on a new set of drawings.
11. Transmittal of keys to Principal, acknowledgement signed by Principal, and Finish Hardware Bitting List.
12. Final Color Finishes Schedule.
13. Owner Training Certification: Submit affidavit that each required Owner training session has been performed. Submitted affidavit to include sign-up log of attendees and description of system or product cross referenced to the specific contract document.
14. Process and deliver to the Architect all product guarantees and warranties, materials and testing certificates, etc., as required by various sections within these specifications and by various agencies having jurisdiction over the Work, indexed.

Do not make separate submittals of the above. Incomplete submittals will be returned to the Contractor.

*END OF SECTION*

Contractor is required to use the provided "Contractor Sales Tax Report Of NC State And Local Taxes Paid". Report shall be provided for each pay period, as an attachment to the contractor's Payment Application.

GO TO NEXT PAGE



**GENERAL**

The Base Bid constitutes the primary choice of the Owner with respect to the pertinent specifications for construction, materials, equipment and supplies. The Owner reserves the right to accept or reject any or all Alternates, in any combination with the Base Bid, in accordance with the general provisions of the Contract for Construction.

See Form of Proposal for complete description of Alternates.

*END OF SECTION*

**GENERAL**

**CASH ALLOWANCES:**

The Contractor shall include a CASH ALLOWANCE in his bid of \$50,000 to include labor, tax, and freight. The Owner reserves the right to bid the work or select subcontractors, and to credit the balance of the allowance at the completion of the Contract. Unit Prices listed on Bid Form of Proposal and Form of Contract are to include all costs, including overhead and profit costs, and shall not be listed as a separate cost when unit prices and materials allowance materials are used or credited.

The work and items covered in the CASH ALLOWANCE are indicated in the plans and specifications, and may include

- Electric and gas utility fees
- Testing and Special Inspections
- Other items or work directed by the Owner

Equipment or items which are specified and not noted to be a part of an ALLOWANCE are to be priced and included in bid separately.

**BUILDING PERMITS** and all other permit costs shall be determined by Bidders and provided for in Bids.

END OF SECTION



**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

Testing laboratory services will be paid for under the cash allowance as indicated in Section 01056 Allowances, to be provided in the General Contractor's bid, as amended below.

**DESCRIPTION:**

Work Included: From time to time during progress of the work, the Architect may require that testing be performed to determine that materials provided for the work meet the specified requirements; such testing includes, but not necessarily limited to:

- Proofrolling, Cutting & Filling of Soils Remediation Operations
- Soil Compaction
- Cast-In-Place Concrete & Reinforcing
- Structural Steel & Decking Connections

Related work described elsewhere: Requirements for testing may be described in various sections of these specifications and Drawings; where no testing requirements are described but the Architect decides that testing is required, the Architect may require testing to be performed under current pertinent standards for testing.

Work not included: Selection of testing laboratory: The Owner will select a pre-qualified independent testing laboratory and / or consultant.

**QUALITY ASSURANCE:**

Qualifications of testing laboratory: The testing laboratory will be qualified to the Architect's approval in accordance with ASTM E-329-70 "Recommended Practice for Inspection and Testing Agencies for Concrete and Steel Used in Construction".

Codes and Standards: Testing, when required, will be in accordance with all pertinent codes and regulations and with selected standards of the American Society for Testing and Materials.

**PRODUCT HANDLING:**

Promptly process and distribute all required copies of test reports and related instructions to ensure all necessary retesting and/or replacement of materials with the least possible delay in progress of the work.

**PART 2: PRODUCTS**

**PAYMENT FOR TESTING SERVICES:**

Initial Services: All initial testing services shall be paid for by the Owner.

Retesting: When initial tests indicate non-compliance with the contract documents, all subsequent retesting occasioned by the non-compliance shall be performed by the same testing laboratory and the costs thereof will be paid for by the Contractor and not charged to the Owner for Testing.

**PART 3: EXECUTION**

**COOPERATION WITH TESTING LABORATORY:**

Representatives of the testing laboratory shall have access to the work at all times; provide facilities for such access in order that the laboratory may properly perform its function.

**SCHEDULES FOR TESTING:**

Establishing Schedule: By advance discussion with the testing laboratory selected by the Owner, determine the time required for the laboratory to perform its tests and to issue each of its finding.

Provide all required testing time within the construction schedule.

Revising Schedule: When changes of construction schedule are necessary during construction coordinate all such changes of schedule with the testing laboratory as required.

Adherence to Schedule: When the testing laboratory is ready to test according to the determined schedule but is prevented from testing or taking specimens due to incompleteness of work, all extra costs for testing attributable to the delay may be back-charged to the Contractor and shall not be charged to the Owner.

*END OF SECTION*

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

**GENERAL**

**DESCRIPTION OF WORK:**

Work of this Section shall be to provide a Project Sign for each site to be purchased by the Contractor with the project cash allowance specified in 01056, constructed and painted as indicated, and erected on the site in a location selected by the Architect. The project sign shall be maintained by the Contractor until completion of the Project, and repaired and/or relocated as required during the construction period. No other signs will be allowed on the site - the General Contractor will be responsible for enforcing this provision.

*END OF SECTION*

**ABBREVIATIONS AND NAMES:** The following acronyms or abbreviations as referenced in contract documents are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents:

AA	Aluminum Association 818 Connecticut Ave. NW; Washington DC 20006; 202/862-5100
AAMA	Architectural Aluminum Manufacturers Association 35 E. Southern Bldg.; Washington DC 20005; 202/737-4060
AAN	American Association of Nurserymen 230 Southern Bldg.; Washington, DC 20005; 202/737-4060
AASHTO	American Association of State Highway and Transportation Officials 444 North Capital St.; Washington DC 20001; 202/624-5800
AATCC	American Association of Textile Chemists and Colorists P. O. Box 12215; Research Triangle Park, NC 27709; 919/549-8141
ACI	American Concrete Institute P. O. Box 19150; Detroit, MI 48219; 313/532-2600
ACIL	American Council of Independent Laboratories 1725 K St., NW; Washington DC 20006 202/659-3766
ADC	Air Diffusion Council 230 N. Michigan Aven.; Chicago, IL 60601; 312/372-9800
AGA	American Gas Association 1515 Wilson Blvd., Arlington, VA 22209; 703/841-8400
AHAM	Association of Home Appliance Manufacturers 20 N. Wacker Dr.; Chicago, IL 60606 312/984-5800
AI	Asphalt Institute Asphalt Inst. Bldg.; College Park, MD 20740 301/277-4258
AIA	American Institute of Architects 1735 New York Ave., NW; Washington, DC 20006; 202/626-7474
A.I.A.	American Insurance Association 85 John St.; New York, NY 10038;

	212/699-0400
AISC	American Institute of Steel Construction 400 N. Michigan Ave.; Chicago, IL 60611; 312/670-2400
AISI	American Iron and Steel Institute 1000 16th St., NW; Washington, DC 20036; 202/452-7100
AITC	American Institute of Timber Construction 333 W. Hampden Ave.; Englewood, CO 80110; 303/761-3212
AMCA	Air Movement and Control Association 30 W. University Dr.; Arlington Heights, IL 60004; 312/394-0150
ANSI	American National Standards Institute 1430 Broadway; New York, NY 10018; 212/354-3300
APA	American Plywood Association P. O. Box 11700; Tacoma, WA 98411; 206/565-6600
ARI	Air Conditioning and Refrigeration Institute 1815 N. Fort Myer Dr.; Arlington, VA 22209; 703/524-8800
ASC	Adhesive and Sealant Council 1600 Wilson Blvd.; Arlington, VA 22209; 703/841-1112
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers 1791 Tullie Circle, NE; Atlanta, Ga 30329 404/636-8400
ASME	American Society of Mechanical Engineers 345 East 47th St.; New York, NY 10017; 212/705-7722
ASPE	American Society of Plumbing Engineers 15233 Ventura Blvd.; Sherman Oaks, Ca. 91403 213/783-4845
ASSE	American Society of Sanitary Engineering P. O. Box 9712; Bay Village, OH 44140 216/835-3040
ASTM	American Society for Testing and Materials 1916 Race St.; Philadelphia, CA 19103 215/299-5400

AWI	Architectural Woodwork Institute 2310 S. Walter Reed Dr.; Arlington, VA 22206 703/671-9100
AWPA	American Wood-Preserver's Association 7735 Old Georgetown Rd.; Bethesda, MD 20814 301/652-3109
AWPB	American Wood Preservers Bureau P. O. Box 6085; Arlington, VA 22206 703/931-8180
AWS	American Welding Society P. O. Box 351040; Miami, FL 33135 305/642-7090
AWWA	American Water Works Association 6666 W. Quincy Ave., Denver, CO 80235 303/794-7711
BHMA	Builders' Hardware Manufacturers Association (c/o TGAM) 60 East 42nd St.; New York, NY 10017 212/682-8142
BIA	Brick Institute of America 1750 Old Meadow Rd.; McLean, VA. 22102 703/893-4010
CDA	Copper Development Association 405 Lexington Ave.; New York, NY 10174 212/953-7300
CE	Corps of Engineers (U.S. Dept. of the Army) Washington, DC 20314
CFR	Code of Federal Regulations Available from Government Printing Office; Washington, DC 20402 (usually first published in Federal Register)
CISPI	Cast Iron Soil Pipe Institute 1499 Chain Bridge Rd., McLean, VA. 22101 703/827-9177
CRIGLP	CRI Green Label Plus 730 College Drive Dalton, GA 30720 706-278-3176
CRSI	Concrete Reinforcing Steel Institute 933 Plum Grove Rd., Schamburg, IL 60195 312/372-5059
CS	Commercial Standard of NBS (U.S. Dept. of Commerce)

	Government Printing Office; Washington, DC 20402
DHI	Door and Hardware Institute 7711 Old Springhouse Rd., McLean, VA. 22102 703/556-3990
EIA	Electronic Industries Association 2001 Eye St., NW; Washington, DC 20006 202/457-4900
FAA	Federal Aviation Administration (U. S. Dept. of Transportation) 800 Independence Ave., SW; Washington, DC 20590
FCC	Federal Communications Commission 1919 M St., NW; Washington, D C 20554 202/632-7000
FCI	Fluid Controls Institute U.S. Highway One, Plaza 222; Tequesta, FL 33458; 305/746-6466
FGMA	Flat Glass Marketing Association 3310 Harrison; Topeka, KS 66611; 913/266-7013
FHA	Federal Housing Administration (U. S. Dept. of HUD) 451 - 7th St., SW; Washington, D C 20201
FM	Factory Mutual Engineering Corp. 1151 Boston-Providence Turnpike; Norwood, MA 02062 617/762-4300
FS	Federal Specification (General Services Admin.) Obtain from your Regional GSA Office, or purchase from GSA Specifications Unit (WFSIS); 7th and D Streets, SW; Washington, DC 20406; 202/472-2205 or 2140
FTI	Facing Tile Institute c/o Box 8880; Canton, OH 44711; 216/488-1211
GA	Gypsum Association 1603 Orrington Aven.; Evanston, IL 60201 312/491-1744
HPMA	Hardwood Plywood Manufacturers Association P. O. Box 2789, Reston, VA. 22090 703/435-2900
IEEE	Institute of Electrical and Electronic Engineers, Inc. 345 E. 47th St.; New York, NY 10017; 212/705-790
IESNA	Illuminating Engineering Society of North America

	345 E. 47th St.; New York, NY 10017 212/705-7926
ILI	Indiana Limestone Institute of America Stone City Bank Bldg.; Bedford, IN 47421; 812/275-4425
IRI	Industrial Risk Insurers 85 Woodland St.; Hartford, CT 06102; 203/525-2601
ISA	Instrument Society of America P. O. Box 12277; Research Triangle Park, NC 27709; 919/549-8411
LEED	Leadership in Energy and Environmental Design U. S. Green Building Council 1800 Massachusetts Avenue NW, Suite 300 Washington , DC 20036 (800) 795-1747
MCAA	Mechanical Contractors Association of America 5530 Wisconsin Aven.; Chevy Chase, MD 20815 202/654-7960
MIA	Marble Institute of America 33505 State St.; Farmington, MI 48024 313/476-5558
MIL	Military Standardization Documents (U.S. Dept. of Defense) Naval Publications and Forms Center 5801 Tabor Ave.; Philadelphia, PA 19120
ML/SFA	Metal Lath/Steel Framing Association 221 N. LaSalle St.; Chicago, IL 60601 312/346-1600
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 5203 Leesburg Pike; Falls Church, VA 22041; 703/998-7996
NAAMM	National Association of Architectural Metal Manufacturers 221 N. Lasalle St.; Chicago, IL 60601 312/346-1600
NAPF	National Association of Plastic Fabricators 1701 N. St., NW; Washington, DC 20036; 202/233-2504
NBGQA	National Building Granite Quarries Association c/o H. E. Fletcher Co.; West Chelmsford, MA 01863
NBS	National Bureau of Standards (U.S. Dept. of Commerce) Gaithersburg, MD 20234



	301/921-1000
NCMA	National Concrete Masonry Association P. O. Box 781; Herndon, VA 22070 703/435-4900
NEC	National Electrical Code (by NFPA)
NEII	National Elevator Industry, Inc. 600 Third Aven.; New York, NY 10016 212/986-1545
NECA	National Electrical Contractors Association 7315 Wisconsin Aven.; Bethesda, MD 20814 301/657-3110
NEII	National Elevator Industry, Inc. 600 Third Avenue; New York, NY 10016 212/986-1545
NEMA	National Electrical Manufacturers Association 2101 L St., NW; Washington, DC 20037 202/457-8400
NFPA	National Fire Protection Association Batterymarch Park; Quincy, MA 02269 617/328-9290
NFPA	National Forest Products Association 1619 Massachusetts Aven.; NW; Washington, DC 20036 202/797-5800
NHLA	National Hardwood Lumber Association P. O. box 34518; Memphis, TN 38104; 901/377-1818
NPA	National Particleboard Association 2306 Perkins Pl.; Silver Spring, MD 20910; 301/587-2204
NRCA	National Roofing Contractors Association 8600 Bryn Marr Aven.; Chicago, Il. 60631 312/693-0700
NSF	National Sanitation Foundation P. O. Box 1468; Ann Arbor, MI 48106 313/769-8010
NSSEA	National School Supply and Equipment Association 1500 Wilson Blvd.; Arlington, VA. 22209 703/524-8819
NTMA	National Terrazzo and Mosaic Association 3166 Des Plains Ave.; Des Plains, IL 60018

312/635-7744

NWMA	National Wood Manufacturers Association 205 West Touhy Avenue; Park Ridge, IL 60068; 312/823-6747
OSHA	Occupational Safety Health Administration (U.S.Dept. of Labor) Government Printing Office; Washington, DC 20402
PCI	Prestressed Concrete Institute 20 N. Wacker Dr., Chicago, IL 60606 312/346-4071
PDI	Plumbing and Drainage Institute 5342 Blvd., Pl.; Indianapolis, IN 46208 317/251-5298
PEI	Porcelain Enamel Institute 1911 N. Fort Myer; Arlington, VA 22209 703/527-5257
PS	Product Standard of NBS (U.S. Dept. of Commerce) Government Printing Office; Washington, DC 20402
RFCI	Resilient Floor Covering Institute 1030 15th St.; NW; Washington, DC 20005 202/833-2635
RIS	Redwood Inspection Service (Grading Rules) 627 Montgomery; San Francisco, CA 94111
SAMA	Scientific Apparatus Makers Association 110I 16th St., NW; Washington, DC 20036 202/223-1360
SCAQMD	South Coast Air Quality Management District 21865 Copley Drive Diamond Bar, CA 91765 (909) 396-2000
SDI	Steel Deck Institute P. O. Box 3812; St. Louis, MO 63122 314/965-1741
SDI	Steel Door Institute 712 Lakewood Cnt. N.; Cleveland, OH 44107 216/226-7700
SHLMA	Southern Hardwood Lumber Manufacturers Association 805 Sterick Bld.; Memphis, TN. 38103 901/525-8221
SIGMA	Sealed Insulating Glass Manufacturers Association

	111 E. Wacker Dr.; Chicago, IL. 60601 312/644-6610
SJI	Steel Joist Institute 1703 Parham Rd.; Richmond, VA 23229 804/288-3071
SMACNA	Sheet Metal and Air Conditioning Contractor's National Association P. O. Box 70; Merrifield, VA 22116
SPIB	Southern Pine Inspection Bureau (Grading Rules) 4709 Scenic Hwy.; Pensacola, FL 32504; 904/434-2611
SSPC	Steel Structures Painting Council 4400 5th Avenue; Pittsburgh, PA 15213; 412/578-3327
TCA	Tile Council of America P. O. Box 326, Princeton, NJ 08540; 609/921-7050
TIMA	Thermal Insulation Manufacturers Association 7 Kirby Plaza; Mt. Kisco, NY 10549; 914/241-2284
TPI	Truss Plate Institute 100 W. Church St., Frederick, MD 21701; 301/694-6100
UL	Underwriters Laboratories 333 Pfingsten Rd.; Northbrook, IL 60062; 312/272-8800
WCLIB	West Coast Lumber Inspection Bureau (Grading Rules) P. O. Box 2315; Portland, OR 97223; 503/639-0651
WIC	Woodwork Institute of California 1833 Broadway; Fresno, CA 93773; 209/233-9035
WRI	Wire Reinforcement Institute 7900 Westpark drive; McLean, VA. 22102; 703/790-9790
WSFI	Wood and Synthetic Flooring Institute 2400 E. Devon; Des Plaines, IL 60018; 312/635-7700
WWPA	Western Wood Products Association (Grading Rules) 1500 Yeon Bldg.; Portland, OR 97204; 503/224-3930

WWPA            Woven Wire Products Association  
                  108 W. Lake St.; Chicago, IL 60601;  
                  312/332-6502

*END OF SECTION*

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

**PART 1 - GENERAL**

**RELATED DOCUMENTS:**

Drawings and General Provisions of Contract, including General and Supplementary Conditions and Division-1 Specification Sections, apply to work of this section.

**DESCRIPTION OF WORK:**

Extent of demolition is shown on the Drawings. Refer to all Drawings and project phasing requirements.

Demolition may require the removal and subsequent off-site disposal of the following, but is not limited to:

- Removal of asphalt or concrete paving, with curb and guttering.

- Removal of building structures and structural elements, complete with foundations – including concrete floors/walks and exterior canopies.

- Removal of building exterior wall and roof components.

- Removal of interior walls and components.

- Removal of partitions and doors.

- Removal of windows and window walls.

- Removal of ceiling systems, floor finishes and wall finishes.

- Removal of underground elements and components; piping and accessories.

- Removal of plumbing, electrical and mechanical equipment.

Cutting concrete floors, masonry walls and ceilings for piping, ducts, and conduit is included with the work of the respective mechanical and electrical Divisions 15 and 16 Specification Sections.

Locating and identification of existing underground utilities.

**SUBMITTALS:**

Demolition Schedule: Submit schedule indicating proposed methods and sequence of operations for selective demolition work to Owner's Representative for review prior to commencement of work. Include coordination for shut-off, capping, and continuation of utility services as required, together with details for dust and noise control protection.

Incorporate all selective demolition and abatement operations and phases into the Project CPM Schedule.

Coordinate with Owner's continuing occupation of portions of existing building.

**JOB CONDITIONS:**

Occupancy: Owner will be continuously occupying the building immediately adjacent to areas of selective demolition. Conduct selective demolition work in a manner that will minimize need for disruption of Owner's normal operations. Provide minimum of 72 hours advance notice to Owner of demolition activities which will severely impact Owner's normal operations.

Condition of Structures: Owner assumes no responsibility for actual condition of items or structures to be demolished.

Protections: Provide temporary barricades and other forms of protection as required to protect personnel and general public from injury due to demolition work.

Provide interior and exterior shoring, bracing or support to prevent movement, settlement, or collapse of structure or element to be demolished, and adjacent facilities or work to remain.

Protect from damage existing finish work that is to remain in place and becomes exposed during demolition operations.

Protect all floors, new or existing, with suitable coverings when necessary. Example: protect flooring finishes from damage from overhead welding or torch work.

Construct temporary insulated solid dustproof partitions where required to separate areas where noisy or extensive dirt or dust operations are performed. Equip partitions with dustproof doors and security locks if required.

Provide temporary weather protection during interval between demolition and removal of existing construction on exterior surfaces, and installation of new construction to insure that no water leakage or damage occurs to structure or interior areas of existing building.

Remove protections at completion of work.

Damages: Promptly repair damages caused to adjacent facilities by demolition work at no cost to Owner.

Traffic: Conduct selective demolition operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

Do not close, block or otherwise obstruct streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed traffic ways if required by governing regulations.

Explosives: Use of explosives will not be permitted.

Utility Services: Maintain existing utilities indicated to remain, keep in service, and protect against damage during demolition operations.

Environmental Controls: Use water sprinkling, temporary enclosures, and other suitable methods to limit dust and dirt rising and scattering in air to lowest practical level. Comply with governing regulations pertaining to environmental protection.

Do not use water when it may create hazardous or objectionable conditions such as ice, flooding, and pollution.

**HAZARDOUS MATERIALS**

If necessary, asbestos abatement will be performed by a separate prime contractor, paid from a 01056 Allowances hazardous material abatement allowance, with which the General Contractor shall coordinate with. Master project construction schedule shall incorporate abatement operations. Refer to and coordinate with the approved project construction schedule and the Supplementary General Conditions.

### **LEAD PAINT**

If the building is constructed before 1978, all contractors are to assume that all painted surfaces inside the existing building may contain lead paint. The contractors are required to comply with OSHA Lead Construction Standard 29 CFR 1926.62.

All demolition debris can be disposed of at C&D landfill as long as the painted surfaces matrix has not been disturbed. For patching against the painted surfaces and painting, sanding, cutting etc. should be done by company who has received RRP certification for disturbing lead paint in a closed environment where children 6 years of age and under can enter the space during or after the work is completed. Information for RRP certification can be obtained from N. C. Health Hazard Control Unit, Raleigh, NC. Phone No. (919) 707-5950 / Don Chaney at (919) 707-5974.

Lead-Based Paint Renovation, Repair, and Painting: Firms and renovators who perform renovations in housing or child occupied facilities built before 1978 must be certified by the Health Hazards Control Unit (HHCU).

All work shall comply with requirements as published by the EPA Lead-Based Paint Renovation, Repair and Painting Rule in the Code of Federal Regulations.

Samples: For determining whether components are free of lead-based paint, certified renovators may collect paint chip samples and submit samples to a laboratory recognized by NLLAP for analysis. Required paint chip samples documentation shall be prepared and maintained by the certified renovator for three years.

At interior and exterior areas suspected to be or are tested positive for lead based paints, provide vertical containment consisting of a minimum of plastic sheeting or other impermeable material on a rigid frame, or an equivalent system of containing the work area. Vertical containment shall comply with requirements as published by the EPA Lead-Based Paint Renovation, Repair and Painting Rule in the Code of Federal Regulations.

HEPA vacuum cleaners must be designed so that all the air drawn into the machine is expelled through a HEPA filter with no air leaking past or around the filter.

Machines used to remove paint or other surface coatings through high speed operation such as sanding, grinding, power planing, abrasive blasting, or sandblasting, is prohibited on painted surfaces unless such machines have shrouds or containment systems and are equipped with a HEPA vacuum attachment to collect dust and debris at the point of generation. Machines must be operated so that no visible dust or release of air occurs outside the shroud or containment system.

### **PART 2 - PRODUCTS (Not Applicable)**

### **PART 3 – EXECUTION**

#### **INSPECTION:**

Prior to commencement of demolition work, inspect areas in which work will be performed. Photograph existing conditions of structure, surfaces, equipment or of surrounding properties which could be

misconstrued as damage resulting from selective demolition work; file with Owner's Representative prior to starting work.

**LOCATING EXISTING UNDERGROUND UTILITIES:**

Prior to commencement of groundbreaking work, contractor shall provide for and retain a private utilities locating firm. All underground utilities within the construction limits shall be located, marked and identified by the private utility location service, prior to any ground breaking. All information shall be documented in a contractor's As-Built drawings format.

**PREPARATION:**

Provide interior and exterior shoring, bracing, or support to prevent movement, settlement or collapse of structures to be demolished and adjacent facilities to remain.

Cease operations and notify the Owner's Representative immediately if safety of structure appears to be endangered. Take precautions to support structure until determination is made for continuing operations.

Cover and protect furniture, equipment and fixtures to remain from soiling or damage when demolition work is performed in rooms or areas from which such items have not been removed.

Erect and maintain dust-proof partitions and closures as required to prevent spread of dust or fumes to occupied portions of the building.

Where selective demolition occurs immediately adjacent to occupied portions of the building, construct dust-proof partitions of minimum 4" studs, 5/8" drywall (joints taped) on occupied side, 1/2" fire-retardant plywood on demolition side, and fill partition cavity with sound-deadening insulation.

Provide weatherproof closures for exterior openings resulting from demolition work.

Locate, identify, stub off and disconnect utility services that are not indicated to remain.

**DEMOLITION:**

Perform demolition work in a systematic manner. Use such methods as required to complete work indicated on Drawings in accordance with demolition schedule and governing regulations.

Demolish concrete and masonry in small sections. Cut concrete and masonry at junctures with construction to remain using power-driven masonry saw or hand tools; do not use power-driven impact tools.

Locate demolition equipment throughout structure and promptly remove debris to avoid imposing excessive loads on supporting walls, floors or framing.

Provide services for effective air and water pollution controls as required by local authorities having jurisdiction.

If unanticipated mechanical, electrical or structural elements which conflict with intended function or design are encountered, investigate and measure both nature and extent of the conflict. Submit report to Owner's Representative in written, accurate detail. Pending receipt of directive from Owner's Representative re-arrange selective demolition schedule as necessary to continue overall job progress without delay.

**DISPOSAL OF DEMOLISHED MATERIALS:**



The Owner reserves salvage rights to equipment and material, items to be determined at pre-construction conference. At request of the Owner, Contractor shall coordinate the scheduled removal of designated material to be salvaged and place said material outside of building, on site, for removal by Owner.

Remove all debris, rubbish and other materials resulting from demolition operations and not salvaged by the Owner from building site. Transport and legally dispose of materials off-site.

Hazardous materials disposal during demolition operations, shall comply with all applicable regulations, laws, and ordinances, concerning removal, handling and protection against exposure or environmental pollution.

Burning of removed materials is not permitted on project sites.

**CLEAN-UP AND REPAIR:**

Upon completion of demolition work, remove tools, equipment and demolished materials from site. Remove protections and leave interior areas broom clean.

Repair demolition performed in excess of that required. Return structures and surfaces to remain to condition existing prior commencement of demolition work. Repair adjacent construction or surfaces soiled or damaged by demolition work to like new condition.

END OF SECTION

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Clearing and protection of vegetation.
- B. Removal of existing debris.
- C. Removal of root mat.

1.2 RELATED REQUIREMENTS

- A. Section 02200 - Grading: Topsoil removal.
- B. Section 02200 - Grading: Fill material for filling holes, pits, and excavations generated as a result of removal operations.
- C. Section 02230 - Fill: Fill material for filling holes, pits, and excavations generated as a result of removal operations.

1.3 PROJECT CONDITIONS

- A. Comply with the approved Erosion and Sedimentation Plan.
- B. Conform to applicable regulations relating to environmental requirements and disposal of debris.
- C. Coordinate clearing work with utility companies.
- D. Protect utilities to remain from damage.
- E. Protect trees, plants and other features designated to remain as final landscaping.
- F. Protect bench marks, survey control points, and existing structures from damage or displacement.

**PART 2 EXECUTION**

2.1 SITE CLEARING

- A. Comply with other requirements specified in Section 017000.

- B. Minimize production of dust due to clearing operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

## 2.2 PREPARATION

- A. Locate and identify utilities to remain.

## 2.3 CLEARING

- A. Clear areas required for access to site and execution of Work.
- B. Remove trees, shrubs, and stumps within marked areas.
- C. Remove roots to a depth of 18 inches.
- D. Clear undergrowth and deadwood without disturbing subsoil.

## 2.4 REMOVAL

- A. Remove debris from site.

## 2.5 EXISTING UTILITIES AND BUILT ELEMENTS

- A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.
- B. Protect existing utilities to remain from damage.
- C. Do not disrupt public utilities without permit from authority having jurisdiction.
- D. Protect existing structures and other elements that are not to be removed.

## 2.6 VEGETATION

- A. Do not remove or damage vegetation beyond the limits indicated on drawings.
- B. Install substantial, highly visible fences at least 3 feet high to prevent inadvertent damage to vegetation to remain:
  - 1. At vegetation removal limits.
- C. Vegetation Removed: Do not burn, bury, landfill, or leave on site, except as indicated.
  - 1. Chip, grind, crush, or shred vegetation for mulching, composting, or other purposes; preference should be given to on-site uses.
  - 2. Trees: Sell if marketable; if not, treat as specified for other vegetation removed; remove stumps and roots to depth of 18 inches.
  - 3. Sod: Re-use on site if possible; otherwise sell if marketable, and if not, treat as specified for other vegetation removed.
- D. Restoration: If vegetation outside removal limits or within specified protective fences is damaged or destroyed due to subsequent construction operations, replace at no cost to Owner.

2.7 DEBRIS

- A. Remove debris, junk, and trash from site.
- B. Leave site in clean condition, ready for subsequent work.
- C. Clean up spillage and wind-blown debris from public and private lands.

END OF SECTION

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Removal and storage of topsoil.
- B. Rough grading the site for roadways, drives, parking lots and building pads and stormwater ponds..
- C. Finish grading .

1.2 RELATED REQUIREMENTS

- A. Section 02110 - Site Clearing.
- B. Section 02220 - Excavation.
- C. Section 02230 - Fill: Filling and compaction.
- D. Section 02210 - Trenching: Trenching and backfilling for utilities.

1.3 PROJECT CONDITIONS

- A. Protect above- and below-grade utilities that remain.
- B. Protect plants, lawns, and other features to remain as a portion of final landscaping.
- C. Protect bench marks, survey control points, and paving from grading equipment and vehicular traffic.

**PART 2 PRODUCTS**

2.1 MATERIALS

- A. Topsoil: Topsoil excavated on-site.
- B. Other Fill Materials: See Section 02230

**PART 3 EXECUTION**

3.1 EXAMINATION

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.

### 3.2 PREPARATION

- A. Identify required lines, levels, contours, and datum.
- B. Stake and flag locations of known utilities.
- C. Locate, identify, and protect from damage above- and below-grade utilities to remain.
- D. Notify utility company to remove and relocate utilities.

### 3.3 ROUGH GRADING

- A. Remove topsoil from areas to be further excavated, re-landscaped, or re-graded, without mixing with foreign materials.
- B. Do not remove topsoil when wet.
- C. Remove subsoil from areas to be further excavated, re-landscaped, or re-graded.
- D. Benching Slopes: Horizontally bench existing slopes greater than 1:4 to key fill material to slope for firm bearing.
- E. Stability: Replace damaged or displaced subsoil to same requirements as for specified fill.

### 3.4 SOIL REMOVAL

- A. Stockpile excavated topsoil on site.
- B. Stockpile topsoil to be re-used on site; remove remainder from site.
- C. Stockpiles: Use areas designated on site; pile depth not to exceed 8 feet; protect from erosion.

### 3.5 FINISH GRADING

- A. Before Finish Grading:
  - 1. Verify building and trench backfilling have been inspected.
  - 2. Verify subgrade has been contoured and compacted.
- B. Remove debris, roots, branches, stones, in excess of 1/2 inch in size. Remove soil contaminated with petroleum products.
- C. Where topsoil is to be placed, scarify surface to depth of 3 inches.
- D. In areas where vehicles or equipment have compacted soil, scarify surface to depth of 3 inches.
- E. Place topsoil in areas where seeding are indicated.
- F. Place topsoil during dry weather.

- G. Remove roots, weeds, rocks, and foreign material while spreading.
- H. Near plants spread topsoil manually to prevent damage.
- I. Fine grade topsoil to eliminate uneven areas and low spots. Maintain profiles and contour of subgrade.
- J. Lightly compact placed topsoil.

3.6 FIELD QUALITY CONTROL

- A. See Section 02230 for compaction density testing.

3.7 CLEANING

- A. Remove unused stockpiled topsoil. Grade stockpile area to prevent standing water.
- B. Leave site clean and raked, ready to receive landscaping.

END OF SECTION

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Excavating for paving and site structures.
- B. Trenching for utilities outside the building to utility main connections.

1.2 RELATED REQUIREMENTS

- A. Section 02200 - Grading: Grading.
- B. Section 02230 - Fill: Fill materials, filling, and compacting.
- C. Section 02210 - Trenching: Excavating for utility trenches outside the building to utility main connections.

1.3 PROJECT CONDITIONS

- A. Verify that survey bench mark and intended elevations for the Work are as indicated.
- B. Protect plants, lawns, and other features to remain.
- C. Protect bench marks, survey control points, and paving from excavating equipment and vehicular traffic.

**PART 2 EXECUTION**

2.1 PREPARATION

- A. Identify required lines, levels, contours, and datum locations.

2.2 EXCAVATING

- A. Excavate to accommodate new structures and construction operations.
- B. Notify The Cullipher Group, PA of unexpected subsurface conditions and discontinue affected Work in area until notified to resume work.
- C. Slope banks of excavations deeper than 4 feet to angle of repose or less until shored.
- D. Correct areas that are over-excavated and load-bearing surfaces that are disturbed;
- E. Remove excavated material that is unsuitable for re-use from site.



- F. Stockpile excavated material to be re-used in area designated on site plans.
- G. Remove excess excavated material from site.

2.3 PROTECTION

- A. Prevent displacement of banks and keep loose soil from falling into excavation; maintain soil stability.
- B. Protect bottom of excavations and soil adjacent to and beneath foundation from freezing.

END OF SECTION

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

**PART 1 GENERAL**

1.1 SECTION INCLUDES

- A. Filling, backfilling, and compacting for paving and site structures, and sidewalks.
- B. Backfilling and compacting for utilities outside the building to utility main connections.

1.2 RELATED REQUIREMENTS

- A. Section 02200 - Grading: Site grading.
- B. Section 02220 - Excavation: Removal and handling of soil to be re-used.
- C. Section 02210 - Trenching: Excavating for utility trenches outside the building to utility main connections.

1.3 REFERENCE STANDARDS

- A. AASHTO T 180 - Standard Specification for Moisture-Density Relations of Soils Using a 4.54 kg (10-lb) Rammer and a 457 mm (18 in.) Drop; 2010.
- B. ASTM D698 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Standard Effort (12,400 ft-lbf/ft<sup>3</sup> (600 kN-m/m<sup>3</sup>)); 2012.
- C. ASTM D1556 - Standard Test Method for Density and Unit Weight of Soil in Place by the Sand-Cone Method; 2007.
- D. ASTM D1557 - Standard Test Methods for Laboratory Compaction Characteristics of Soil Using Modified Effort (56,000 ft-lbf/ft<sup>3</sup> (2,700 kN m/m<sup>3</sup>)); 2012.
- E. ASTM D2167 - Standard Test Method for Density and Unit Weight of Soil in Place by the Rubber Balloon Method; 2008.
- F. ASTM D2922 - Standard Test Methods for Density of Soil and Soil-Aggregate in Place by Nuclear Methods (Shallow Depth); 2005.
- G. ASTM D3017 - Standard Test Method for Water Content of Soil and Rock in Place by Nuclear Methods (Shallow Depth); 2005.

1.4 DEFINITIONS

- A. Finish Grade Elevations: Indicated on drawings.
- B. Subgrade Elevations: Indicated on drawings.

1.5 SUBMITTALS

- A. Fill Composition Test Reports: Results of laboratory tests on proposed and actual materials used.
- B. Compaction Density Test Reports.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. When necessary, store materials on site in advance of need.
- B. When fill materials need to be stored on site, locate stockpiles where indicated.
  - 1. Separate differing materials with dividers or stockpile separately to prevent intermixing.
  - 2. Prevent contamination.
  - 3. Protect stockpiles from erosion and deterioration of materials.

**PART 2 PRODUCTS**

2.1 FILL MATERIALS

- A. General Fill - Fill Type 1: Imported borrow or on site subsoil complying with ASTM D 2487, Types SW, SP, SM, SC. .
- B. General Fill - Fill Type 2: Subsoil excavated on-site.
- C. Structural Fill - Fill Type 3: Conforming to State of North Carolina Highway Department of Transportation Standard for Specifications for Roads and Structures standard..
- D. Granular Fill: Coarse aggregate, conforming to State of North Carolina Highway Department standard.
- E. Sand - Fill Type 4: Natural river or bank sand; washed; free of silt, clay, loam, friable or soluble materials, and organic matter.
- F. Topsoil: Topsoil excavated on-site.

2.2 SOURCE QUALITY CONTROL

- A. Where fill materials are specified by reference to a specific standard, test and analyze samples for compliance before delivery to site.
- B. If tests indicate materials do not meet specified requirements, change material and retest.
- C. Provide materials of each type from same source throughout the Work.

**PART 3 EXECUTION**

**3.1 EXAMINATION**

- A. Verify that survey bench marks and intended elevations for the Work are as indicated.
- B. Identify required lines, levels, contours, and datum locations.

**3.2 PREPARATION**

- A. Scarify and proof roll subgrade surface to a depth of 6 inches to identify soft spots.
- B. Cut out soft areas of subgrade not capable of compaction in place. Backfill with general fill.
- C. Compact subgrade to density equal to or greater than requirements for subsequent fill material.
- D. Until ready to fill, maintain excavations and prevent loose soil from falling into excavation.

**3.3 FILLING**

- A. Fill to contours and elevations indicated using unfrozen materials.
- B. Employ a placement method that does not disturb or damage other work.
- C. Systematically fill to allow maximum time for natural settlement. Do not fill over porous, wet, frozen or spongy subgrade surfaces.
- D. Maintain optimum moisture content of fill materials to attain required compaction density.
- E. Granular Fill: Place and compact materials in equal continuous layers not exceeding 6 inches compacted depth.
- F. Soil Fill: Place and compact material in equal continuous layers not exceeding 8 inches compacted depth.
- G. Compaction Density Unless Otherwise Specified or Indicated:
  - 1. Under paving, slabs-on-grade, and similar construction: 97 percent of maximum dry density.
  - 2. At other locations: 95 percent of maximum dry density.
- H. Reshape and re-compact fills subjected to vehicular traffic.

**3.4 FILL AT SPECIFIC LOCATIONS**

- A. Use general fill unless otherwise specified or indicated by the Geotechnical Engineering report.

**3.5 TOLERANCES**

- A. Top Surface of General Filling: Plus or minus 1 inch from required elevations.

3.6 FIELD QUALITY CONTROL

- A. Perform compaction density testing on compacted fill in accordance with ASTM D1556, ASTM D2167, ASTM D2922, or ASTM D3017.
- B. Evaluate results in relation to compaction curve determined by testing uncompacted material in accordance with ASTM D698 ("standard Proctor"), ASTM D1557 ("modified Proctor"), or AASHTO T 180.
- C. If tests indicate work does not meet specified requirements, remove work, replace and retest.
- D. Frequency of Tests: See Geotechnical Engineering report.
- E. Proof roll compacted fill at surfaces that will be under slabs-on-grade and paving.

3.7 CLEANING

- A. Remove unused stockpiled materials, leave area in a clean and neat condition. Grade stockpile area to prevent standing surface water.

END OF SECTION

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Provide soil treatment for termite control, as herein specified.

**QUALITY ASSURANCE:**

In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

Engage a professional pest control operator, licensed in accordance with regulations of governing authorities for application of soil treatment solution.

**JOB CONDITIONS:**

Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of the soil toxicant manufacturer.

**SUBMITTALS:**

Product Data: Submit manufacturer's technical data and application instructions.

**SPECIFIC PRODUCT WARRANTY:**

Furnish written warranty certifying that applied soil poisoning treatment will prevent infestation of subterranean termites and, that if subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation.

Provide warranty for a period of 5 years from date of treatment, signed by Applicator and Contractor.

**PART 2: PRODUCTS**

**SOIL TREATMENT SOLUTION:**

The pest control operator will submit the Safety Data Sheet and label of the termiticide he will use on the project. The termiticide must be currently approved as a termiticide by the N. C. Structural Pest Control Committee.

**PART 3: EXECUTION**

**APPLICATION:**

Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Toxicants may be applied before placement of compacted fill under slabs, if recommended by toxicant manufacturer.

All treatments (excluding the rate of application and treating techniques) must be performed as outlined on the termiticide's label.

All treatments in regards to rate of application and treatment technique will be performed as outlined in the N. C. Structural Pest Control Committee's Rules and Regulations as currently applies to treatment of commercial buildings under construction.

All treatments performed pursuant to Rule. -506 shall be performed at the label recommended rate and concentration only.

Minimum Treatment Requirements:

1. Establish a vertical barrier in the soil along inside of the main foundation wall; the entire perimeter of all multiple masonry chimney bases, pillars, pilasters, and piers; and both sides of partition or inner walls with a termiticide from the top of the grade to the top of the footing.
2. After a building or structure has been completed and the excavation filled and leveled, so that the final grade has been reached along the outside of the main foundation wall, establish a vertical barrier in the soil adjacent to the outside of the main foundation wall with a termiticide from the top of the grade to the top of the footing, according to the label; except that, where drain tile, trench drains or other foundation drainage systems present a hazard of contamination outside the treatment zone, treatment shall be performed in a manner that will not introduce termiticide into the drainage system.
3. Establish a horizontal barrier in the soil within 3' of the main foundation, under slabs, such as patios, walkways, driveways, terraces, gutters, etc. Treatment shall be performed before slab is poured, but after fill material or fill dirt has been spread.
4. Establish a vertical barrier in the soil around all critical areas, such as expansion and construction joints and plumbing and utility conduits, at their point of penetration of the slab of floor or, for crawl space construction, at the point of contact with the soil.

Reapply soil treatment solution to areas distributed by subsequent excavation or other construction activities following application.

*END OF SECTION*

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

**PART 1 GENERAL**

**1.1 SECTION INCLUDES**

- A. Prevention of erosion due to construction activities.
- B. Prevention of sedimentation of waterways, open drainage ways, and storm and sanitary sewers due to construction activities.
- C. Restoration of areas eroded due to insufficient preventive measures.
- D. Compensation of Owner for fines levied by authorities having jurisdiction due to non-compliance by Contractor.

**1.2 RELATED REQUIREMENTS**

- A. Section 02510 - Aggregate Base Courses: Temporary and permanent roadways.

**1.3 PERFORMANCE REQUIREMENTS**

- A. Comply with all requirements of U.S. Environmental Protection Agency for erosion and sedimentation control, as specified for the National Pollutant Discharge Elimination System (NPDES), Phases I and II, under requirements for the 2003 Construction General Permit (CGP).
- B. Also comply with all more stringent requirements of State of North Carolina Erosion and Sedimentation Control Manual.
- C. Develop and follow an Erosion and Sedimentation Prevention Plan and submit periodic inspection reports.
- D. Do not begin clearing, grading, or other work involving disturbance of ground surface cover until applicable permits have been obtained; furnish all documentation required to obtain applicable permits.
- E. Timing: Put preventive measures in place as soon as possible after disturbance of surface cover and before precipitation occurs.
- F. Storm Water Runoff: Control increased storm water runoff due to disturbance of surface cover due to construction activities for this project.
  - 1. Prevent runoff into storm and sanitary sewer systems, including open drainage channels, in excess of actual capacity or amount allowed by authorities having jurisdiction, whichever is less.
  - 2. Anticipate runoff volume due to the most extreme short term and 24-hour rainfall events that might occur in 10 years.



- G. Erosion On Site: Minimize wind, water, and vehicular erosion of soil on project site due to construction activities for this project.
  - 1. Control movement of sediment and soil from temporary stockpiles of soil.
  - 2. Prevent development of ruts due to equipment and vehicular traffic.
  - 3. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
  
- H. Erosion Off Site: Prevent erosion of soil and deposition of sediment on other properties caused by water leaving the project site due to construction activities for this project.
  - 1. Prevent windblown soil from leaving the project site.
  - 2. Prevent tracking of mud onto public roads outside site.
  - 3. Prevent mud and sediment from flowing onto sidewalks and pavements.
  - 4. If erosion occurs due to non-compliance with these requirements, restore eroded areas at no cost to Owner.
  
- I. Sedimentation of Waterways On Site: Prevent sedimentation of waterways on the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
  - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
  - 2. If sediment basins are used as temporary preventive measures, pump dry and remove deposited sediment after each storm.
  
- J. Sedimentation of Waterways Off Site: Prevent sedimentation of waterways off the project site, including rivers, streams, lakes, ponds, open drainage ways, storm sewers, and sanitary sewers.
  - 1. If sedimentation occurs, install or correct preventive measures immediately at no cost to Owner; remove deposited sediments; comply with requirements of authorities having jurisdiction.
  
- K. Open Water: Prevent standing water that could become stagnant.
  
- L. Maintenance: Maintain temporary preventive measures until permanent measures have been established.
  
- M. Record Keeping: Install rain gauge on-site and record rain events and maintenance activity in accordance with NCDEQ Division of Environment, Mineral and Land Resources, Sedimentation and Erosion Control Permit.

## **PART 2 PRODUCTS**

### **2.1 MATERIALS**

- A. Mulch: Use one of the following:
  - 1. Straw or hay.
  - 2. Wood waste, chips, or bark.
  - 3. Erosion control matting or netting.
  
- B. Grass Seed For Temporary Cover: Select a species appropriate to climate, planting season, and intended purpose. If same area will later be planted with permanent vegetation, do not use

species known to be excessively competitive or prone to volunteer in subsequent seasons. See Construction Plans for seeding schedule.

- C. Bales: Air dry, rectangular straw bales.
  - 1. Cross Section: 14 by 18 inches, minimum.
  - 2. Bindings: Wire or string, around long dimension.
- D. Bale Stakes: One of the following, minimum 3 feet long:
  - 1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.
  - 2. Wood, 2 by 2 inches in cross section.
- E. Silt Fence Fabric: Polypropylene geotextile resistant to common soil chemicals, mildew, and insects; non-biodegradable; in longest lengths possible; fabric including seams with the following minimum average roll lengths:
  - 1. Average Opening Size: 30 U.S. Std. Sieve, maximum, when tested in accordance with ASTM D4751.
  - 2. Permittivity:  $0.05 \text{ sec}^{-1}$ , minimum, when tested in accordance with ASTM D4491.
  - 3. Ultraviolet Resistance: Retaining at least 70 percent of tensile strength, when tested in accordance with ASTM D4355/D4355M after 500 hours exposure.
  - 4. Tensile Strength: 100 lb-f, minimum, in cross-machine direction; 124 lb-f, minimum, in machine direction; when tested in accordance with ASTM D4632/D4632M.
  - 5. Elongation: 15 to 30 percent, when tested in accordance with ASTM D4632/D4632M.
  - 6. Tear Strength: 55 lb-f, minimum, when tested in accordance with ASTM D4533.
  - 7. Color: Manufacturer's standard, with embedment and fastener lines preprinted.
- F. Silt Fence Posts: One of the following, minimum 5 feet long:
  - 1. Steel U- or T-section, with minimum mass of 1.33 lb per linear foot.

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine site and identify existing features that contribute to erosion resistance; maintain such existing features to greatest extent possible.

#### **3.2 PREPARATION**

- A. Schedule work so that soil surfaces are left exposed for the minimum amount of time.

#### **3.3 SCOPE OF PREVENTIVE MEASURES**

- A. In all cases, if permanent erosion resistant measures have been installed temporary preventive measures are not required.
- B. Construction Entrances: Traffic-bearing aggregate surface.
  - 1. Width: As required; 20 feet, minimum.
  - 2. Length: 50 feet, minimum.
  - 3. Provide at each construction entrance from public right-of-way.
  - 4. Where necessary to prevent tracking of mud onto right-of-way, provide wheel washing area out of direct traffic lane, with drain into sediment trap or basin.

- C. Linear Sediment Barriers: Made of silt fences.
  - 1. Provide linear sediment barriers:
    - a. Along downhill perimeter edge of disturbed areas, including soil stockpiles.
    - b. Along the top of the slope or top bank of drainage channels and swales that traverse disturbed areas.
    - c. Along the toe of cut slopes and fill slopes.
    - d. Perpendicular to flow across the bottom of existing and new drainage channels and swales that traverse disturbed areas or carry runoff from disturbed areas; space at maximum of 200 feet apart.
    - e. Across the entrances to culverts that receive runoff from disturbed areas.
  - 2. Space sediment barriers with the following maximum slope length upslope from barrier:
    - a. Slope of Less Than 2 Percent: 100 feet..
    - b. Slope Between 2 and 5 Percent: 75 feet.
    - c. Slope Between 5 and 10 Percent: 50 feet.
    - d. Slope Between 10 and 20 Percent: 25 feet.
    - e. Slope Over 20 Percent: 15 feet.
- D. Storm Drain Curb Inlet Sediment Trap: Protect each curb inlet using one of the following measures:
  - 1. Filter fabric wrapped around hollow concrete blocks blocking entire inlet face area; use one piece of fabric wrapped at least 1-1/2 times around concrete blocks and secured to prevent dislodging; orient cores of blocks so runoff passes into inlet.
  - 2. Straw bale row blocking entire inlet face area; anchor into pavement.
- E. Storm Drain Drop Inlet Sediment Traps: As detailed on drawings.
- F. Temporary Splash Pads: Stone aggregate over filter fabric; size to suit application; provide at downspout outlets and storm water outlets.
- G. Soil Stockpiles: Protect using one of the following measures:
  - 1. Cover with polyethylene film, secured by placing soil on outer edges.
  - 2. Cover with mulch at least 4 inches thickness of pine needles, sawdust, bark, wood chips, or shredded leaves, or 6 inches of straw or hay.
- H. Mulching: Use only for areas that may be subjected to erosion for less than 6 months.
  - 1. Wood Waste: Use only on slopes 3:1 or flatter; no anchoring required.
- I. Temporary Seeding: Use where temporary vegetated cover is required.

### 3.4 INSTALLATION

- A. Traffic-Bearing Aggregate Surface:
  - 1. Excavate minimum of 6 inches.
  - 2. Place geotextile fabric full width and length, with minimum 12 inch overlap at joints.
  - 3. Place and compact at least 6 inches of 1.5 to 3.5 inch diameter stone.
- B. Silt Fences:
  - 1. Store and handle fabric in accordance with ASTM D4873.
  - 2. Where slope gradient is less than 3:1 or barriers will be in place less than 6 months, use nominal 16 inch high barriers with minimum 36 inch long posts spaced at 6 feet maximum, with fabric embedded at least 4 inches in ground.

3. Where slope gradient is steeper than 3:1 or barriers will be in place over 6 months, use nominal 28 inch high barriers, minimum 48 inch long posts spaced at 6 feet maximum, with fabric embedded at least 6 inches in ground.
  4. Where slope gradient is steeper than 3:1 and vertical height of slope between barriers is more than 20 feet, use nominal 32 inch high barriers with woven wire reinforcement and steel posts spaced at 4 feet maximum, with fabric embedded at least 6 inches in ground.
  5. Install with top of fabric at nominal height and embedment as specified.
  6. Do not splice fabric width; minimize splices in fabric length; splice at post only, overlapping at least 18 inches, with extra post.
  7. Fasten fabric to steel posts using wire, nylon cord, or integral pockets.
  8. Wherever runoff will flow around end of barrier or over the top, provide temporary splash pad or other outlet protection; at such outlets in the run of the barrier, make barrier not more than 12 inches high with post spacing not more than 4 feet.
- C. Straw Bale Rows:
1. Install bales in continuous rows with ends butting tightly, with one bale at each end of row turned uphill.
  2. Install bales so that bindings are not in contact with the ground.
  3. Embed bales at least 4 inches in the ground.
  4. Anchor bales with at least two stakes per bale, driven at least 18 inches into the ground; drive first stake in each bale toward the previously placed bale to force bales together.
  5. Fill gaps between ends of bales with loose straw wedged tightly.
  6. Place soil excavated for trench against bales on the upslope side of the row, compacted.
- D. Mulching Over Large Areas:
1. Dry Straw and Hay: Apply 2-1/2 tons per acre; anchor using dull disc harrow or emulsified asphalt applied using same spraying machine at 100 gallons of water per ton of mulch.
  2. Wood Waste: Apply 6 to 9 tons per acre.
  3. Erosion Control Matting: Comply with manufacturer's instructions.
- E. Mulching Over Small and Medium Areas:
1. Dry Straw and Hay: Apply 4 to 6 inches depth.
  2. Wood Waste: Apply 2 to 3 inches depth.
  3. Erosion Control Matting: Comply with manufacturer's instructions.
- F. Temporary Seeding:
1. When hydraulic seeder is used, seedbed preparation is not required.
  2. When surface soil has been sealed by rainfall or consists of smooth undisturbed cut slopes, and conventional or manual seeding is to be used, prepare seedbed by scarifying sufficiently to allow seed to lodge and germinate.
  3. If temporary mulching was used on planting area but not removed, apply nitrogen fertilizer at 1 pound per 1000 sq ft.
  4. On soils of very low fertility, apply 10-10-10 fertilizer at rate of 12 to 16 pounds per 1000 sq ft.
  5. Incorporate fertilizer into soil before seeding.
  6. Apply seed uniformly; if using drill or cultipacker seeders place seed 1/2 to 1 inch deep.
  7. Irrigate as required to thoroughly wet soil to depth that will ensure germination, without causing runoff or erosion.
  8. Repeat irrigation as required until grass is established.

3.5 MAINTENANCE

- A. Inspect preventive measures weekly, within 24 hours after the end of any storm that produces 0.5 inches or more rainfall at the project site, and daily during prolonged rainfall.
- B. Repair deficiencies immediately.
- C. Silt Fences:
  - 1. Promptly replace fabric that deteriorates unless need for fence has passed.
  - 2. Remove silt deposits that exceed one-third of the height of the fence.
  - 3. Repair fences that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- D. Straw Bale Rows:
  - 1. Promptly replace bales that fall apart or otherwise deteriorate unless need has passed.
  - 2. Remove silt deposits that exceed one-half of the height of the bales.
  - 3. Repair bale rows that are undercut by runoff or otherwise damaged, whether by runoff or other causes.
- E. Clean out temporary sediment control structures weekly and relocate soil on site.
- F. Place sediment in appropriate locations on site; do not remove from site.

3.6 CLEAN UP

- A. Remove temporary measures after permanent measures have been installed, unless permitted to remain by The Cullipher Group, PA.
- B. Clean out temporary sediment control structures that are to remain as permanent measures.
- C. Where removal of temporary measures would leave exposed soil, shape surface to an acceptable grade and finish to match adjacent ground surfaces.

END OF SECTION

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**GENERAL LANDSCAPE REQUIREMENTS AND ONE YEAR WARRANTY:**

Provide fully grown-in grass turf throughout. At ALL areas disturbed, restore finish grading to like new condition with fully grown-in grass turf. Maintain and warranty complete installation for one year following acceptance.

**PRE-EMERGENT HERBICIDE TREATMENT:**

Prior to permanent seeding, apply herbicide as recommended by the seed supplier, in accordance with published recommendations.

**SEEDING PLAN:**

PERMANENT SEEDING AFTER APRIL 15 AND BEFORE SEPTEMBER 15:

Seeding Mixture:

1. Centipede, applied at the rate of 10 lbs. Per acre.
2. Common Bermuda, applied at the rate of 100 lbs. Per acre.

PERMANENT SEEDING AFTER SEPTEMBER 15 AND BEFORE APRIL 15:

Seeding Mixture:

1. Common Bermuda (unhulled), applied at the rate of 100 lbs. Per acre.
2. Annual Rye Grass or Fescue, applied at the rate of 50 lb. Per acre.

**SOIL AMENDMENTS**

Apply 3000 lb. / acre ground agricultural limestone and 1,000 lb. / acre of 10-10-10 fertilizer.

**MULCH**

Use jute, excelsior matting, or other effective channel lining material to cover the bottom of channels, ditches, and swales as required to prevent erosion and promote turf establishment. Extend lining above the highest calculated depth of flow. On channel side slopes above this height, and in drainages not requiring temporary lining, apply 4000 lb. / acre grain straw by stapling netting over the top.

All other lawn areas shall be mulched with 2,000 lb. / acre grain straw, stitched into ground with a disc harrow with blades set straight

**TURF ESTABLISHMENT, MAINTENANCE, AND SPECIAL RIGHT OF OWNER TO TAKE CORRECTIVE ACTION**

Turf establishment and maintenance includes sufficient irrigation and frequent mowing to promote turf grow-in and to prevent the growth and proliferation of weeds. In addition, the contractor shall re-seed, re-fertilize and mulch immediately following erosion or other damage, which is to be expected. Should the Owner determine that the grounds in part or as a whole lack proper maintenance in accordance with this

paragraph, the Owner or his designated agent (the Architect or Engineer) may provide written notice to the Contractor to take corrective action. If the Contractor does not respond with corrective action or otherwise in an acceptable manner to the Owner within five (5) calendar days, the Owner may, at his option, undertake such corrective action with his own or other forces, and deduct the full cost from the Contract amount of the Contractor.

**PLANTING GENERAL LAWNS:**

Where topsoil has been stripped, redistribute a minimum 3" layer of stockpiled topsoil, add specified soil amendments and mix thoroughly into top 4" of soil, tilling surface to a level, fine texture.

Cultivate to a depth of 6" in areas where topsoil has not been stripped, add specified soil amendments, and mix thoroughly into top 4" of soil, tilling surface to a level, fine texture.

Grade and roll prepared lawn surface. Water thoroughly but do not create muddy soil condition.

Broadcast seed mix uniformly in two directions in the quantity specified in the Seeding Plan Schedule. Water thoroughly with fine spray until grown in and established.

When electing to Hydro-Seed, broadcast uniformly in two directions in the quantity recommended by the seed producer, and water thoroughly with fine spray until grown in and established.

Protect seeded areas against erosion by stitching straw mulching with a disc harrow with blades set straight. Immediately after seeding, protect the area against traffic or other use by erecting barricades as required until final acceptance.

**FINAL ACCEPTANCE:**

Final Inspection and Acceptance: At the end of the turf establishment period, final inspection will be made upon written request at least 10 days prior to the anticipated date. Final acceptance will be based upon a full stand of turf of the species specified.

Turf establishment period shall be defined as minimum three mowing cycles, or as required to produce a stand of turf. Contractor is responsible for irrigation and mowing as required.

Re-planting: In areas which do not have a satisfactory stand of turf or sod, replace sod or replant, mulch, re-fertilize and irrigate within specified planting dates.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Extent of portland cement concrete paving includes concrete sidewalks, curbs and gutters, as shown on Drawings.

Prepared subbase is specified in Section 02200.

Concrete and related materials are specified in Section 03200.

**QUALITY ASSURANCE:**

Codes and Standards: Comply with NCDOT Regulations if more stringent than herein specified.

**SUBMITTALS:**

Furnish samples, manufacturer's product data, test reports, and materials' certifications as required in referenced sections for concrete and joint fillers and sealers.

Install sample section of concrete sidewalk for review and approval by Architect. Mockup sample to include full construction features required by Drawings, including expansion joints and sealants, and control joints.

**JOB CONDITIONS:**

Traffic Control: Maintain access for vehicular and pedestrian traffic as required for other construction activities.

Utilize flagmen, barricades, warning signs and warning lights as required.

**PART 2: PRODUCTS**

**MATERIALS:**

Forms: Steel, wood, or other suitable material of size and strength to resist movement during concrete placement and to retain horizontal and vertical alignment until removal. Use straight forms, free of distortion and defects.

Use flexible spring steel forms or laminated boards to form radius bends as required.

Coat forms with a non-staining form release agent that will not discolor or deface surface of concrete.

Concrete Materials: Comply with requirements of applicable Division - 3 Sections for concrete materials, admixtures, bonding materials, curing materials, and others as required.

Welded Steel Wire Fabric: ASTM A185 Plain Type; in flat sheets; unfinished. Rolled WWF shall not be acceptable for use on this job.



Expansion Joint Materials: Bituminous Fiber, 1/2" thick, complying with NCDOT Spec. Section 928-1 and Section 420-12.

Liquid-Membrane Forming Curing Compound: Complying with ASTM C 309, Type I, Class A unless other type acceptable to Engineer. Moisture loss not more than 0.055 gr. / sq. cm. when applied at 200 sq. ft. / gal.

Detectable Tactile Warning Surfaces: Vitrified polymer composite panels, cast into concrete. Dark contrasting color. "Armor-Tile" as manufactured by Engineered Plastics or equivalent. Comply with all ADA and NC Accessibility code requirements.

### **CONCRETE MIX, DESIGN AND TESTING:**

Comply with requirements of applicable Division - 3 Sections for concrete mix design, sampling and testing, and quality control, and as herein specified.

Design mix to produce normal-weight concrete consisting of portland cement, aggregate, water-reducing or high-range water-reducing admixture (super - plasticizer), air-entraining admixture and water to produce the following properties:

Compressive Strength: 3,000 psi, minimum at 28 days, unless otherwise indicated.

Slump Range: Not greater than 4".

Air Content: 5 % - 8%.

### **PART 3: EXECUTION**

#### **SUBSURFACE PREPARATION:**

Remove loose material from compacted subbase surface immediately before placing aggregate base course. No aggregate base course shall be placed until the foundation has been inspected and approved by the Engineer. Proof-rolling may be required depending on condition of subbase.

Place aggregate base course material on prepared subgrade in layers of uniform thickness. Grade the base course evenly to thickness indicated on drawings and compact before placing concrete.

#### **FORM CONSTRUCTION:**

Set forms to required grades and lines, rigidly braced and secured. Install sufficient quantity of forms to allow continuous progress of work and so that forms can remain in place at least 2 hours after concrete placement.

Check completed formwork for grade and alignment to following tolerances:

Top of forms not more than 1 / 8" in 10'.

Vertical face on longitudinal axis, not more than 1/4" in 10'.

Clean forms after each use, and coat with form release agent as often as required to ensure separation from concrete without damage.

#### **REINFORCING**

Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions, including load bearing pads.

**CONCRETE PLACEMENT:**

General: Comply with requirements of Division - 3 Sections for mixing and placing concrete, and as herein specified.

Do not place concrete until subbase and forms have been checked for line and grade. Moisten subbase if required to provide a uniform dampened condition at time concrete is placed. Do not place concrete around manholes or other structures until they are at required finish elevation and alignment.

Place concrete using methods which prevent segregation of mix. Consolidate concrete along face of forms and adjacent to transverse joints with internal vibrator. Keep vibrator away from joint assemblies, reinforcement, or side forms. Use only square-faced shovels for hand-spreading and consolidation. Consolidate with care to prevent discoloration of reinforcing, dowels, and joint devices.

Deposit and spread concrete in a continuous operation between transverse joints, as far as possible. If interrupted for more than 1/2-hour, place a construction joint.

Drop top of curb as shown in details of plans at all radii of intersections, to allow construction of handicapped ramps and sidewalks.

Curbs and Gutters: Automatic machine may be used for curb and gutter placement at Contractor's option. If machine placement is to be used, submit revised mix design and laboratory test results which meet or exceed minimums specified. Machine placement must produce curbs and gutters to required cross-section, lines, grades finish, and jointing as specified.

**JOINTS:**

General: Construct expansion, weakened-plane (contraction), and construction joints true-to-line with face perpendicular to surface of concrete. Construct transverse joints at right angles to the centerline, unless otherwise indicated.

When joining existing structures, place transverse joints to align with previously placed joints, unless otherwise indicated.

Exterior Concreted Walks: Provide all concrete walk surfaces with a concrete walk 1/2" tooled expansion joints at 30' centers maximum and sawcut weakened-plane (contraction) joints at 5' centers maximum. Pour sample for Architect approval.

Weakened-Plane (Contraction) Joints: Provide sawcut weakened-plane (contraction) joints, sectioning concrete sidewalks at 5' intervals. Sawcut weakened-plane joints for a depth equal to at least 1/4 concrete thickness, as follows:

Sawcut joints at concrete walks as soon as concrete has sufficient strength to prevent spalling of the joint due to the action of the saw. But in no case greater than 4 hours after initial placement of the concrete. Concrete walk sawcut joints shall not be filled with joint filler.

Tooled Joints: Form tooled joints in fresh concrete by grooving top portion with a recommended cutting tool and finishing edges with a jointer. Remove tooling marks.

Construction Joints: Place tooled construction joints at end of placements and at locations where placement operations are stopped for a period of more than 1/2-hour, except where such placements terminate at expansion joints.

Construct joints as shown or, if not shown, use standard metal keyway-section forms.

Locate expansion joints at 90' o.c. for each curb and gutter section and 30' o.c. for each sidewalk section unless otherwise indicated, and at beginning and end of all curb and gutter radii. Connections with rigid objects including existing curb and gutter and catch basins.

Extend joint fillers full-width and depth of joint, and not less than 1/2" or more than 1" below finished surface where joint sealer is indicated. If no joint sealer, place top of joint filler flush with finished concrete surface.

Furnish joint fillers in one-piece lengths for full width being placed, wherever possible. Where more than one length is required, lace or slip joint filler sections together.

Protect top edge of joint filler during concrete placement with a metal cap or other temporary material. Remove protection after concrete has been placed on both sides of joint.

Fillers and Sealants: Comply with manufacturer's requirements for preparation of joints, materials installation, and performance. Place at all curb and gutter template joints, curb-to-walk transition joints, concrete walk expansion joints, tooled concrete walk construction joints. Joint filler not required at 5' O.C. sawcut weakened-plane contraction joints.

#### **CONCRETE FINISHING:**

After striking-off and consolidating concrete, smooth surface by screening and floating. Use hand methods only where mechanical floating is not possible. Adjust floating to compact surface and produce uniform texture.

After floating, test surface for trueness with a 10' straight edge. Distribute concrete as required to remove surface irregularities, and refloat repaired areas to provide a continuous smooth finish.

Work edges of slabs, gutters, back top edge of curb, and formed joints with an edging tool, and round to 1/2" radius, unless otherwise indicated. Eliminate tool marks on concrete surface.

After completion of floating and troweling when excess moisture or surface sheen has disappeared, complete surface finishing, as follows:

Provide all concrete walk surfaces with a unidirectional fine broom finish. Pour sample for Architect approval.

Broom Finish, by drawing a fine-hair broom across concrete surface, perpendicular to line of traffic. Repeat operation if required to provide a fine line texture acceptable to Engineer.

Do not remove forms for 24 hours after concrete has been placed. After form removal, clean ends of joints and point-up any minor honey combed areas. Remove and replace areas or sections with major defects, as directed by Engineer.

#### **CURING:**

Protect and cure finished concrete paving, complying with applicable requirements of Division - 3 Sections. Use membrane-forming curing and sealing compound or approved moist-curing methods.

#### **REPAIRS AND PROTECTIONS:**

Repair or replace broken or defective concrete, as directed by Engineer.

Drill test cores where directed by Engineer, when necessary to determine magnitude of cracks or defective areas. Fill drilled core holes in satisfactory pavement areas with portland cement concrete bonded to pavement with epoxy adhesive.

Protect concrete from damage until acceptance of work. Exclude traffic from pavement for at least 14 days after placement. When construction traffic is permitted, maintain pavement as clean as possible by removing surface stains and spillage of materials as they occur.

Sweep concrete and wash free of stains, discolorations, dirt and other foreign material just prior to final inspection.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**1.1 SECTION INCLUDES**

- A. Formwork for cast—in place concrete, with shoring, bracing and anchorage.
- B. Openings for other work.
- C. Form accessories.
- D. Form stripping.

**1.2 RELATED SECTIONS**

- A. Section 03200 — Concrete Reinforcement.
- B. Section 03300 — Cast-in-Place Concrete.

**1.3 REFERENCES**

- A. ACI 301 — Structural Concrete for Buildings.
- B. ACI 318 — Building Code Requirements for Reinforced Concrete.
- C. PS 1 — Construction and Industrial Plywood.

**1.4 DESIGN REQUIREMENTS**

- A. Design and construct formwork, shoring and bracing to conform to design and code requirements; resultant concrete to conform to required shape, line and dimension.

**1.5 QUALITY ASSURANCE**

- A. Perform Work in accordance with ACI 301 and 318.
- B. Maintain one copy of each document on site.

**1.6 REGULATORY REQUIREMENTS**

- A. Conform to ACI 301 and ACI 318 code for design, fabrication, erection and removal of formwork.

**1.7 DELIVERY, STORAGE, AND HANDLING**

- A. Deliver, store, protect and handle products to site to prevent damage.
- B. Store off ground in ventilated and protected manner to prevent deterioration from moisture.

**1.8 COORDINATION**

- A. Coordinate this Section with other Sections of work which require attachment of components to formwork.
- B. If formwork is placed after reinforcement resulting in insufficient concrete cover over reinforcement before proceeding, request instructions from Architect/Engineer.

## **PART 2: PRODUCTS**

### **2.1 WOOD FORM MATERIALS**

- A. Plywood: Douglas Fir; solid one side, tight faced undamaged sheets with clean, true edges.

### **2.2 MANUFACTURERS — PREFABRICATED FORMS**

- A. Symons or equal.

### **2.3 PREFABRICATED FORMS**

- A. Preformed Steel Forms: Minimum 16 gage, matched, tight fitting, stiffened to support weight of concrete without deflection detrimental to tolerances and appearance of finished surfaces.
- B. Steel Tubular Column Type: Round, steel material, minimum 16 gage, surface treated with release agent, of sizes required.

### **2.4 FORMWORK ACCESSORIES**

- A. Form Ties: Snap—off type, galvanized metal, cone type, with waterproofing washer.
- B. Form Release Agent: Colorless mineral oil which will not stain concrete, or absorb moisture.
- C. Dovetail Anchor Slot: Galvanized steel, 22 gage, foam filled.
- D. Flashing Reglets: Galvanized steel, 22 gage, longest possible lengths, with alignment splines for joints, foam filled,
- E. Nails, Spikes, Lag Bolts, Through Bolts, Anchorages: Sized as required, of sufficient strength and character to maintain formwork in place while placing concrete.
- F. Waterstops: Hydrophylic type as manufactured by American Colloid or approved equal.

## **PART 3: EXECUTION**

### **3.1 EXAMINATION**

- A. Verify lines, levels and centers before proceeding with formwork. Ensure that dimensions agree with drawings.

### **3.2 EARTH FORMS**

- A. Hand trim sides and bottom of earth forms. Remove loose soil, mud, and debris prior to placing concrete.

### **3.3 ERECTION — FORMWORK**

- A. Erect formwork, shoring and bracing to achieve design requirements, in accordance with requirements of ACI 301.

- B. Provide bracing to ensure stability of formwork. Shore or strengthen formwork subject to over stressing by construction loads.
- C. Arrange and assemble formwork to permit dismantling and stripping. Do not damage concrete during stripping. Permit removal of remaining principal shores.
- D. Align joints and make watertight. Keep form joints to a minimum.
- E. Obtain approval before framing openings in structural members which are not indicated on Drawings.
- F. Provide chamfer strips on exposed external corners.

### **3.4 APPLICATION — FORM RELEASE AGENT**

- A. Apply form release agent on formwork in accordance with manufacturer's recommendations.
- B. Apply prior to placement of reinforcing steel, anchoring devices, and embedded items.
- C. Do not apply form release agent where concrete surfaces will receive special finishes or applied coverings which are affected by agent. Soak inside surfaces of untreated forms with clean water. Keep surfaces coated prior to placement of concrete.

### **3.5 INSERTS, EMBEDDED PARTS, AND OPENINGS**

- A. Provide formed openings where required for items to be embedded in passing through concrete work.
- B. Locate and set in place items which will be cast directly into concrete.
- C. Coordinate with work of other sections in forming and placing openings, slots, reglets, recesses, sleeves, bolts, anchors, other inserts, and components of other Work.
- D. Position recessed reglets for brick veneer masonry anchors to spacing and intervals noted on drawings or specified in Section 04200.
- E. Install accessories in accordance with manufacturer's instructions, straight, level, and plumb. Ensure items are not disturbed during concrete placement.
- F. Install waterstops in accordance with manufacturer's instruction continuous without displacing reinforcement.
- G. Provide temporary ports or openings in formwork where required to facilitate cleaning and inspection. Locate openings at bottom of forms to allow flushing water to drain.
- H. Close temporary openings with tight fitting panels, flush with inside face of forms, and neatly fitted so joints will not be apparent in exposed concrete surfaces.

### **3.6 FORM CLEANING**

- A. Clean forms as erection proceeds, to remove foreign matter within forms.
- B. Clean formed cavities of debris prior to placing concrete.
- C. Flush with water or use compressed air to remove remaining foreign matter. Ensure that water and debris drain to exterior through clean—out ports.

- D. During cold weather, remove ice and snow from within forms. Do not use de-icing salts. Do not use water to clean out forms, unless formwork and concrete construction proceed within heated enclosure. Use compressed air or other means to remove foreign matter.

**3.7 FORMWORK TOLERANCES**

- A. Construct formwork to maintain tolerances required by ACI 301.

**3.8 FIELD QUALITY CONTROL**

- A. Inspect erected formwork, shoring, and bracing to ensure that work is in accordance with formwork design, and that supports, fastenings, wedges, ties, and items are secure.

**3.9 FORM REMOVAL**

- A. Do not remove forms or bracing until concrete has gained sufficient strength to carry its own weight and imposed loads.
- B. Loosen forms carefully. Do not wedge pry bars, hammers, or tools against finish concrete surfaces scheduled for exposure to view.
- C. Store removed forms in manner that surfaces to be in contact with fresh concrete will not be damaged. Discard damaged forms.

*END OF SECTION*



**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Work of this Section shall include furnishing all labor and materials required to provide all cast-in-place concrete scheduled on Drawings and as specified in this Section.

Related Work Specified Elsewhere:

Concrete Formwork (Section 03100)  
Concrete Reinforcement (Section 03300)

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Industry Standards Index in Division 1.

LEED NC, U. S. Green Building Council

**DELIVERY AND PROTECTION OF MATERIALS:**

Store cement in weather tight structure with floor at least 12 inches off ground, and accessible for inspection in original packages.

Store fine and coarse aggregate separately. Segregate sizes and avoid getting dirt and foreign materials in concrete.

Deliver ready-mixed concrete in compliance with requirements set forth in ASTM C 94.

Provide documentation of LEED credits requirements for use of local regional materials.

**SEVERE-WEATHER PROVISIONS:**

Cold-Weather Concreting: (In accordance with ACI 306 and as follows):

Provide adequate equipment for heating concrete materials and protecting concrete during freezing or near-freezing weather. Do not use frozen materials, or materials containing ice.

All concrete materials and all reinforcement, forms, fillers, and around which concrete is in contact shall be free from frost.

Whenever temperature of surrounding air is below 40 degrees F., all concrete shall have temperature between 70 degrees and 80 degrees F. Provide adequate means for maintaining temperature not less than 70 degrees F. for three days, or 50 degrees F. for five days, or for as much more time as is necessary to insure curing of concrete.

Use no salt or other chemicals to prevent freezing.

Housing, covering, or other protection used in connection with curing shall remain in place, intact, at least 24 hours after artificial heat is discontinued.

Hot Weather Concreting: (In accordance with ACI 305 and as follows):

Provide adequate methods of lowering temperature of concrete ingredients so that temperature of concrete when placed does not exceed 90 degrees F.

When weather is such as to raise concrete temperature, as placed, consistently above 80 degrees F., use approved retarder.

Sprinkle all subgrade and forms with water before placing concrete. Remove all excess water before placing concrete.

Start curing as soon as practicable to prevent evaporation of water and keep forms wet. Protect flat work from dry wind, direct sun, and high temperatures.

## **PART 2: PRODUCTS**

### **CEMENT:**

Cement shall be standard portland cement of United States manufacture, conforming to ASTM C 150, Type I or Type III. Only one brand of commercial portland cement shall be used. Each bag shall weigh approximately 94 pounds and contain one cubic foot.

### **CONCRETE AGGREGATES:**

Fine Aggregate: Washed sand having clean, hard, durable, uncoated grains, free from harmful substances conforming to ASTM C 33.

Coarse Aggregate for standard-weight concrete: crushed stone, gravel, or other approved inert material having clean, hard, durable uncoated particles conforming to ASTM C 33. Maximum size, in accordance with ACI 318.

Lightweight Coarse Aggregate shall conform to ASTM C 330. Lightweight aggregate shall be expanded shale or slate. Maximum size of aggregate shall be of 3/4".

### **WATER:**

Clean and free from harmful amounts of acids, alkalis, or organic materials. No water shall be added at the site unless delivered, documented, and approved by the batch plant and testing agency.

### **VAPOR BARRIER:**

Vapor barrier under floor slabs on earth shall be puncture resistant polyethylene sheet not less than 15 mils thick, with permeance of less than 0.01 perms per ASTM F 1249 or ASTM E 96, and in compliance with ASTM E 1745 Class A and ACI 302. Accessories would include seam tape and vapor proofing mastic with permeance less than 0.03 perms. Provide pipe boots constructed from vapor barrier material, pressure sensitive tape and/or mastic per manufacturer's instructions.

### **EXPANSION JOINT MATERIALS:**

Expansion joint material shall be asphalt-impregnated fiber strips, 1/2" thick, unless otherwise shown or noted: Flexcell by Celotex Corporation, Sealtight by W. R. Meadows, Inc., Joint Filler by Serviced Products Corporation, or approved equal.

**ADMIXTURES:**

Water Reducing Admixture: ASTM C 494, Type A, and contain no chloride ions.

Air Entraining Admixture: ASTM C 60 for slabs permanently exposed to weather. No air entraining admixture is to be used for concrete not exposed to weather. Air content is to be confirmed by lab tests for both air entrained and non-air entrained mixes.

**CLASS OF CONCRETE:**

f'c minimum 4000 psi, maximum 150 pcf (regular weight) for exposed exterior concrete.

f'c minimum 3000 psi, maximum 150 pcf (regular weight).

f'c minimum 3000 psi, maximum 120 pcf (light weight-for use in elevated slabs).

f'c minimum 3000 psi, maximum 150 pcf (regular weight pea gravel) high slump mix for concrete masonry fill.

**MIX DESIGNS:**

Contractor shall select a testing laboratory acceptable to Architect to verify mixes of all classes of concrete.

Contractor shall submit samples in adequate quantities for each mix verification, of all concrete materials to be used on project to designated testing laboratory.

Laboratory shall be engaged by and paid by the contractor out of the material testing allowance.

Submit four (4) copies of all mix design, aggregate test results, and compression test results to Architect prior to use on the job.

**PLANT MIXING:**

Proportioning Concrete:

Stresses for design of this structure are based on specified minimum 28-day compressive strength of concrete. Proportions shall be in compliance with approved design mix for each class of concrete.

Batching:

Ready-mixed concrete shall be mixed and delivered in accordance with requirements of ASTM C 94.

Producer shall furnish delivery ticket with each load of concrete delivered under this Specification. Delivery ticket shall show clearly class and strength of concrete, size of coarse aggregate, slump ordered, and date and time of departure from batching plant.

1. Stresses for design of this structure are based on specified minimum 28-day compressive strength of concrete. Proportions shall be in compliance with approved design mix for each class of concrete.
2. Regular weight 3000 psi or 4000 psi concrete shall be proportioned for a slump of 4" + or - 1".
3. Lightweight 3000 psi concrete shall be proportioned for a slump of 6" + or - 1".

4. Fine aggregate 3000 psi concrete masonry grout shall be proportioned for a slump of 10" + or - 2".
5. All concrete shall be proportioned for a maximum water to cement ratio 0.5.
6. Concrete not permanently exposed to weather such as concrete for foundations, interior slabs on grade, concrete unit masonry grout, and elevated slabs on composite metal deck shall not have air added by entrainment admixtures. This requirement shall be verified by the testing laboratory.
7. Concrete to be permanently exposed to weather shall have air added by entrainment admixtures. Air content shall be 5% + or - 1%. This requirement shall be verified by the testing laboratory.

**CONVEYING EQUIPMENT:**

Carts or buggies transporting concrete more than 50 feet shall be equipped with pneumatic tires.

Equipment for chuting or conveying concrete shall be of sufficient size to insure continuous flow of concrete at delivery and without separation of materials.

**PART 3: EXECUTION**

**EVALUATION OF COMPRESSION TESTS:**

Evaluation of results of tests for ultimate-strength design concrete shall be according to ACI 318.

Neither results of laboratory verification tests nor any provision in Contract Documents shall relieve Contractor of obligation to furnish concrete of class and strength specified.

**INSPECTION OF WORK BEFORE PLACING:**

Inspect work to receive concrete for deficiencies which would prevent proper execution of finished work. Do not proceed with placing until such deficiencies are corrected.

Do not place concrete on earth until fill or excavation has been prepared as set forth under applicable sections of specifications for that work as verified by the testing lab.

Before any concrete is placed in form, all pipes or sleeves, openings, or embedded items shall be in place and shall receive all tests specified for them.

Remove all grease, oil, mud or other foreign matter from forms and have reinforcing steel in proper condition and position before placement of concrete. Dowels shall be in place and tied off prior to placing concrete.

Remove hardened, or partially hardened, concrete on forms or reinforcement before placing concrete.

**CONVEYING:**

Convey concrete from mixer to placement by methods which will prevent separation or loss of material. No water shall be added at the site to aid placement of concrete. Concrete too stiff to be properly placed shall be rejected and removed from the site and legally disposed of at no additional cost to the owner.

Runway supports shall not bear upon reinforcing steel or fresh concrete.

If pump(s) are used for conveying concrete, there shall be no aluminum in contact with the concrete, either in pump or in conveying pipes.

Clean conveying equipment thoroughly before run of concrete at frequent intervals.

**CONSTRUCTION AND EXPANSION JOINTS:**

Construction Joints: Early in construction program, contractor shall review with Architect construction joints he proposes to use, not indicated on the Drawings. Contractor shall not use any construction joints not approved by Architect.

Expansion Joints: Install as indicated.

**PLACING:**

Deposit concrete as nearly as practicable in its final position to avoid rehandling. Do not deposit concrete on work partially hardened or contaminated by foreign material. Do not use retempered concrete. In no case use concrete when elapsed time, after addition of water and cement to batch, exceeds one hour.

Concrete shall not be dropped more than four feet. For dropping greater distances use metal chutes or tremie pipes.

Once concreting is started carry on as continuous operation until placing of section is completed. Finish top surface to true plane. When construction joints are necessary, they shall be made in accordance with article above. Do not allow cold joints to occur within pours.

Compact all concrete thoroughly by suitable means during placing, and work thoroughly around reinforcement, embedded fixtures, and into corners of forms. When vibrator is used, apply directly to concrete. Do not over vibrate.

**PROTECTION**

During curing period protect concrete from damaging mechanical disturbances, particularly load stresses, heavy stock, and excessive vibration. Protect all finished concrete surfaces from damage by construction equipment, materials, or methods, and by rain, running water, hot sun, or windy conditions. Do not load self supporting structures in such a way as to overstress concrete.

Coordinate with protection requirements of Section 03362 – Polished Concrete Floor Finishes.

**TESTING:**

Conduct strength tests of concrete in accordance with following procedures:

Secure composite samples in accordance with "Method of Sampling Fresh Concrete" (ASTM C 172).

Mold and cure five specimens from each sample in accordance with "Method of Making and Curing Concrete Compression and Flexure Specimens in the Field" (ASTM C 31). Five specimen comprise one test.

Test Two Specimens at 7 days (ASTM C 39). Test two specimens at 28 days in accordance with "Method of Test for Compressive Strength of Molded Concrete Cylinders" (ASTM C 39). Test evaluation shall be conducted in accordance with provisions of ACI 318. Keep one Specimen in reserve.

Make one strength test for each 100 cu. yds. or fraction thereof for each mix design of concrete placed in any one day, except that in no case shall given mix design be represented by less than five tests.

Testing Laboratory shall be selected and paid by the Contractor out of the material testing allowance.

Report all test results to Architect, Structural Engineer, and Contractor on same day that tests are made.

Testing laboratory shall make and handle all test cylinders.

**NON-CONFORMING MATERIAL**

Any tested concrete material that fails to meet design strength at 28 days shall be removed and repoured. Substandard concrete may be allowed to remain if certified structurally adequate by a qualified independent engineer and approved by the Owner and Architect, however, the cost of the substandard material shall be deducted from the contract sum.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Work shall consist of providing specified finishes to all cast-in-place concrete shown on drawings.

**RELATED WORK:**

Coordinate with requirements and work specified in Specification Section 03362 - Polished Concrete Floor Finishes.

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Industry Standards Index in Division 1.

**SUBMITTALS:**

Submit (in duplicate) Manufacturer's printed instructions for application of curing compounds and floor hardeners.

Coordinate with submittal requirements in Section 03362 – Polished Concrete Floor Finishes.

**PART 2: PRODUCTS**

**FINE AGGREGATE:** ASTM C 33, fine aggregate. Natural sand

**PORTLAND CEMENT:** ASTM C 150, Type 1, gray.

**WATER:**

Potable, and free of chemicals affecting set of cement.

**CURING COMPOUND AND SEALER:**

Transparent, resinous sealer, in volatile, conforming to ASTM C 309.

Coordinate with products specified in Section 03362 – Polished Concrete Floor Finishes.

**LIQUID CHEMICAL FLOOR HARDENER:**

Colorless, aqueous solution containing blend of magnesium fluosilicate and zinc fluosilicate with wetting agent, containing not less than 2 lbs. fluosilicates per gallon. Compound shall be approved by Architect in writing.

Coordinate with products specified in Section 03362 – Polished Concrete Floor Finishes.

**ABRASIVE AGGREGATE:**

Ceramically bonded aluminum oxide grains 1/8" to 1/32" size. Material shall be delivered to the site in the manufacturer's original container. Submit sample and manufacturer's descriptive data for approval.

**JOINT SEALANTS:**

Apply interior and exterior joint sealant products required by drawings at locations indicated on drawings.

**PROTECTION:**

Coordinate with protection requirements specified in Section 03362 – Polished Concrete Floor Finishes.

**PART 3: EXECUTION**

**PATCHING CONCRETE:**

Concrete which is not formed as shown on Drawings, or is out of alignment or level, or shows defective surface, or shows defects which reduce structural strength of member or members, shall be considered as not conforming to intent of these specifications and shall be removed from job by Contractor at his expense, unless Architect grants permission to patch effective area. Permission to patch any such area shall not be considered a waiver of Architect's right to require complete removal of defective work if patching does not, in his opinion, satisfactorily restore quality and appearance of surface, or if patching does not restore structural strength of member or members.

After removing forms, inspect all concrete surfaces. Patch any pour joints, voids, honeycomb, stone pockets, or other defective areas permitted by Architect to be patched, and all tie holes. Where necessary, chip away defective areas to depth of not less than 1", with edges perpendicular to surface. Wet area to be patched and space at least 6" wide entirely surrounding it to prevent absorption of water from patching mortar. Brush grout of equal parts portland cement and sand (with sufficient water to produce brushing consistency) into surface, followed immediately by patching mortar. Patching mortar shall be made of same material (and of approximately same proportions) as used for concrete except that coarse aggregate shall be omitted. Mortar shall not be richer than 1 part cement to 3 parts sand. Amount of mixing water shall be as little as is consistent with requirements of handling and placing. Mortar shall be retempered without addition of water by allowing it to stand for period of one hour, during which time it shall be mixed occasionally with trowel to prevent setting.

Compact mortar thoroughly into place and screed off to leave patch slightly higher than surrounding surface. Leave patch undisturbed for period of 1 to 2 hours to permit initial shrinkage before beginning final finishing. Finish patch in manner to match adjoining surface. On exposed surface where unlined forms have been used, obtain final finish by striking off surface with straight-edge spanning patch, held parallel to direction of form marks. All patches shall be used in accordance with curing requirements for surface in which patch occurs. Keep patch moist for not less than 3 days after installation.

Tie-holes left by withdrawal of rods, or holes, left by removal of ends of ties shall be filled solidly with mortar after first being wet thoroughly. Any excess mortar at surface of wall shall be struck off flush with cloth.

**FLATNESS AND LEVELNESS:**

Comply with ACI Standard No. 117 and provide floors with a flatness of F25 and a levelness of F20. Use laser guided equipment to set all forms. Use laser guided highway screed to achieve specified levelness and flatness. Use of BULLFLOATS is prohibited.

Areas of Integrally Colored and Dye Stained Polished Concrete Floor Finishes: Comply with ACI Standard No. 117 and provide floors with a flatness of minimum F50 and a minimum levelness of F30.



Use laser guided equipment to set all forms. Use laser guided highway screed to achieve specified levelness and flatness. Use of BULLFLOATS is prohibited.

**TESTING:**

Floors shall be tested for levelness and flatness by an independent testing agency, using a "Dipstick Floor Profiler". Floors that do not meet specification will be removed and re-constructed.

**MONOLITHIC CEMENT FINISH:**

Apply steel trowel finish to surface of concrete roof and floor slabs as follows:

- For all floors where, in Finish Schedule, resilient flooring or carpet covering is called for.
- For all roof slab areas (for future use as floor).
- For all other concrete floors, stairs, platforms, or slabs where, in Finish Schedule, or shown on Drawings, exposed concrete finish is called for, unless otherwise noted.

Screed floor slabs to an even surface by use of straight-edge and screeding strips accurately to proper grade. Float concrete with laser guided highway screed in manner which will compact and produce surface free from depressions or unevenness. Floors shall be level and flat within tolerances and guidelines specified, except where drains occur (in which cases floors shall be pitched to drains). Steel trowel concrete after concrete has hardened sufficiently to prevent fine materials from working to top, and only after all water sheen has disappeared. Drying of surface moisture before troweling shall proceed naturally, and shall not be hastened by dusting on of dry sand or cement. Perform final troweling after concrete has hardened so that no mortar accumulates on trowel and ringing sound is produced as trowel is drawn over surface.

Coordinate with requirements and work specified in Specification Section 03362 - Polished Concrete Floor Finishes.

Exterior Concreted Areas:

Provide all (walks and vertical surfaces) surfaces with a unidirectional fine broom finish, with concrete walk 1/2" tooled expansion joints at 30' centers maximum and sawcut joints at 5' centers maximum. Pour sample for Architect approval.

**CURING:**

General Requirements for Curing:

Prevent surfaces of concrete from drying out until required curing time has elapsed. Start curing procedures immediately following initial set of concrete.

Surfaces to Receive Finishes Set in Portland Cement Setting Beds:

Cover with non-staining, reinforced kraft paper. Lap kraft paper, and keep weighted down to prevent evaporation. Do not use membrane curing compound on these surfaces.

**FLOOR HARDENER:**

Apply to floor surfaces to be exposed in accordance with Manufacturer's printed instructions, and at a rate of not less than 100 sq. ft. per gallon. Apply uniform coating to avoid mottled appearance.

**GLOSS URETHANE FLOOR SEALER FOR EQUIPMENT PLATFORMS, BOILER ROOMS, MECHANICAL ROOMS, ELECTRICAL ROOMS, CUSTODIAL ROOMS:** (Apply whether scheduled or not; typical)

After all areas are final cleaned, to include removal of all stains and exposed reinforcing fibers, apply gray gloss urethane to floor surfaces to be exposed (no floor finishes except sealer) in accordance with Manufacturer's printed instructions, and at a rate of not less than manufacture's application rate instructions and to achieve a permanent high gloss sheen. Apply uniform coating to avoid mottled appearance. Coordinate with Section 09900 requirements.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**1.1 SECTION INCLUDES**

- A. Reinforcing steel bars, wire fabric and accessories for cast-in-place concrete.

**1.2 REFERENCES**

- A. ACI 301 - Structural Concrete for Buildings.
- B. ACI 318 - Building Code Requirements For Reinforced Concrete.
- C. ACI SP-66 - American Concrete Institute - Detailing Manual.
- D. ANSI/ASTM A82 - Cold Drawn Steel Wire for Concrete Reinforcement.
- E. ANSI/ASTM A184 - Fabricated Deformed Steel Bar Mats for Concrete Reinforcement.
- F. ANSI/ASTM A185 - Welded Steel Wire Fabric for Concrete Reinforcement.
- G. ANSI/ASTM A496 - Deformed Steel Wire Fabric for Concrete Reinforcement.
- H. ANSI/ASTM A497 - Welded Deformed Steel Wire Fabric for Concrete Reinforcement.
- I. ANSI/AWS D1.4 - Structural Welding Code for Reinforcing Steel.
- J. ASTM A615 - Deformed and Plain Billet Steel Bars for Concrete Reinforcement.
- K. ASTM A616 - Rail Steel Deformed and Plain Bars for Concrete Reinforcement.
- L. ASTM A617 - Axle Steel Deformed and Plain Bars for Concrete Reinforcement.
- M. ASTM A704 - Welded Steel Plain Bar or Rod Mats for Concrete Reinforcement.
- N. ASTM A706 - Low-Alloy Steel Deformed Bars for Concrete Reinforcement.
- O. ASTM A767 - Zinc-Coated (Galvanized) Bars for Concrete Reinforcement.
- P. ASTM A775 - Epoxy-Coated Reinforcing Steel Bars.
- Q. ASTM D3963 - Epoxy-Coated Reinforcing Steel.
- R. ASTM C1116 – Standard Specification for Fiber-Reinforced Concrete and Shotcrete
- S. AWS D12.1 - Welding Reinforcement Steel, Metal Inserts and Connections in Reinforced Concrete Construction.
- T. CRSI - Concrete Reinforcing Steel Institute - Manual of Practice.
- U. CRSI 63 - Recommended Practice For Placing Reinforcing Bars.

- V. CRSI 65 - Recommended Practice For Placing Bar Supports, Specifications and Nomenclature.

**1.3 SUBMITTALS**

- A. Shop Drawings: Indicate bar sizes, spacings, locations, and quantities of reinforcing steel and wire fabric, bending and cutting schedules, and supporting and spacing devices.
- B. Manufacturer's Certificate: Certify that products meet or exceed specified requirements.
- C. Submit in writing any request for deviation from the design drawings and specifications.

**1.4 QUALITY ASSURANCE**

- A. Perform Work in accordance with CRSI 63, 65 and Manual of Practice, ACI 301, ACI SP-66, ACI 318, ANSI/ASTM A184.
- B. Submit certified copies of mill test report of reinforcement materials analysis.

**1.5 COORDINATION**

- A. Coordinate with placement of formwork, formed openings and other Work.

**PART 2: PRODUCTS**

**2.1 REINFORCEMENT**

- A. Reinforcing Steel: ASTM A615, 60 ksi yield grade; deformed billet steel bars, unfinished.
- B. Welded Steel Wire Fabric: ASTM A185 Plain Type; in flat sheets; unfinished. Rolled WWF shall not be acceptable for use on this job.

**2.2 ACCESSORY MATERIALS**

- A. Tie Wire: Minimum 16 gage annealed type.
- B. Chairs, Bolsters, Bar Supports, Spacers: Sized and shaped for strength and support of reinforcement during concrete placement conditions including load bearing pad on bottom to prevent vapor barrier puncture.
- C. Special Chairs, Bolsters, Bar Supports, Spacers Adjacent to Weather Exposed Concrete Surfaces: Stainless steel type; size and shape as required.

**2.3 FABRICATION**

- A. Fabricate concrete reinforcing in accordance with CRSI Manual of Practice ACI SP-66, ACI 318 ANSI/ASTM A184.
- B. Locate reinforcing splices not indicated on drawings, at point of minimum stress. Indicate location of splices on shop drawings for approval by the Architect/Engineer.

**PART 3: EXECUTION**

**3.1 HANDLING AND STORAGE**

- A. Provide proper equipment for safe off loading and handling of material.
- B. Provide proper clean level storage area with proper skids to keep material clear of mud and water.
- C. Keep material free from mud and other deleterious materials that will reduce bond and do not place any reinforcing bars that are bent, twisted, broken, pitted, or otherwise unsuitable for use on the project as determined by the architect.
- D. All necessary field bending and straightening shall be accomplished without heating the material.
- E. Cutting torch shall be used only for cut off of material but not for bending. All heat bent material will be rejected by the inspector and shall be promptly removed and replaced at no additional cost. Do not weld reinforcing bars.

**3.2 PLACEMENT**

- A. Place, support and secure reinforcement against displacement. Do not deviate from required position. WWF laying on the metal deck and being manually pulled up into the fresh concrete during concrete placement operations shall not be acceptable.
- B. Do not displace or damage vapor barriers. Damaged vapor barrier shall be removed and replaced at the direction of the Architect.
- C. Accommodate placement of formed openings.
- D. Maintain concrete cover around reinforcing as indicated on drawings.
- E. Provide proper and adequate supports at maximum 3 ft x 3 ft spacing each way for support of wwf in the designated position. Tie off wwf sheets so that placement of the fresh concrete will not cause the wwf to be displaced. Pulling up of the wwf sheets into freshly placed concrete will not be an acceptable means of placing the wwf.

**3.3 FIELD QUALITY CONTROL**

- A. Field inspection will be performed by the Architect.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**1.1 SECTION INCLUDES**

- A. Cold-formed structural metal stud framing at exterior and interior wall locations.
- B. Framing accessories

**1.2 REFERENCES**

- A. ASTM A36 Standard Specification for Carbon Structural Steel.
- B. ASTM A123 Zinc (Hot—Dip Galvanized) Coatings on Iron and Steel Products.
- C. ASTM A1003 Standard Specification for Steel Sheet, Carbon, Metallic and Nonmetallic-Coated for Cold-Formed Framing Members.
- D. ASTM A525 General Requirements for Steel Sheet, Zinc—Coated (Galvanized) by the Hot—Dip Process.
- E. ASTM A591 Steel Sheet, Cold—Rolled, Electrolytic Zinc—Coated.
- F. ASTM C645 Non-Load (Axial) Bearing Steel Studs, Runners (Track) and Rigid Furring Channels for Screw Application of Gypsum Board.
- G. ASTM C754 Installation of Steel Framing Members to Receive Screw—Attached Gypsum Wallboard, Backing Board, or Water—Resistant Backing Board.
- H. ASTM C1513 Standard Specification for Steel Tapping Screws for Cold-Formed Steel Framing Connections.
- I. COSP Specification for the Design of Cold-Formed Steel Structural Members, Code of Standard Practice.
- J. GA 203 Installation of Screw Type Steel Framing Members to Receive Gypsum Board.
- K. Metal Framing Manufacturers Association (MFMA) Guidelines for the Use of Metal Framing.
- L. SSPC (Steel Structures Painting Council) Steel Structures Painting Manual.

**1.3 SYSTEM DESCRIPTION**

- A. Metal stud framing system for exterior walls shall be 6" or 8" x 68 mil minimum structural studs, as noted on Drawings, as manufactured by Marino\Ware, Dietrich, Unimast, Clark Metal Framing Systems or approved equal. Refer to Drawings for metal stud sizes and thickness.
- B. Refer to drawings for interior metal stud sizes and gages.
- C. Design and size connection components to withstand dead and live loads caused by pressure and suction of wind acting normal to plane of wall as calculated in accordance with the current North Carolina State Building Code wind loading requirements.
- D. Maximum Allowable Deflection: 1/600 span.
- E. System to accommodate construction tolerances, deflection of building structural members, and clearances of intended openings.
- F. Wall studs shall align in straight and true lines.

**1.4 SUBMITTALS**

- A. Shop Drawings: Submit shop drawings to indicate plans, elevations, prefabricated work, component details, stud layout, framed openings, anchorage to structure, bracing, connection details, type and location of fasteners, weld lengths and locations, and accessories and finishes, or items required of other related work.

Show and describe method for securing studs to tracks, splicing, and for blocking and reinforcement to framing connections.

- B. Product Data: Provide manufacturer's product data and technical data sheets describing standard framing member materials and finish, product criteria, load charts, limitations.
- C. Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention.
- D. Delegated Design Submittals: Submit structural calculations as follows:
- a. Structural calculations for connections and attachments, prepared by manufacturer for approval, sealed by a professional engineer registered in the State in which the project is located.
  - b. Description of design criteria.
  - c. Selection of framing connection requirements.
  - d. Verification of attachments to structure and adjacent framing components.
- E. Welder's current certifications for light gauge metal framing.

## **1.5 QUALITY ASSURANCE**

- A. Perform Work in accordance with MFMA and ASTM C754.

## **1.6 QUALIFICATIONS**

- A. Manufacturer:
- a. Having [5] years of experience manufacturing components similar to or exceeding requirements of project.
  - b. Having sufficient capacity to produce and deliver required materials without causing delay in work.
- B. Manufacturer's Structural Engineer:
- a. Professional engineer registered in the state in which the project is located.
  - b. Having a minimum of five years of experience with projects of similar scope.
- C. Installer: Acceptable to the manufacturer, experienced in performing the work of this section with minimum five years documented experience, and specialized in installation of work similar to that required for this project.
- D. Welders: Certified by the AWS within the previous 12 months.

## **1.7 COORDINATION**

- A. Coordinate with all trades the placement of components within the stud framing system to provide a totally sound and complete system installation ready to receive sheathing and wallboard.

## PART 2: PRODUCTS

### 2.1 STUD FRAMING MATERIALS

- A. Studs: ASTM A525, ASTM A591, cold rolled steel, channel shaped, punched for utility access
  - 1. Depth: 8", 6", 3 5/8", and as shown on the drawings.
  - 2. Thickness: 68 mil minimum at 8" and 6" studs and 33 mil minimum 3 5/8" studs.
  - 3. Width minimum 1 5/8" with 1/2" stiffening return both flanges.
- B. Runners: Of same material and thickness as studs unless otherwise noted.
- C. Furring and Horizontal CRC Bracing Members: Of same material as studs; thickness to suit purpose.
- D. Vertical Deflection Clips and Tracks: Manufacturer's standard clips and tracks, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to studs.
- E. Fasteners: Stainless steel or zinc coated #12 pan head, self-drilling, self tapping screws.
- F. Anchorage Devices: Powder actuated fasteners and screws as shown on drawings.
- G. Touch Up Primer for Galvanized Surfaces: SSPC — Paint 20 Type I Inorganic.

### 2.2 JOIST FRAMING

- A. Steel Floor and Ceiling Joists: Cold-formed steel joists, of web depths indicated on Drawings, as follows:
  - a. Type as indicated on Drawings.
  - b. Minimum Base Metal Thickness: As indicated on the Drawings.
  - c. Section Properties: As indicated on the Drawings.
- B. Steel Joist Track: Cold-formed steel joist track, of web depths indicated, unpunched, with unstiffened flanges. Type as indicated on the Drawings. Minimum Base Metal Thickness: Match steel joists. Flange Width 1 1/4 inches, minimum.

### 2.3 ACCESSORIES

- A. Framing Connectors:
  - A. Type: Steel-framing accessories fabricated from steel sheet, ASTM A1003/A1003M, 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, unless otherwise indicated, as follows:



1. Web stiffeners, solid blocking, utility angles, joist hangers, gusset plates, rigid clips, breakaway clips.

C. Anchors, Clips and Fasteners

1. Steel Shapes and Clips: ASTM A36/A36M and zinc coated by hot-dip process according to ASTM A123/A123M.
2. Cold-formed Steel Connections: ASTM A653/A653M, zinc coated by hot-dip process according to ASTM A123/A123M.
3. Expansion Anchors: Fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E488.
4. Powder-actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E1190 and as indicated on the drawings.
5. Mechanical Fasteners: ASTM C1513, corrosion-resistant-coated, self-drilling, self-tapping steel drill screws.
6. Welding Electrodes: Comply with AWS standards.
7. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.
8. Shims: Load bearing, high-density multimonomer plastic, non-leaching.
9. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

## 2.4 FABRICATION

- A. Fabricate cold-formed metal framing and accessories assemblies of framed sections to sizes and profiles required; with framing members fitted, plumb, square, and true to line, reinforced, and with connections securely fastened, and braced to suit design requirements, in accordance with referenced specification standards, and manufacturer's written instructions, and requirements in this Section.
- B. Fit and assemble in largest practical sections for delivery to site, ready for installation.
- C. Studs shall bear tightly against the top and bottom tracks.
- D. Fabricate framing assemblies using jigs or templates.
- E. Cut framing members by sawing or shearing; do not torch cut.
- F. Fasten cold-formed metal framing members by welds, screw fasteners, clinch fasteners or rivets as standard with fabricator. Do not wire-tie framing members.
  - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.

- b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
- c. Fasten other materials to cold-formed metal framing by welding, bolting, or screw fastening, according to Shop Drawings.

## **2.5 FINISHES**

- A. Studs: Galvanize to G60 coating class (minimum) or as indicated on Drawings.
- B. Tracks and Headers: Galvanize to G60 coating class (minimum) or as indicated on Drawings.
- C. Accessories: Same finish as framing members.

## **PART 3: EXECUTION**

### **3.1 EXAMINATION**

- A. Verify that conditions are ready to receive work.
- B. Verify that rough-in utilities are in proper location, and coordinated with framing.

### **3.2 ERECTION**

- A. General:
  - 1. Erect in accordance with ASTM C1007 and manufacturer's installation instructions.
  - 2. Field Welding: Per AWS D1.3, and the following:
    - a. Stud-to-Track Connections: 1/2 inch (13 mm) fillet weld, full length of inside flange dimension, inside each flange of stud onto track web.
    - b. Other Connections: Flat, plug, butt or seam.
    - c. Minimum Steel Thickness for Welded Connections: 18 gauge.
    - d. Field Fastening: Minimum of 2 self-tapping metal screws per connection, unless otherwise indicated.
- B. Wall Systems:
  - 1. Align and secure top and bottom runners.
  - 2. Fit runners under and above openings; secure intermediate studs to same spacing as wall studs.
  - 3. Install studs vertically uniformly at the spacings shown on the drawings.
  - 4. Align stud web openings horizontally.
  - 5. Secure studs to tracks using screws or welding.
  - 6. Stud splicing not permissible.

7. Fabricate corners using a minimum of three studs.
8. Minimum double stud at wall openings, door and window jambs, not more than 2 inches from each side of openings. Refer to drawings for additional jamb and head conditions.
9. Brace stud framing system rigid.
10. Coordinate erection of studs with requirements of doorframes, window frames, and; install supports and attachments.
11. Coordinate installation of wood bucks, anchors, and wood blocking with electrical and mechanical work to be placed within or behind stud framing.
12. Blocking: Secure wood blocking to studs. Secure steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, toilet accessories, hardware, etc. as required by Architect.
13. Coordinate placement of insulation in stud spaces made inaccessible after stud framing erection.
14. Fabricate and install headers at openings as indicated on Drawings.
15. All multiple members shall be stitch welded together with 1" seam welds spaced at 16" oc maximum both sides of members to form a totally composite member. Multiple members in composite units shall not be spliced.
16. All connections not shown on the drawings shall be designed by the supplier to support the imposed loads.
17. Provide continuous 2" x 43 mil horizontal strap bridging at 48" maximum intervals on both flanges. Install with 1 screw per stud. Provide solid blocking using a piece of metal stud between studs at each end of bridging run and at 12' oc maximum. Terminate bridging at wall openings with solid blocking bridging as required.
18. Place one stud tightly against each side of the tubular steel columns in line with the wall. Align the face of stud flush with face of tubular columns for smooth finish application for dry wall and sheathing. Fasten stud to column with powder actuated fasteners spaced at 16" oc.
19. Touch-up field welds and damaged galvanized surfaces with primer.

C. Steel Joists:

1. Locate joist end bearing directly over load bearing studs or provide approved load-distributing member to top of stud track.
2. Provide web stiffeners at reaction points where indicated in drawings.
3. Provide joist bridging as shown in drawings.
4. Provide end blocking where joist ends are not otherwise restrained from rotation.
5. Place joists at maximum 12 inches on center and not more than 2 inches from abutting walls. Connect joists to supports using mechanical fastener method.
6. Touch-up field welds and damaged galvanized surfaces with primer.

**3.3 ERECTION TOLERANCES**

- A. Maximum Variation From True Position: 1/4 inch.
- B. Maximum Variation of any Member from Plane: 1/4 inch.
- C. Maximum Variation From Plumb: 1/4 inch in 10' height.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Work of this Section shall consist of all labor and materials required to provide all miscellaneous fabricated metal items scheduled on Drawings and specified in this Section.

Miscellaneous metal items for which drawing information is fully descriptive that are not necessarily named herein, shall be provided as shown and as required, providing complete assemblies.

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

**QUALITY ASSURANCE:**

Manufacturers:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured or furnished by Manufacturers listed for each item.

**SUBMITTALS:**

Shop Drawings: Submit shop drawings in quadruplicate to Architect in accordance with GENERAL CONDITIONS for approval of all fabricated miscellaneous items. Shop drawings shall indicate following: fabrication, assembly and erection details, sizes of all members, fastenings, supports, and anchors; patterns; clearances, and all necessary connection to work of other trades.

Catalog Cuts: For standard manufactured items, catalog cuts may be submitted as specified in GENERAL CONDITIONS, providing all technical performance characteristics and other pertinent information are given.

**PRODUCT HANDLING:**

Handling and Storage: Handle all materials carefully to prevent damage and store at site above ground in covered, dry locations.

Replacement: Damaged items that cannot be restored to like-new conditions shall be removed and replaced at no additional cost to Owner.

**PART 2: PRODUCTS**

**BASIC MATERIALS:**

Structural Shapes: ASTM A 36/A572 Dual Certified.

Steel Pipes: ASTM A 72 welded wrought iron pipe, standard weight, Schedule 40.

Steel Pipes: ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products

Steel Tubing: ASTM A 500, Grade B.

Cast Iron: ASTM A 48j, Class 30, with minimum tensile strength of 30,000 psi.

Zinc-coated iron or Steel Sheets: ASTM A 446.

Cold-rolled Carbon Steel Sheets: ASTM A 366-66.

Exterior Lintels: ASTM A123 - Zinc (Hot Dipped Galvanized) Coatings on Iron and Steel Products

Metal Bar Grating: NAAMM A202.1 Metal Bar Grating Manual

Stainless Steel Sheet: Type #304

**FABRICATION:**

Measurements: Verify all measurements and take all field measurements necessary before fabrication.

Fasteners: Exposed fastenings shall be compatible materials, shall generally match in color and finish, and shall harmonize with material to which fastenings are applied. Permanent connections shall be riveted, welded or bolted. Exposed welds shall be ground smooth and flush.

Components: Include materials and parts necessary to complete each item properly, even though such work may not definitely be shown or specified.

Provide and install miscellaneous bolts and anchors, supports, braces, and connections necessary for completion of work.

Drill or punch holes for bolts and screws. Poor matching of holes will be rejected. Conceal fastenings where practicable.

Painting and Protective Coating:

All ferrous metal, except stainless steel and galvanized surfaces, shall be properly cleaned and given one shop coat of red lead or zinc chromate primer.

Anchors built into masonry shall be coated with asphalt paint unless specified to be galvanized. Metal work to be encased in concrete shall be left unpainted unless specified or noted otherwise.

Where hot-dip galvanized or zinc-coated metal is specified or shown, it shall not be shop-primed unless specifically required otherwise for paint finish, which shall require bonderized or paint-grip primer. Recoat at all field welds and grindings, and where initial galvanized coating has been removed or deteriorated.

Galvanizing:

Hot-dip galvanizing or zinc coatings applied on products fabricated from rolled, pressed and forged steel shapes, plates, pipes, bars and strips shall comply with ASTM A 123-68.

Unless otherwise noted, all exposed exterior structural steel members and steel framing shall be hot-dipped galvanized after fabrication to comply with ASTM A123 G60 standards, including but not limited to: steel pipe, structural steel columns (tubes or wide flanged), beams (tubes or wide flanged), steel angle framing, connections. Reference 09900 Paint for paint primer and topcoats requirements.

Lintels in exterior walls shall be hot dip galvanized to ASTM A123 G60 standards after fabrication. Reference 09900 Paint for paint primer and topcoats requirements.

Exterior handrails shall be hot dip galvanized to ASTM A123 G90 standards, not less than .90 oz/square foot, after fabrication.

Exterior steel stair treads, unless otherwise noted, shall be hot dip galvanized to ASTM A123 G90 standards, not less than .90 oz/square foot, after fabrication.

Steel bar grating, unless otherwise indicated shall be hot dip galvanized to ASTM A123 G90 standards, not less than .90 oz/square foot, after fabrication.

**MISCELLANEOUS ITEMS:**

Supplementary Structural Steel: All structural framing incorporated in building design and detailed on Architectural Drawings, but not shown on Structural Steel Drawings, shall be furnished as part of miscellaneous metal work.

Miscellaneous Lintels, Shelf Angles, Beams and Plates, Brackets: Provide miscellaneous lintels and shelf angles, beams, plates, and brackets as indicated.

Lintels shall have 8" bearings at each end unless shown otherwise.

Weld or bolt members together where so indicated, to form complete composite assembly. Set beams on plates as indicated.

Where shelf angles are attached to concrete with bolts and adjustable inserts, provide slotted holes of proper size and spacing in vertical leg of shelf angles.

Miscellaneous Fasteners: Furnish all bolts, nuts, anchor bolts, plates, anchors, ties, clamps, hangers, nails, spikes, screws, straps, toggle and expansion bolts, and other items of rough hardware of sufficient size and number to tie together various parts of building and secure all of its parts in place. Such miscellaneous items shall be of same material as metals they contact.

Supports, Bracing:

Furnish and install all bracing and suspension type supports, fastened to structure, for following and additional conditions, as may be required.

1. Exterior soffits
2. Head of exterior doors and window wall

Steel Bar Grating: Provide galvanized steel bar gratings, cat-walk type, where indicated on Drawings, in accordance with ASTM A36/A36M and NAAMM A202.1 Welded. Steel bar gratings shall be hot dip galvanized to ASTM A123 G90 and ASTM A525 G90 standards. Top surface shall be serrated. Provide complete assemblies, that include all required accessories in matching galvanized materials; to include but not limited to: Fasteners and J-hooks, perimeter closures, and edge banding. Anchor in place by welding, and weld joints of intersecting metal sections. Touch up all cuts and welds with SSPC 20 Type I Inorganic, zinc rich primer.

Handrails: Provide pipe handrails as detailed, fabricated from 1-1/2 O.D. pipe. Weld all joints and grind smooth. Fabricate entire assembly carefully in accordance with details. After installation, use wire brush, sand blast, or otherwise treat to provide completely smooth surface for application of paint. Interior wall

handrails consist of straight sections of black steel pipe, mounted on wall brackets. Install brackets with approved anchoring device. Close ends with molded end closures.

All exterior handrails shall be G-90 hot dipped galvanized. All welds and grindings to be recoated on site with a field applied zinc galvanizing coating to match.

Ladders: Where indicated, vertical wall mounted interior ladders shall be 20" wide, fabricated with 3/8"x 1-1/2" hot-rolled rails and 3/4" round steel rungs extending through rails with connection welds, provided at all roof hatch locations. Space rungs 12" o.c. Anchor ladders at bottom and top. Brackets shall be of same size as side rails and of such length as to hold ladder 7" away from wall.

Exterior ladders shall be G-60 hot-dipped galvanized.

Fold-out Escape Egress Ladder: Provide prefabricated extruded aluminum and stainless steel fold-out escape egress ladder on utility platforms where indicated on drawings, rated for 1000 lbs., 6060-T6 high-grade aluminum, pull out release pin, see Drawings. "MODUM Fire Escape Ladder", by Modum International of Illinois Accessories include egress ladder signage, acrylic sign panels as indicated on drawings, removable chain in safety yellow.

Mount and anchor to (4) member built up metal stud post at platform level and to wall surface below platform. Adjacent ceilings to be installed in breakaway fashion to allow complete fold-out operation.

### **PART 3: EXECUTION**

#### **WORKMANSHIP:**

Ferrous metal surfaces shall be clean and free from mill scale, flake rust and rust pitting; well formed and finished to shape and size, with sharp lines and angles and smooth surfaces.

Castings shall be of uniform quality, free from blow-holes, porosity, hard spots, shrinkage distortion or other defects. Castings shall be smooth and well cleaned by shot-blasting or other approved method. Covers subject to street or foot traffic shall have machined horizontal bearing surfaces. Provide machined bearing or contact surfaces for other joints where indicated or required.

COORDINATION: At proper time, deliver and set in place items of metal work to be built into adjoining construction.

PAINTING: Finish painting of items not factory painted shall be as specified in Section 09900.

#### **STEEL FRAMED STAIRS:**

GENERAL: Construct stairs to conform to sizes and arrangements shown; joint pieces together by welding unless otherwise indicated. Provide complete stair assemblies including metal framing, hangers, columns, railings, newels, balusters, struts, clips, brackets, bearing plates and other components necessary for the support of stairs and platforms and as required to anchor and contain the stairs on the supporting structure. Certify with drawings bearing the seal of an N. C. Registered Engineer indicating capacity to support 100 p.s.f. uniform live load or 300 pound concentrated load as required by code.

EXTERIOR STEEL FRAMED STAIRS: Exterior steel framed stairs, ships ladders, ladders shall be finished in ASTM A123 G60 hot dip galvanized. Treads shall be G90 hot dip galvanized.

STAIR FRAMING: Fabricate stringers of structural steel channels, or plates, or a combination thereof, as shown. Provide closures for exposed ends of stringers. Construct platforms of structural steel channel headers and miscellaneous framing members as shown. Bolt or weld headers to strings and newels and



framing members to strings and headers; fabricate and join so that bolts, if used, do not appear on finish surfaces.

METAL PAN RISERS, SUBTREADS, AND SUBPLATFORMS: Shape metal pans for risers and subtreads to conform to configuration shown. Provide minimum 12 gage thickness of structural steel sheet for metal pans indicated but not less than that required to support total design loading.

Form metal pans of hot-rolled or cold-rolled carbon steel sheet, unless otherwise indicated.

Attach risers and subtreads to stringers by means of brackets made of steel angles or bars. Weld brackets to strings and attach metal pans to brackets by welding, riveting or bolting.

Provide subplatforms of configuration and construction indicated, or if not indicated, of same metal as risers and subtreads and in thickness required to support design loading. Attach sub platform to platform framing members with welds.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Work of this Section shall consist of all labor and materials required to provide all rough carpentry work scheduled on Drawings and specified herein.

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

**CODE COMPLIANCE:**

All framing to comply with the current edition of the Building Code having jurisdiction in North Carolina.

**QUALITY ASSURANCE:**

Manufacturers:

Standard: For purposes of designating type and quality of work under this Section, drawings and Specifications are based on products manufactured or furnished by Manufacturer listed for each product.

COORDINATION WITH OTHER TRADES: Coordinate locating of nailers, furring, grounds, and similar supports for other trades so that installation of finish work may be properly executed to fulfill design requirements.

MOISTURE CONTENT OF LUMBER: Maximum moisture content for lumber products shall be 19 percent on air dried stock, and 15 percent maximum on kiln-dried (KD) stock.

DRESSED LUMBER: Surface lumber four sides (S4S) unless specified otherwise for particular products.

DELIVERY AND STORAGE: As soon as materials are delivered to site, place under cover and protect properly from weather. Do not store or erect material in wet or damp portions of buildings or in areas where plastering or similar work is to be executed until such work has been completed and has become reasonably dry.

**PART 2: PRODUCTS**

**FRAMING LUMBER**

Various materials for framing shall be of sizes shown and shall conform to Grading Standards of SPIB. All framing material shall be #2 SYP.

Where indicated on the Drawings, provide FRT Fire Retardant Treated lumber.

PLYWOOD or ORIENTED STRAND BOARD MATERIALS: Softwood plywood or OSB sheathing shall conform to requirements of U. S. Product Standard PS 1-66, Construction and Industrial. All plywood or

OSB sheathing which has any edge or surface permanently exposed to weather shall be "EXTERIOR" type.

Where indicated on the Drawings, provide FRT Fire Retardant Treated plywood.

Where indicated on the Drawings, provide PT Preservative Treated plywood.

**PRESERVATIVE TREATED WOOD PRODUCTS:** Protective pressure treatment of lumber or products shall be .40 pcf retention of chromated copper arsenate as produced by Wolman, Osmose, Boliden or approved equal. Material shall be treatment grade marked, for ground contact, kiln dried not to exceed 19%, and all cut ends shall be coated with the same preservative, at job site during construction.

All lumber products in contact or fastened to concrete, concrete masonry or brick masonry to be preservative treated wood products.

**FASTENING DEVICES:** Anchors and fasteners for securing wood items, unless noted otherwise, shall meet following requirements:

**Bolts:**

- Bolts, nuts, studs and rivets shall conform to Federal Specifications FF-B-571a and FF-B-575, as applicable.
- Lag screws or lag bolts: Federal Specification FF-B-561b.
- Toggle Bolts: Federal Specification FF-B-588b.
- Screws: Federal Specification FF-S-111b.
- Nails and Staples: Federal Specification FF-N-105a.

All fastening devices used in exterior or concrete construction shall be hot-dip galvanized.

All fastening devices used in Fire Retardant Treated or Preservative Treated lumber and plywood to be corrosion resistant per manufacturer's recommendations.

**Ground Anchorage:** Wood plugs or nailing blocks are not acceptable for fastening grounds, furring, or blocking to concrete or masonry. Hardened steel nails, expansion screws, toggle-bolts, metal plugs, or metal inserts, as most appropriate for each type of masonry or concrete construction shall be used.

**Explosive-Driven Fastenings:** Explosive or powder-driven fastenings may be used only when approved by Architect.

### **PART 3: EXECUTION**

#### **GENERAL REQUIREMENTS FOR FRAMING AND BRACING:**

**Finish:** Unless otherwise indicated, use S4S lumber for all framing members.

**Size:** Unless otherwise indicated, framing shall conform to nominal size requirements shown on Drawings.

Space framing on 16 inch centers, unless shown otherwise on Drawings.

Install required blocking, bracing, or other framing required for support of built-in equipment,

including casework.

**INSTALLATION OF WOOD GROUNDS:**

Location: Install permanent and temporary wood grounds as indicated for proper execution of work of all trades. Remove temporary grounds when no longer required.

Fastening: Except as otherwise required for special locations, form grounds of kiln-dried southern yellow pine, 1-1/2 inches wide, and of thickness to properly align related items of work. Securely fasten grounds into position by means of nails, brads, bolts, or other methods that will provide maximum results.

Coordination: Coordinate locations, sizes and fastenings of grounds with work of other trades. When grounds are to provide backing for fastening of grilles, fixtures, louvers, and similar items of work, exercise care in installation of grounds to provide for correct installation of those other items of work.

**INSTALLATION OF WOOD BLOCKING:**

Location: Install all wood blocking required to provide anchorage for other materials. Form to shapes and sizes as indicated or as may be required to accomplish particular installation. Form blocking of sizes shown or of minimum 2 inch thick nominal material.

At location of wall mounted equipment install 2"x 8" blocking unit between properly located studs at height indicated in Finish Hardware Schedule, or where indicated for wall mounted equipment. Install wood blocking behind all cabinets and toilet accessories as required.

Steel: Blocking in conjunction with steel work shall be bolted to steel with bolts, washers and nuts, countersunk where required.

Roofing: Form blocking in conjunction with gravel stops and built-up roofs to shapes as detailed. Anchor with countersunk bolts, washers and nuts.

Anchorage: Wedge, anchor and align blocking to provide rigid and secure installation of both blocking and other related work.

**INSTALLATION OF WOOD FURRING:**

Location: Provide all free-standing, suspended, solid-anchored, and other types of wood furring as required for receipt, alignment and complete installation of various types of finishing materials.

Spacing: Space furring members as required. Provide headers and other nailing members within furring framework. Install with faces true to line and plumb, using wood shims as necessary.

Fastening: Install furring into position by whatever means required to provide secure, rigid, and correct installation. When necessary, use nailing plugs, power-actuated anchors, toggle bolts, anchor bolts, washers and nuts, nails, and similar fastenings.

CLEANING UP: At completion, remove all excess materials and all debris resultant from operations of work of this Section. Leave entire work in neat, clean condition, satisfactory for receipt of other related items of work to be installed as part of work of other Sections.

*END OF SECTION*

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Work of this Section shall consist of furnishing all labor and materials required to insulate exterior CMU/brick cavity walls, exterior stud/brick cavity walls, interior stud walls, foundations, interior ceilings, and acoustical sound tubes all as shown on Drawings and as specified herein.

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

**QUALITY ASSURANCE:**

Extent of insulation work is shown on drawings and indicated by provisions of this section.

Applications of insulation specified in this section include the following:

- Foundation wall board insulation (supporting backfill)
- Ceiling fiberglass blanket Insulation.
- Exterior Below Grade Waterproofing

**QUALITY ASSURANCE:**

Thermal Conductivity: Thicknesses indicated are for thermal conductivity (k-value at 75 degrees F or 24 degrees C) specified for each material. Provide adjusted thicknesses as directed for equivalent use of material having a different thermal conductivity. Where insulation is identified by "R" value, provide thickness required to achieve indicated value.

**SUBMITTALS:**

Product Data: Submit manufacturer's product specifications and installation instructions for each type of insulation and vapor barrier material required.

**PRODUCT HANDLING:**

General Protection: Protect insulation from physical damage and from becoming wet, soiled, or covered with ice or snow. Comply with manufacturer's recommendations for handling, storage and protection during installation.

**PART 2: PRODUCTS**

**FOUNDATION / CAVITY WALL INSULATION:**

Extruded Polystyrene Board Insulation: Rigid, closed-cell, extruded polystyrene insulation board with integral high-density skin and tongue and groove edges; complying with ASTM C578, Type IV, 25 psi

compressive strength, R-value of 5.00 @ 75 degrees F mean temperature; 0.1% maximum water absorption; 1.5 perm-inch max. water vapor transmission; manufacturer's standard lengths and widths.

Available Manufacturers: Subject to compliance with requirements, manufacturers offering products which may be incorporated in the work included, but are not limited to the following:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

- Dow Chemical Co., Midland, MI (Dupont Styrofoam XPS)
- UC Industries/U.S. Gypsum; Chicago, IL (Foamular)

Mechanical Anchors: Type and size shown or, if not shown, as recommended by insulation manufacturer for type of application and condition of substrate.

Adhesive Mastic: Type, size and spacing for each condition as recommended by insulation manufacturer for type of application and condition of substrate.

Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints between units and filling voids in work.

### **EXTERIOR BELOW GRADE WATERPROOFING**

Where indicated on Drawings, provide hot mopped liquid asphalt on three inter-mopped layers of #30 lb. asphalt roofing felts, all bonding together and flood coated with hot liquid asphalt.

### **CEILING INSULATION:**

Unfaced Blanket-type Glass Fiber Ceiling Insulation: Inorganic non-asbestos fibers formed into semi-rigid blankets, R-13 and R-19, 24" x 48" batt size. Do not insulate over lighting fixtures. Provide over all ceilings, unless otherwise noted.

## **PART 3: EXECUTION**

### **INSPECTION AND PREPARATION:**

Installer must examine substrates and conditions under which insulation work is to be performed, and must notify Contractor in writing of unsatisfactory conditions. Do not proceed with insulation work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

Clean substrates of substances harmful to insulations or vapor barriers, including removal of projections which might puncture vapor barriers.

### **INSTALLATION:**

#### General:

Comply with manufacturer's instructions for particular conditions of installation in each case. If printed instructions are not available or do not apply to project conditions, consult manufacturer's technical representative for specific recommendations before proceeding with work.

Extend insulation full thickness as shown over entire area to be insulated. Spray, cut and fit tightly around obstructions, and fill voids with insulation. Remove projections which interfere with placement.

*END OF SECTION*

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

**PART 1 - GENERAL**

**RELATED WORK SPECIFIED ELSEWHERE:**

07610 Metal Roofing  
07950 Metal Roof Retrofit System  
13120 Pre-Engineered Buildings

**DESCRIPTION OF WORK:**

Contract work of this Section shall include, but not be limited to providing following:

All sheet metal work required for complete assemblies of items specified at all areas indicated on Drawings, including but not necessarily required:

- Gutters
- Downspouts
- Copings
- All sheet metal work required for moisture control
- Metal valley flashing
- Metal base flashings and counterflashings
- Ventilation perforated sheetmetal

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

Standards: Workmanship and methods employed for forming, anchoring, cleating, and expansion and contraction of sheet metal work shall conform to application details and description as indicated in current edition of Architectural Sheet Metal Manual, published by Sheet Metal and Air Conditioning Contractors National Association, Inc. and hereinafter referred to as "SMACNA Manual", unless otherwise noted on Contract Drawings or specified herein.

**QUALITY ASSURANCE:**

Manufacturers:

Standard: For purposes of designating type and quality for the work under this Section, Drawings, and Specifications are based on products manufactured or furnished by Manufacturers listed under PRODUCTS.

**SUBMITTALS:**

Shop Drawings: Submit for approval in accordance with GENERAL CONDITIONS.

Details and layout shall show weights, gauges or thicknesses of sheet metal, joints, expansion joint spacing, and procedures to be followed during installation. Indicate bolt size and spacing, nailers or blocking required to be furnished by others for securing work of this Section.



Catalog Cuts: For Standard manufactured items, catalog cuts may be submitted as specified in GENERAL CONDITIONS.

Guarantee: Installation of all items of this Section shall be guaranteed to be leak-free for period of five years from date of acceptance of project. Any repairs or replacements required to maintain waterproof installation shall be done at no cost to Owner.

**PRODUCT HANDLING:**

Handling and Storage: Damaged items that cannot be restored to like-new condition shall be removed and replaced at no additional cost to Owner.

**PART 2 - PRODUCTS**

**MATERIALS:**

Flatwork, Flashings, Copings, Gutters and Gravel Stops: Pre-finished aluminum sheet, minimum yield of 50,000 PSI.

Gutter: .032" aluminum gutter. Provide pre-finished gutter spacers and brackets as shown on Drawings.

Finish: Premium fluorocarbon coating produced with Kynar 500 or Hylar 5000 resin

Downspouts: Downspouts, .040" and .032" pre-finished aluminum, Kynar 500 finish. Wall mounting brackets shall be matching material.

Perforated Sheetmetal: Where indicated on Drawings, provide a ventilated continuous eave trim around all eave perimeters. Provide 16 gauge (.050") thick aluminum perforated sheet metal, with a round hole pattern, 1/8" hole size, holes at 3/16" staggered centers, with 40% open area. Equivalent to McNichols. 800 237-3820, [www.mcnichols.com](http://www.mcnichols.com)

**ACCESSORIES:**

General: Provide all accessories or other items essential to completeness of sheet metal installation, though not specifically shown or specified. All such items shall be of same material or compatible to base material to which applied and gauges shall conform to SMACNA Manual recommendations.

Fasteners: All exposed screws, bolts, rivets and other fastenings for sheet metal, unless otherwise noted, shall be pre-finished stainless steel, and of size and type suitable for intended use. All concealed fasteners shall be RUSPERT metal finish coated, 3-layer corrosion protection coating.

Sealant: Elastomeric polyurethane sealant equal to Sonneborn Sonolastic NP-1. Clean all sheet metal surfaces prior to application with xylene and prime with Primer equal to Sonneborn 733 primer. Follow manufacturer's written product installation guidelines, recommendations and instructions. Color to be selected by Architect.

**PART 3 - EXECUTION**

**CONDITION OF SURFACES:**

Proper Surfaces: Surfaces to which sheet metal and flashing are applied shall be even, smooth, sound, thoroughly clean and dry and free from projections or other defects that would affect application. Defects shall be corrected by trades involved before installation of sheet metal work.

**INSTALLATION:**

Workmanship: Fabricate and install sheet metal with lines, arises, and angles sharp and true, and plane surfaces free from waves warps, or buckles, match existing work unless shown otherwise. Exposed edges of sheet metal shall be folded back to form 1/2 inch wide hem on side concealed from view. Finished work shall be free from water leakage under all weather conditions.

Fastenings: Unless otherwise indicated or specified, all fastenings shall be concealed. Installation of and joints of all sheet metal work, including fascia claddings, shall be in accordance with recommendations of SMACNA.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**1.01 DESCRIPTION**

A. General

1. Furnish all labor, material, tools, equipment, and services for a complete roofing and wall panel system, and soffit panel system to include all flashings, curbs, gutters and downspouts as indicated, in accordance with provisions of Contract Documents.
2. Completely coordinate with work of all other trades.
3. Although such work is not specifically indicated, furnish and install all supplementary or miscellaneous items, appurtenances and devices incidental to or necessary for a sound, secure and complete installation.
4. See Division 1 for General Requirements.

B. Related work specified elsewhere:

1. Flashing and Sheet Metal: Section 07600.
2. Metal Roof Retrofit System Section 07950
3. Pre-Engineered Buildings Section 13120
4. Drawings Building Code Summary

**1.02 QUALITY ASSURANCE**

A. Applicable standards:

1. SMACNA: "Architectural Sheet Metal Manual" Sheet Metal and Air Conditioning Contractors National Association, Inc.
2. AISC: "Steel Construction Manual" American Institute of Steel Construction.
3. AISI: "Cold Form Steel Design Manual," American Iron and Steel Institute.
4. ASTM A792-AZ50: Specifications for steel sheet, aluminum-zinc alloy coated (galvanized) by the hot dip process, general requirements (galvalume).
5. Underwriters Laboratories Inc. wind uplift classification UL 90
6. 2000 International Building Code, Table 1604.5, Classification Of Buildings And Other Structures For Importance Factors, Category II Seismic, Snow and Wind Factors.
7. 2000 International Building Code, Table 1604.5, Classification Of Buildings And Other Structures For Importance Factors, Category III Seismic, Snow and Wind Factors.
8. Energy Star Roof Rating

9. Cool Metal Roof Coalition
  10. Cool Roof Rating Council
- B. Manufacturer's qualifications:
1. Manufacturer has a minimum of three years experience in manufacturing panels of this nature.
- C. Installer's qualifications:
1. Installation of panels and accessories by installers with a minimum of two years experience in panel projects of this nature.

### 1.03 SUBMITTALS

- A. Shop drawings:
1. Submit complete shop drawings and erection details to Architect for review. Do not proceed with manufacture prior to review of shop drawings. Do not use drawings prepared by Architect for shop or erection drawings.
  2. Shop drawings show methods of erection, elevations, and plans of roof and wall panels, sections and details, anticipated loads, flashings, roof curbs, vents, sealants, interfaces with all materials not supplied and proposed identification of component parts and their finishes.
  3. Certification: Manufacturer to certify that roof system submitted is in compliance with Building Category Importance Factors requirements
- B. Mockups and Samples:
1. Roofing contractor to build a full-sized roof corner mockup on-site for review and approval by the Architect. Roof corner mockup to include roof metal rake intersection with eave metal gutter and fascia.
  2. Submit samples and color chips for all proposed finishes.
    - a. Submit one 8 in. long sample of roof panel, including clips.
    - b. Submit one 8 in. long sample of wall panel, including clips.
    - c. Submit 3 in. x 5 in. color chip samples in all standard colors.
- C. Warranty
1. Provide contractor's written ND (No Dollar Limit) weathertightness warranty twenty (20) years, against leaks in roof panels arising out of or caused by ordinary wear and tear under normal weather and atmospheric conditions. Warranty coverage shall include all curbs, flashing and miscellaneous trim and accessories. Warranty shall be non-prorated, signed by the metal roofing system contractor and shall provide for both labor and materials.
  2. Provide manufacturer's ND (No Dollar Limit) written warranty for twenty (20) years against perforation of metal roof panels due to corrosion under normal weather and

atmospheric conditions. Warranty shall be signed by metal roofing system manufacturer and shall provide for complete replacement of panels and associated trim.

3. Provide manufacturer's NDL (No Dollar Limit) written paint film warranty for twenty (20) years on finish film integrity and color retention. The finish will not crack, check, peel, flake, or blister, or chalk in excess of ASTM 4214, number 8 rating, or fade in excess of 5 units per ASTM D 2244, under normal atmospheric conditions. Warranty shall be signed by metal roof system manufacturer.
4. Inspection and Report Services: Contractor shall retain independent third party agent who shall perform an inspection of the entire roof system and shall submit a written report to the Owner detailing all conditions requiring maintenance and repair by parties under the above warranties. Third party agent shall be a registered roof consultant (RRC) with minimum of 5 years as a registered roof consultant and 5 years of active project experience. Provide written certification of qualifications.

#### **1.04 PRODUCT DELIVERY, STORAGE AND HANDLING**

- A. Obtain roofing products from local regional source, within 500 miles of project site.
- B. Delivery: Deliver panels to jobsite properly packaged to provide protection against transportation damage.
- C. Handling: Exercise extreme care in unloading, storing and erecting panels to prevent bending, warping, twisting, and surface damage.
- D. Storage: Store all material and accessories above ground on well skidded platforms. Store under water- proof covering. Provide proper ventilation to panels to prevent condensation build-up between each panel.

### **PART 2: PRODUCTS**

#### **2.01 MATERIALS**

- A. Roof panel profile: 2 in. high x 3/4 in. wide rib x 16 in. wide striated panel.
- B. Panel style: Large batten, vertical leg, concealed fastener, standing seam, utilizing male and female rib configurations, with factory applied hot melt mastic in female rib, continuously locked together by an electrically powered mechanical seaming device during installation.
- C. Gauge: .032" aluminum (UL-90 rated - Underwriters Laboratories).
- D. Substrate: Aluminum sheet, minimum yield of 50,000 PSI.
- E. Recycled Content: Metal roof materials shall be 35% recycled content.
- F. Floating Clip: low profile, 18 gauge stainless steel base, with 22 gauge stainless steel upper tab, with factory applied mastic (# UL-90 rated-Underwriters Laboratories). Floating clip concealed anchor fasteners shall be RUSPERT metal finish coated, 3-layer corrosion protection coating.
- G. Texture: Smooth.
- H. Finish: Premium fluorocarbon coating produced with Kynar 500 or Hylar 5000 resin (20 year warranty).

- I. Reflectivity and Emissivity: Metal Roof Panels shall be high reflectance and high remittance in accordance with Energy Star. Initial Reflectance shall be at least 0.68 when tested with ASTM E-903. The three year aged reflectance shall be at least 0.57, when tested in accordance with ASTM E-1918 (Measured AS Solar Reflectivity, Not Visible Reflectance).
- J. Color: Selected from manufacturer's standard Energy Star Rated roof colors, with Solar Reflectance Index (SRI) value equal to or greater than SRI 29.
- K. Acceptable manufacturer: Metal Roofing Systems; MRS System 2500
- L. Acceptable optional manufacturers:
  - 1. Equivalent products by:
    - i. MBCI
    - ii. AEP Span
    - iii. American Building Company
    - iv. Butler Manufacturing Company
    - v. McElroy Metal
    - vi. Peterson Aluminum Corporation, Tite-Loc
- M. Provide downspouts in profiles, shapes and materials as indicated on Drawings, .032" and .040" aluminum with Kynar 500 or Hylar 5000 resin finish. Provide straps, brackets and anchors in matching material as indicated on Drawings.
- N. U-Channel Gutter Bracket Strap: Provide .050" prefinished aluminum U-bar channel gutter strap, factory powder coat painted to match roof, or optional wrapping of alum U-bar with pre-finished .032" matching aluminum break metal.
- O. All exposed fasteners shall be pre-finished stainless steel.
- P. All concealed fasteners shall be RUSPERT metal finish coated, 3-layer corrosion protection coating.
- Q. Pipe flashing shall be Dektite, or equivalent by Master Flash, Westform Metals or IPS Roofing Products.
- R. Provide roof and gutter expansion joints as indicated on Drawings, in matching Kynar 500 or Hylar 5000 resin finish.
- S. All roof curbs are by metal roof contractor. Refer to mechanical drawings and coordinate curbs required with HVAC Contractor.
- T. Provide special rolled / radiused panels and trim where shown on drawings.
- U. Provide special shapes where shown on drawings.
- V. Ribbed Wall Panels: COLOR TO MATCH EXISTING

Ribbed wall panels where indicated on Drawings shall be fabricated from .032" aluminum, 70% fluoropolymer Kynar 500 factory applied paint system with a 25-year finish warranty, formed to provide a weathertight closure assembly. Panel shall be a 12" wide x 1" deep with (2) stiffening beads, concealed fastener type, smooth textured, flat profiled with reverse rib fastener legs. Provide all accessories, trims, channels and flashings for a complete assembly. Provide panels

equivalent to Metal Roofing Systems (MRS) Flush Seam panel, or equivalent products by MBCI or Peterson.

W. Metal Soffit Panels:

Metal soffit panels and trim where indicated to be .032" aluminum, flat profile and smooth textured, with a factory KYNAR 500 finish, selected from standard colors. Provide 12 inch wide solid non-vented panels with (2) stiffening beads, unless otherwise noted. Soffit system shall be equivalent to Metal Roofing Systems (MRS) Flush Seam panel, or equivalent products by MBCI or Peterson. Provide soffit panels in compliance with ASTM 1592, and the Architectural Aluminum Manufacturers Association (AAMA) Specifications 1402-86 Standard Specifications for Aluminum siding, soffit, and fascia. Provide all necessary accessories and trims for complete assemblies.

X. Perforated Sheetmetal: For ventilated continuous eave trim around all eave perimeters. Where indicated on Drawings, provide 16 Gauge (.050") thick aluminum perforated sheetmetal, with a round hole pattern, 1/8" hole size, holes at 3/16" staggered centers, with 40% open area. Equivalent to McNichols. 800 237-3820, www.mcnichols.com

Y. Self-adhering polymer modified bituminous membrane, 40 mil minimum thickness, Vycor Ice and Water Shield by W.R. Grace or equivalent products by GAF Materials Corp. or Carlisle Coatings and Waterproofing.

**2.02 PRE-ENGINEERED BUILDING BID ALTERNATE**

A. Roof panel profile: 2 in. high x 3/4 in. wide rib x 16 in. wide striated panel.

B. Panel style: Large batten, vertical leg, concealed fastener, standing seam, utilizing male and female rib configurations, with factory applied hot melt mastic in female rib, continuously locked together by an electrically powered mechanical seaming device during installation.

C. Gauge: 24 gauge (UL-90 rated - Underwriters Laboratories).

D. Substrate: Galvalume steel sheet, 0.5 ounces/square foot, minimum yield of 50,000 PSI.

E. Recycled Content: Metal roof materials shall be 35% recycled content.

F. Clip: Floating clip, low, 22 gauge, with factory applied mastic (# UL-90 rated-Underwriters Laboratories).

G. Texture: Smooth.

H. Finish: Premium fluorocarbon coating produced with Kynar 500 or Hylar 5000 resin (20 year warranty).

I. Color: MATCH EXISTING

J. Acceptable manufacturer: Varco Pruden SLR II (per 13120); MBCI BattenLok Series

K. Ribbed wall panels where indicated on Drawings shall be fabricated from 24 gauge galvalume steel, 70% fluoropolymer Kynar 500 factory applied paint system with a 25-year finish warranty, formed to provide a weathertight closure assembly. Panel shall be a 16" wide, concealed fastener type, smooth textured, flat profiled with pencil ribs, with 2" standing seam ribs. Provide all accessories, trims, channels and flashings for a complete assembly. Provide panels equivalent to Varco Pruden SLR II panel. PROFILE AND COLOR TO MATCH EXISTING

### **2.03 FABRICATION**

- A. Material shall be in-line tension leveled prior to roll forming finished panel profile.
- B. Factory roll form panels in continuous lengths, full length of detailed runs. Field formed panels will not be accepted.
- C. Standard panel length shall be no more than 45 feet.
- D. Panel laps shall be 5" minimum.
- E. Fabricate trim, flashing and accessories to detailed profiles.
- F. Fabricate trim and flashing from same material as panel.

### **PART 3: EXECUTION**

#### **3.01 SURFACE CONDITIONS**

- A. Examination
  - 1. Inspect installed work of other trades and verify that such work is complete to a point where this work may continue.
  - 2. Verify that installation may be made in accordance with approved shop drawings and manufacturer's instructions.
- B. Discrepancies:
  - 1. In event of discrepancy, notify Architect.
  - 2. Do not proceed with installation until discrepancies have been resolved.

#### **3.02 INSTALLATION**

- A. Install panels so that they are weathertight, without waves, warps, buckles, fastening stresses or distortion, allowing for expansion and contraction.
- B. Install panels in accordance with manufacturer's instructions and shop drawings.
- C. Provide concealed anchors at all panel attachment locations.
- D. Dissimilar metals shall be separated, with use of PTFE polymer resin tapes, closed cell neoprene tapes, elastomer membranes, washers or gaskets, or approved coatings.
- E. Install panels plumb, level, and straight with seams and ribs/battens parallel, conforming to design as indicated.
- F. Do not place scratched panels or material in the work.
- G. Metal roofing contractor is responsible for cutting and sealing all roof penetrations and installations of all curbs. Refer to plumbing and mechanical drawings. Coordinate roof penetrations and curbs required with Plumbing and HVAC Contractors.



- H. Install self-adhering polymer modified bituminous membrane ice and water shield, under metal roofing, to cover entire roof surface.

**3.03 CLEANING, PROTECTION**

- A. Dispose of excess materials and remove debris from site.
- B. Clean work in accordance with manufacturer's recommendations.
- C. Protect work against damage until final acceptance. Replace or repair to the satisfaction of the Architect, any work that becomes damaged prior to final acceptance.
- D. Scratched panels or scratched flat surfaces will not be accepted. Scratched materials shall be replaced with new matching material at contractor's expense. Repainting to conceal surface scratches will not be accepted.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK :**

Work of this Section shall require furnishing all labor and materials to provide sealants, non-rated caulking, fire-rated fire caulking, and related primers, including expansion joint fillers, interior and exterior, as shown on Drawings and as specified in this Section.

Caulking and primers required for installation of all work included in Sections for Window Wall, Storefront Systems shall be part of work under that Section and shall be done in accordance with the applicable portions of this Section.

Acoustical caulking for installation of gypsum board is specified in Section 09250.

Required applications of sealants and caulking include, but are not necessarily limited to, following general locations:

- Flashing reglets and retainers.
- Coping Members, Bed and Joints.
- Interior and exterior wall joints around doors and windows perimeters.
- Exterior wall control joints
- Horizontal and vertical interior CMU wall and structural steel joints
- Joints at penetrations of walls, decks and floors by piping and other services and equipment.
- Fire-rated penetrations of walls, decks and floors by piping and other services and equipment.
- Concrete walk and pavement expansion joints
- Exposed interior concrete floor slab control joints

Required applications of joint fillers and gaskets include, but are not necessarily limited to, the following general types of work and locations:

- Expansion joint fillers in structural concrete.
- Exterior wall expansion joint fillers.
- Fire-rated pipe and conduit through penetrations.

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

ASTM E 814 (UL 1479) Standard Tests of Penetration Firestop Systems

ASTM E 1966 (UL 2079) Standard Test Method for Fire Resistive Joint Systems

UL - Underwriters Laboratory

ASTM C 920

Comply with 21 CFR 177.2600 for sealants in contact with food.

LEED SC, U. S. Green Building Council

SCAQMD - South Coast Air Quality Management District

**QUALITY ASSURANCE:**

Manufacturers:

Standard: For purposes of designating type and quality for the work under this Section, Drawings and Specifications are based on products of Sonneborn BASF Corporation and 3M Corporation.

Source: Products for use on this Project shall be of one Manufacturer, unless noted specifically otherwise.

All sealants shall comply with requirements of the South Coast Air Quality Management District (SCAQMD) Rule #1168.

**SUBMITTALS:**

Manufacturer's Data: For information only, submit 2 copies of Manufacturer's specifications, installation instructions and recommendations for each type of material required. Include Manufacturer's published data, certifications or laboratory test reports indicating that each material complies with requirements. Show by transmittal that copy of instructions and recommendations has been distributed to installer.

Submit applicable UL Tested Assemblies for each type of fire-rated through penetration and fire-stopping required.

Certifications: Submit written certifications that all primers, backings, and caulking materials are chemically compatible with each other and with the overcoating or topcoating materials.

Submit environmental certifications from Manufacturers of all joint sealant materials products, listing all applicable LEED credits made available by certifications.

Samples:

Caulking and Sealants: Submit samples of interior and exterior caulking compounds and related sealants required for installation. Install 12" samples in the work on site in locations requested by the Architect, for review.

Joint Fillers and Gaskets: Submit 3, 12" long samples of each joint filler or gasket which will be reviewed by Architect for color and texture only. Compliance with all other requirements is exclusive responsibility of Contractor.

Guarantee: Furnish Owner, in care of Architect, guarantee in accordance with requirements of General Conditions for period of three (3) years from date of acceptance of project against defective workmanship and materials, warranting airtightness and water tightness of exterior sealant and installation. Repairs shall be made promptly or material replaced after proper notice at no additional cost to Owner.

**PRODUCT HANDLING:**

Store and handle materials in strict compliance with Manufacturer's instructions.

Store in original containers until ready for use. Damaged material will be rejected and shall be removed from site.

**PART 2: PRODUCTS**

**JOINT BACKING MATERIAL:**

Non-Traffic Joints: Except where otherwise specified, packing shall be closed-cell expanded polyethylene cord or square rod conforming to ASTM D 1752, or closed-cell vinyl type conforming to ASTM D 1667, Grade VE-41.

Floor Joints: Packing shall be closed cell neoprene cord or square rod conforming to ASTM C 509-66T, with minimum shore "A" hardness of 45.

Fire-Rated Through Penetrations: non-combustible rock wool type mineral wool.

**NON-RATED CAULKING COMPOUNDS /SEALANTS**

Interior Joints: Caulking, other than where sealant is called for, shall be a solvent free, low modulus, one-part silyl-terminated polyether, non-sag sealant. Tack free time shall be minimum 90 minutes. Material shall be butyl-free skinning type, paintable within one hour.

Latex sealants are restricted to use only in non-moving joints in drywall construction.

Sonolastic 150 VLM manufactured by Sonneborn, or approved equal, with 7.24% of post-consumer material recycled content, VOC (volatile organic content) of 2 g/L.

MasterSeal CR-100 two-component self-leveling 100% polyurea control joint filler, for interior exposed and bare concrete floor slab control joints; for Boiler and Mechanical rooms, utility and custodial spaces. Not for use under VCT or carpeting adhered type floor finishes.

Exterior Joints: Caulking for exterior joints other than where other sealant is called for, shall be polyurethane:

Sonneborn NP-1 for walls, with 5% of post-consumer material recycled content, VOC (volatile organic content) of 43 g/L.

Sonneborn NP-2 for walls, with 5% of post-consumer material recycled content, VOC (volatile organic content) when mixed of 53-80 g/L.

Sonolastic SL-1 or SL-2 for concrete expansion joints in non-vehicular traffic areas, with 5% of post-consumer material recycled content, VOC (volatile organic content) maximum of 104 g/L.

Sonomeric 1 for concrete expansion joints in vehicular traffic areas, with 5% of post-consumer material recycled content, VOC (volatile organic content) maximum of 128 g/L.

Approved equivalent products by Tremco or Pecora are acceptable.

**PRIMER:**

Type: Primer, where required by Sealant Manufacturer, shall be solution or compound designed to insure adhesion of sealant and shall be compatible with sealant.

Source: Material shall be provided by Sealant or Caulking Manufacturer and shall be selected for compatibility with sealant, with substrate and shall be non-staining.

PRODUCT COMPATIBILITY: All primer, backing, and caulking materials shall be chemically compatible with each other for use as an assembly, and with all surfaces in contact with these materials.

### **FIRE BARRIER SEALANTS**

All fire caulk sealants used for fire barriers shall have been tested and passed the criteria of ASTM E 814 (UL 1479) Standard Tests of Penetration Firestop Systems, ASTM E 1966 (UL 2079) Standard Test Method for Fire Resistive Joint Systems and CAN/ULC-S115 Standard Method of Fire Tests of Firestop Systems. All fire caulk sealants shall meet the requirements of the IBC, IRC, IPC, IMC, NFPA 5000, NEC (NFPA 70), NFPA 101 and NBCC. All fire caulks shall be listed in a tested and published through penetration UL assembly.

3M Fire Barrier Sealant FD 150+: one-component, gun grade, latex based elastomeric sealant. Paintable and repairable; firestops construction joints, and through penetrations. Not acceptable for use with CPVC pipe. VOC (volatile organic content) of <250 g/L.

3M Fire Barrier Silicone Sealant 2000+: one-component, gun grade, natural cure silicone elastomer based sealant; firestops dynamic construction joints, through penetrations, static construction joints, and blank openings. Non-paintable. VOC (volatile organic content) of <32 g/L.

3M Fire Barrier Sealant CP 25WB+: High-performance, one-component, gun-grade, latex-based, intumescent sealant. Paintable, firestops and seals single or multiple through penetrations, blank openings, and static construction joints. Not acceptable for use with CPVC pipe. VOC (volatile organic content) of <1 g/L.

3M Fire Barrier Water Tight Sealant 3000WT: High-performance, one-component, neutral cure, intumescent silicone sealant. Fully cured acts as barrier to water leakage, repairable, firestops single and multiple through penetrations, bottom-of-wall static construction joints, blank openings, VOC (volatile organic content) of <31 g/L.

Provide 3M Ultra GS Wrap Strip where required by the through penetration assembly.

### **PART 3: EXECUTION**

Proper Surfaces: Material in contact with sealant shall be dry, full cured, and free of laitance, loose aggregate, form release agents, curing compounds, water repellents and other surface treatment that would be detrimental to adhesion of sealant.

Masonry shall be cleaned and joints raked to proper depth to receive back-up and sealant.

Concrete shall be finished joints cleaned and fins removed.

Curing: Joints in masonry, concrete and stucco work shall not be sealed until substrate has cured minimum of 28 days.

### **PREPARATION:**

Joint Cleaning: Clean all joints thoroughly, and blow out or vacuum loose particles from joints. Surfaces with protective coatings (such as aluminum) shall be wiped with xylol or methyl ethyl ketone solvent to remove protective coatings and oil deposits.

Sheet Metal: New sheet metal shall be wiped down with copper sulphate solution or with strong acetic acid solution to etch the zinc coating and remove oil and foreign matter from surface.

Joint Design: Coordinate work of other trades so that shape of joint, dimensions, and anticipated movement shall conform to following: (Comply with manufacturer's joint design requirements)

Minimum Width: Opening not less than 1/4" wide.

Minimum Depth: Opening not less than 1/8" deep.

Maximum Movement: The width of the opening shall be at least 4 times its maximum movement.

Width Depth Ratio: Comply with manufacturer's joint design requirements. Unless otherwise required, the depth of the sealant shall be no greater than the width. Depth should be more than 1/8" and not more than 1/2" deep, unless otherwise required by manufacturer.

All caulking joints shall be recessed openings. "Fillet" type caulking into corners will not be acceptable.

Joint Packing: Packing shall be installed in all joints to receive sealant. Packing shall be sized to require 20% to 50% compression upon insertion, and placed in accordance with "Joint Design" paragraph. (In joints not of sufficient depth to allow packing, install polyethylene bond-breaking tape at back of joint). Avoid lengthwise stretching of packing material.

Masking: Apply masking tape where required to protect adjacent surfaces. Adhere tape in continuous strips in alignment with joint edge, and remove immediately after joints have been sealed and tooled.

#### **INSTALLATION:**

Application of sealants shall be as recommended by Sealant Manufacturer. Work shall be done with standard handguns or mechanical guns. Extrude sealant through nozzles of such diameter as to allow full bead of material to run into joint, but not to exceed width of joint. Force sealant into joint by tooling to insure full contact with sidewalls and backing.

Locations: Use sealants in locations hereinbefore specified for joints as specified.

Joint Finishing: Unless otherwise indicated, all joints in horizontal surfaces shall be finished flush, all joints in vertical surfaces shall be finished slightly concave in shape. Use tooling stick or knife to strike off excess material, and properly shape bead. Use xylol or toluene to prevent sealant from adhering to tooling stick. Finished bead shall be smooth, even, and free from all wrinkling, air pockets, and foreign matter.

Install expansion joint filler as recommended by Manufacturer. Filler shall be size recommended by Manufacturer for use in the expansion joint erected and shall be installed with special tool and adhesive-lubricant.

#### **CLEAN-UP:**

Excess Material: Remove all excess material adjacent to joint by mechanical means and/or with solvent (such as xylol or toluol). Leave work in neat and workmanlike manner.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**RELATED DOCUMENTS**

Section 08418 Aluminum Storefront Framing  
Section 08700 Door Hardware

**DESCRIPTION OF WORK**

The extent of each type of door and frame is shown on the Drawings and Schedules.

The following types of doors and frames are required:

1. SL-14 FRP fiberglass/aluminum/glass monumental medium stile and rail doors with FRP mid-panel, with 2"x6" Aluminum Frames. (Matching Existing)
2. FRP panels and mid-panels
3. Insert frames
4. Frame capping systems
5. Door hardware
6. Built-In Concealed Electronic Access Control Devices

**SYSTEM PERFORMANCE**

Provide door assemblies that have been designed and fabricated to comply with requirements for system performance characteristics listed below and as indicated on Drawings, as demonstrated by testing manufacturer's corresponding standard systems according to test methods designated.

Thermal Transmission (exterior doors): "U" value of not more than 0.09 (BTU/Hr. x sf x degrees F.) per AAMA 1503.01.

NFPA 80-16: Standard for fire Doors and Other Opening Protectives.

UL 10B: Standard for Fire Tests of Door Assemblies

UL 10C: Standard for Positive Pressure Fire Tests of Door Assemblies

NFPA 252: Fire Tests of Door Assemblies

Flame Spread/Smoke Developed: Provide FRP doors and panels with the following ratings in according with ASTM E 84: Flame Spread: Not greater than 170 (Class C). Smoke Developed: Not greater than 390 (Class C).

Class A option for flame spread and smoke developed rating on interior faces of exterior panels and both faces of interior panel as shown. Flame spread no greater than 15, smoke developed no greater than 310 per ASTM E-84.

Additional Criteria: Provide FRP doors and panels with the following performance: ASTM D 256 ð nominal value of 20.0 ASTM D 570 ð nominal value of .20 to .40% ASTM D 2583 ð nominal value of 50

Abrasion Resistance: Face sheet to have no greater than .029 average weight loss percentage after Taber Abrasion Test ð 25 cycles at 500 gram weight with H-18 wheel.

Stain Resistance: Face sheet to be unaffected after 24 hour exposure to SVS-1 white spray enamel. Must retain DE of .57 or less with MacBeth Colorimeter. Dark Brown (Bronze) FRP to be used as a basis.

Chemical Resistance: Face sheet to be unaffected after 4 hour exposure to acetic acid (10% solution), acetone, sodium hypochlorite (5.25% solution) and hydrochloric acid (10% solution). No discoloration or panel damage will be allowed.

### **QUALITY ASSURANCE**

Standards: Comply with the requirements and recommendations in applicable specification and standards by AAMA, except to the extent more stringent requirements are indicated.

#### References:

- A. [AAMA 1304](#) – Voluntary Specification for Forced Entry Resistance of Side-Hinged Door Systems.
- B. [AAMA 1503-98](#) – Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
- C. [ANSI A250.4](#) – Test Procedure and Acceptance Criteria for Physical Endurance of Steel Doors and Hardware Reinforcing.
- D. [ASTM-B117](#) – Standard Practices for Operating Salt Spray (Fog) Apparatus.
- E. [ASTM-B209](#) – Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- F. [ASTM-B221](#) – Standard Specification for Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- G. [ASTM-C518](#) – Standard test Method for Steady-State Thermal Transmission Properties by Means of Heat Flow Meter Apparatus.
- H. [ASTM-D256](#) – Standard Test Methods for Determining the Pendulum Impact Resistance of Plastics.
- I. [ASTM-D570](#) – Standard Test Method for Water Absorption of Plastics.
- J. [ASTM-D638](#) – Standard Test Method for Tensile Properties of Plastics.
- K. [ASTM-D790](#) – Standard Test Methods for Flexural Properties of Unreinforced and Reinforced Plastics and Electrical Insulating Materials.
- L. [ASTM-D1621](#) – Standard Test Method for Compressive Properties of Rigid Cellular Plastics.
- M. [ASTM-D1622](#) – Standard Test Method for Apparent Density of Rigid Cellular Plastics.
- N. [ASTM-D1623](#) – Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics.
- O. [ASTM-D2126](#) – Standard Test Method for Response of Rigid Cellular Plastics to Thermal and Humid Aging.
- P. [ASTM-D2583](#) – Standard Test Method for Indentation Hardness of Rigid Plastics by Means of a Barcol Impressor.
- Q. [ASTM-D3029](#) – Test Methods for Impact Resistance of Flat Rigid Plastic Specimens by Means of a Tup (Falling Weight) (Withdrawn 1995) (Replaced by ASTM-D5420).
- R. [ASTM-D5116](#) – Standard Guide for Small-Scale Environmental Chamber Determinations of Organic Emissions from Indoor Materials/ Products.
- S. [ASTM-D5420](#) – Standard Test Method for Impact Resistance of Flat, Rigid Plastic Specimen by Means of a Striker Impacted by a Falling Weight (Gardner Impact).
- T. [ASTM-D6670](#) – Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/ Products.
- U. [ASTM-E84](#) – Standard Test Method for Surface Burning Characteristics of Building Materials.



- V. [ASTM-E90](#) – Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions.
- W. [ASTM-E283](#) – Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- X. [ASTM-E330](#) – Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- Y. [ASTM-E1886](#) – Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- Z. [ASTM-E1996](#) – Standard Specification for Performance of Exterior Windows, Glazed Curtain Walls, Doors and Storm Shutters Impacted by Wind Borne Debris in Hurricanes.
- AA. [ASTM-F476](#) – Standard Test Methods for Security of Swinging Door Assemblies.
- BB. [ASTM-F1642-04](#) – Standard Test Method for Glazing Systems Subject to Air Blast Loading.
- CC. [NWWDA T.M. 7-90](#) – Cycle Slam Test Method.
- DD. [NFRC 100](#) – Procedure for Determining Fenestration Products U-Factors.
- EE. [NFRC 400](#) – Procedure for Determining Fenestration Products Air Leakage.
- FF. [TAS 201](#) – Impact Test Procedures.
- GG. [TAS 202](#) – Criteria for Testing Impact & Nonimpact Resistant Building Envelope Components Using Uniform Static Air Pressure.
- HH. [TAS 203](#) – Criteria for Testing Products Subject to Cyclic Wind Pressure Loading.

**Performance:** A minimum ten (10) year record of production of frames, doors and panels and completion of similar projects in type and size.

**Instruction:** The manufacturer or his representative will be available for consultation to all parties engaged in the project including instruction to installation personnel.

**Field Measurement:** Field verify all information prior to fabrication and furnishing of materials. Furnish and install materials omitted due to lack of verification at no additional cost to owner.

**Regulation and Codes:** Comply with the current edition in force at the project location of all local, state and federal codes and regulations, including the Americans with Disabilities Act of 1992.

### **SYSTEM PERFORMANCE**

- A. Completed assemblies shall comply with all current NC Building code requirements.
- B. All test unit sizes and configurations shall conform to: Florida High Velocity Hurricane Zone (HVHZ) Protocols, ICC Compliant ASTM E 1886, ASTM E 1996, all requirements of TAS 201, TAS 202, and TAS 203.
- C. Door and Aluminum Tube Frame Assembly.
  - 1. Physical Endurance, ANSI A250.4: 25,000,000 Cycles, No Damage.
  - 2. Salt Spray, ASTM-B117: 500 hours minimum exposure.
  - 3. Air Leakage, NFRC 400, ASTM-E283.
    - a. Opaque Swinging Door (< than 50% glass)
      - 1. 0.01 cfm/sqft @ 1.57 psf.
      - 2. 0.01 cfm/sqft @ 6.24 psf.
    - b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      - 1. 0.38 cfm/sqft @ 1.57 psf.
      - 2. 0.73 cfm/sqft @ 6.24 psf.
  - 4. Structural Performance, ASTM E-330.
    - a. Single or Pair of Doors, 8'4" x 8'2" overall size, single point latching.
      - 1. ± 75 psf design pressure, pass.

5. Impact and Cycle Test, ASTM-E1886.
  - a. Single or Pair of Doors, 6'8" x 7'8" overall size, 3-point latching.
    1. 9 lbs. missile @ 50 fps, minimum 3 impacts, no rips, tears, or penetrations.
    2. ± 75 psf design pressure, pass.
6. Forced Entry, AAMA 1304.
  - a. Single or Pair of Doors, 6'8" x 7'8" overall size, 3-point latching.
    1. 300lb Pull Test, pass.
7. Impact Test, TAS 201.
  - a. Single or Pair of Doors, 6'8" x 7'8" overall size, 3-point latching.
    1. 9 lbs. missile @ 50 fps, minimum 3 impacts, no rips, tears, or penetrations.
8. Static Air Pressure, TAS 202.
  - a. Single or Pair of Doors, 6'8" x 7'8" overall size, 3-point latching.
    1. ± 65 psf design pressure, pass.
    2. Forced Entry, 300lb Pull Test, pass.
9. Cyclic Wind Pressure Loading, TAS 203.
  - a. Single or Pair of Doors, 6'8" x 7'8" overall size, 3-point latching.
    1. ± 65 psf design pressure, pass.
10. Security Test, ASTM-F476: Minimum Grade 40.
11. Blast Test, ASTM-F1642.
  - a. 6 psi @ 45 psi-msec, minimal hazard, operable.
- D. Door and Thermally Broken Aluminum Frame Assembly.
  1. Thermal Transmittance, NFRC 100.
    - a. Opaque Swinging Door (< than 50% glass)
      1. U-Factor = 0.31 Btu/hr-ft<sup>2</sup>·°F.
    - b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. U-Factor = 0.64 Btu/hr-ft<sup>2</sup>·°F.
  2. Air Leakage, NFRC 400, ASTM-E283.
    - a. Opaque Swinging Door (< than 50% glass)
      1. 0.01 cfm/sqft @ 1.57 psf.
      2. 0.01 cfm/sqft @ 6.24 psf.
    - b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. 0.38 cfm/sqft @ 1.57 psf.
      2. 0.73 cfm/sqft @ 6.24 psf.
  3. Sound Transmission, ASTM-E90: STC = 30, OITC = 29.
- E. Door and AF-150 Frame Assembly.
  1. Thermal Transmittance, NFRC 100.
    - a. Opaque Swinging Door (< than 50% glass)
      1. U-Factor = 0.32 Btu/hr-ft<sup>2</sup>·°F.
    - b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. U-Factor = 0.57 Btu/hr-ft<sup>2</sup>·°F.
  2. Air Leakage, NFRC 400, ASTM-E283.
    - a. Opaque Swinging Door (< than 50% glass)
      1. 0.12 cfm/sqft @ 1.57 psf.
      2. 0.06 cfm/sqft @ 6.24 psf.
    - b. Commercially Glazed Swinging Entrance Door (> than 50% glass)
      1. 0.04 cfm/sqft @ 1.57 psf.
      2. 0.14 cfm/sqft @ 6.24 psf.
- F. Door and Hollow Metal Steel Frame.
  1. Cycle Slam, NWWDA T.M. 7-90.
    - a. 5,000,000 cycles.
      1. No Operational Damage.
      2. No Hinge Separation.

## **SUBMITTALS**

Product Data: Submit Manufacturers product data, specifications and instructions for each type of door and frame required in accordance with Section 01340 and the following:

1. Include details of core, stile and rail construction, trim for lites and all other components.
2. Include details of finish hardware mounting.
3. Include samples of each aluminum alloy to be used on this project. Where normal finish color and texture variations are expected, include two or more samples to show the range of such variations.
4. Include one sample of typical fabricated section, showing joints, fastenings, quality of workmanship, hardware and accessory items before fabrication of the work proceeds.
5. Product Data and details: Concealed proximity reader

### Testing and Evaluation Reports.

Submit testing reports and evaluations provided by manufacturer conducted by and accredited independent testing agency certifying doors and frames comply with specified performance requirements listed

Submit Shop Drawings for the fabrication and installation of the doors and frames, and associated components. Details to be shown full scale. Include glazing details and finish hardware schedule.

## **PRODUCT DELIVERY, STORAGE AND HANDLING**

Deliver materials to job site in their original, unopened packages with labels intact. Inspect materials for damage and advise manufacturer immediately of any unsatisfactory materials.

Package door assemblies in individual corrugated cartons so no portion of the door has contact with the outer shell of the container. Package and ship frames preassembled to the greatest possible extent.

## **PROJECT GUARANTEE**

Provide a written guarantee signed by manufacturer, installer and contractor, agreeing to replace, at no cost to the owner, any doors, frames or factory hardware installation which fail in materials or workmanship, within the guarantee period. Failure of materials or workmanship includes: excessive deflection, faulty operation of entrances, deterioration of finish or construction in excess of normal weathering and defects in hardware installation. The minimum time period of guarantee is ten (10) years from acceptance.

## **PART 2: PRODUCTS**

### **DOORS**

Manufacturer: Subject to compliance with requirements, provide products of the following:

2. SL-14 Monumental Medium Stile FRP/glass/aluminum door with 12" SL-484 FRP Accent Colored Mid-Panel, with SpecLite3E as manufactured by Special-Lite, Inc., Decatur, Michigan.

Other acceptable manufacturers are:

1. Extrudart Products, Inc.

2. Cline Aluminum Doors, Inc.
3. Other pre-approved manufacturers.

### **MATERIALS AND ACCESSORIES**

Aluminum Members: Alloy and temper as recommended by manufacturer for strength, corrosion resistance and application of required finish and control of color; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate with aluminum wall thickness of 0.1259.

Components: Furnish door and frame components from the same manufacturer.

Splitting of door and frame components is not permitted.

Fasteners: Aluminum, non-magnetic stainless steel or other non-corrosive metal fasteners, guaranteed by the manufacturer to be compatible with the doors, frames, stops, panels, hardware, anchors and other items being fastened. For exposed fasteners (if any) provide Phillips head screws with finish matching the item to be fastened.

Glazing Gaskets: For glazing factory-installed glass, and for gaskets which are factory-installed in Captive assembly of glazing stops, manufacturers standard stripping of molded neoprene, complying with ASTM D 2000 (designation 2BC415 to 3BC620), or molded PVC complying with ASTM C 509 Grade 4

Weather stripping: Manufacturer's standard pile type in replaceable rabbets for stiles; manufacturer's standard EPDM bulb type in doorframes.

Hardware:

ADA Compliant:

- a. Hardware as scheduled on drawings and specified in 08700 unless otherwise noted herein
- b. Heavy-Duty 3/8" adjustable continuous hinge: Pemko, McKinney, or Select Products.
- c. Removable mullion at pairs of doors: Von Duprin, keyed operation.
- d. SL-84 integral recessed door pull (MATCH EXISTING)

### **ELECTRONIC ACCESS CONTROL (EAC) DEVICES:**

- a. Access Control Reader: Special-Lite provided low profile proximity card reader; internally mounted. Factory prepped and installed within door, concealed behind fiberglass panel skins of door mid-rail panels. Provide HID Thinline II reader device or equivalent. Requires the use of a frame to door EPT, Special-Lite factory prepped for and provided.
- b. Provide 10-year warranty for access control reader device and installation.

### **FABRICATION**

Sizes and Profiles: The required sizes for door and frame units, and profile requirements are shown on the drawings.

Coordination of Fabrication: Field measure before fabrication, and show recorded measurements on final shop drawings.

Complete the cutting, fitting, forming, drilling and grinding of all metal work prior to assembly.

Remove burrs from cut edges, and ease edges and corners to a radius of approximately 1 /649.

No welding of doors or frames is acceptable.

Maintain continuity of line and accurate relation of planes and angles. Secure attachments and support at mechanical joints, with hairline fit at contacting members.

### **FIBERGLASS REINFORCED POLYESTER FRP FLUSH DOORS**

#### Materials and Construction:

1. Construct SL-14 1 3 /4" thickness doors of 6063-T5 aluminum alloy stiles and rails 3 ½" width minimum. Construct with mitered corners and provide joinery of 3 /89 diameter full width tie rods through extruded splines top and bottom as standard .1259 tubular shaped stiles and rails reinforced to accept hardware as specified. Provide hex type aircraft nuts for joinery without welds, glues or other methods for securing internal door extrusions. Furnish integral reglets to accept mid-rail panel face sheet to permit a flush appearance. Rail caps or other face sheet capture methods are not acceptable.
2. Extrude top and bottom rail legs for interlocking continuous rigidity weather bar. Lock face sheet material in place with extruded interlocking edges to be flush with aluminum stiles and rails.
3. Door FRP face sheeting: .1209 thickness fiberglass reinforced polyester. SL-17 flush doors with an abuse resistant engineered surface of the standard colors: to be selected from manufacturers standard selection, minimum selection as follows: white, light gray, red, blue, green, beige, dark gray, dark bronze, black.

12" Mid-rail panel FRP face sheeting: .1209 thickness fiberglass reinforced polyester. SL-14 monumental FRP/aluminum/glass doors with an abuse resistant engineered surface of the standard colors: to be selected from manufacturers standard selection, minimum selection as follows: white, light gray, red, blue, green, beige, dark gray, dark bronze, black. MATCH EXISTING

- a. Standard Interior and Exterior Class C 0.120" thick, pebble texture, through color with SpecLite 3® integral surfaseal film FRP sheet.
- b. Flexural Strength, ASTM-D790: 21 x 103 psi.
- c. Flexural Modulus, ASTM-D790: 0.7 x 106 psi.
- d. Tensile Strength, ASTM-D638: 13 x 103 psi.
- e. Tensile Modulus, ASTM-D638: 1.2 x 106 psi.
- f. Barcol Hardness, ASTM-D2583: 55.
- g. Izod Impact, ASTM-D256: 14.0 ft-lb/in.
- h. Gardner Impact Strength, ASTM-D5420: 120 in-lb.
- i. Water Absorption, ASTM-D570: 0.20%/24hrs at 77°F.
- j. Surface Burning, ASTM-E84: Flame Spread ≤ 200, Smoke Developed ≤ 450.
- k. Taber Abrasion Resistance, Taber Test: 0.007% Max Wt. Loss, cs-17 wheels, 1000g. Wt., 25 cycles.
- l. Chemical Resistance.
- m. Excellent Rating.
- n. Acetic Acid, Concentrated.
- o. Acetic Acid, 5%.
- p. Bleach Solution.

- q. Detergent Solution.
  - r. Distilled Water.
  - s. Ethyl Acetate.
  - t. Formaldehyde.
  - u. Heptane.
  - v. Hydrochloric Acid, 10%.
  - w. Hydrogen Peroxide, 3%.
  - x. Isooctane.
  - y. Lactic Acid, 10%.
4. Core of Door Assembly: Minimum five pounds per cubic foot density poured-in-place polyurethane free of CFC. Minimum 'R' value of 11. Ballistic rating is as indicated. Meeting stiles on pairs of doors and bottom weather bar with nylon brush weather stripping.
  5. Manufacture doors with cutouts for glass vision lites, louvers or FRP panels as scheduled. Factory furnish and install all glass, louvers and panels prior to shipment.
  6. Pre-machine doors in accordance with templates from the specified hardware manufacturers and approved hardware schedule, including built-in and concealed Electronic Access Control devices. Factory install hardware and devices.

### **LOUVERS**

Special-Lite inverted 'Y' louver, clear anodized.

### **FRAMING SYSTEMS**

#### Aluminum Tubular Framing:

1. Framing system from the door manufacturer of the size and type shown on Drawings, widths to match adjacent storefront framing sizes, with .1259 minimum wall thickness and type 6063-T5 aluminum alloy. .6259 high applied doorstops with screws and weather stripping. Frame members are to be box type with four (4) enclosed sides. Open back framing will not be acceptable.
2. Caulk joints before assembling frame members. Secure joints with fasteners and provide a hairline butt joint appearance. Prefit doors to frame assembly at factory prior to shipment. Field fabrication of framing using Stick material is not acceptable.
3. Applied stops for side, transom and borrowed lites and panels, with fasteners exposed on interior or unsecure portion only. Pre-machine and reinforce frame members for hardware in accordance with manufacturer's standards and the approved hardware schedule.
4. Install with anchors appropriate for wall conditions to anchor framing to wall materials. A minimum of five anchors up to 7849 on jamb members, and one additional anchor for each foot over 7849. Secure head and sill members of transom, side lites and similar conditions.
5. Factory pre-assemble side lites to the greatest extent possible, and mark frame assemblies according to location.

#### Insert Framing Systems:

1. Model: SL-1031, SL-1032 or SL-1034.
2. Insert frame as shown, using an integral stop fitted with weather stripping.

3. Corner joints of miter design, secure with furnished aluminum clips, and screw into place.
4. Reinforce and pre-machine insert frame members for hardware in accordance with manufacturer's standards and the approved hardware schedule.
5. Anchors of a suitable type to fasten insert framing to existing frame materials, using a minimum of five anchors on jambs up to 7849 height, three on headers. One additional anchor for each additional lineal foot of frame.

Frame Capping:

1. Model: SL-70
2. .0939 wall thickness capping as indicated on drawings with insert frame as shown. Finish of capping to match framing.

**GLAZING**

Design system for Glass:

1. Manufacturers standard flush glazing system of recessed channels and captive glazing gaskets or applied stops as shown.
2. Allow for thermal expansion on exterior units.
3. Provide glass as specified in 08800 and shown, factory glazed into doors.

Security Grate Option: Security grate model SL-349 as manufactured by Special-Lite, Inc., Decatur, Michigan.

**FINISHES**

Anodized Surfaces: Clear, Class I, 0.7 mils.

**PART 3: EXECUTION**

**INSTALLATION**

Comply with manufacturers recommendations and specifications for the installation of the doors and frames. Factory install hardware, glass and louvers in doors. Factory assemble side lites and transoms to the greatest extent possible.

Set units plumb, level and true to line, without warp or rack of doors or frames. Anchor securely in place. Separate aluminum and other metal surfaces with bituminous coatings or other means as approved by architect.

Set thresholds in a bed of mastic and backseal.

Clean surfaces promptly after installation of doors and frames, exercising care to avoid damage to the protective coatings.

Ensure that the doors and frames will be without damage or deterioration (other than normal weathering) at the time of acceptance.

Provide owner with all adjustment tools and instruction sheets. Arrange an inservice session to owner at owner's convenience. Provide a minimum one-year written guarantee on all labor related to this section. Any workmanship, which is defective or deficient, shall be corrected to the owner's satisfaction and at no additional cost to the owner.

*END OF SECTION*



**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, apply to the work specified in this Section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Work of this Section shall include all labor, materials, equipment, transportation, tools and storage required for complete installation of all finish hardware shown and scheduled on Drawings and specified herein. Intent of this Specification is to provide complete finishing hardware requirements for entire building project excepting hardware, which is specifically mentioned hereinafter as being furnished by others. Any openings not specifically mentioned herein shall be furnished consistent with hardware specified for similar openings.

Wood doors for Project are prefit. Coordinate with wood door manufacturer in furnishing hardware templates and schedules at earliest possible time.

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

**QUALITY ASSURANCE:**

Manufacturers: Hardware listed in Hardware Schedule shall be supplied by one of following Manufacturers listed for each item or an equal. To establish quality of hardware required, catalog numbers of Manufacturers listed in Hardware Schedule have been used. Hardware furnished shall be of equal type, design, quality and function as that specified in Hardware Schedule.

Acceptable Manufacturers: Similar items manufactured or furnished by other manufacturers may be submitted for approval, subject to these Specification requirements and written approval received 7 days prior to bid date.

Supplier's Qualifications: Contractor shall select only supplier who has in his employ qualified personnel, who shall manage and coordinate complete hardware contract, and shall also be available to visit Project in order to solve or correct conditions affecting proper hardware installation or adjustment, as required.

**SUBMITTALS:**

Schedule: Submit Hardware Schedule to Architect in six (6) copies, as promptly as possible, showing quantities, types, catalog numbers and locations of various items of finish hardware required. Submit as specified for shop drawings in accordance with GENERAL CONDITIONS.

Job Completion Instructions: At completion of work turn over to Owner all tools, instructions, and maintenance information for his use in maintaining hardware. Furnish Owner also with two copies of Job Use Finish Hardware Schedule for his permanent records.

**PRODUCT HANDLING:**

Packing, Marking and Labeling: Deliver hardware to project site in manufacturer's original packages. Each article of hardware shall be neatly wrapped and individually packed in substantial carton or other container, properly marked or labeled to be readily identifiable with Hardware Schedule.

Storage: General Contractor shall furnish secure storage area for delivery by Hardware Supplier of finish hardware and storage of same. General Contractor shall be responsible for shortages due to theft and pilferage.

General Contractor shall provide in storage area adequate counters, shelves, and bins for assembly and grouping of hardware for distribution and installation.

## **PART 2: PRODUCTS**

### **TYPES, SIZES AND DESCRIPTIONS:**

Hardware shall be of types and sizes listed in this Section, applied with fastenings of proper size, quantity and finish.

Templates: Hardware for application on metal shall be made to standard templates. Furnish physical samples or templates, as required to Manufacturer of metal doors and frames for proper manufacturer and application.

Reinforcement: Reinforcing for hardware shall be furnished and installed by Door and Frame Manufacturer.

Modifications to hardware required by reasons of construction characteristics shall be such as to provide same operative or functional features.

Provide hardware for fire rated openings in compliance with UL, UL 10C-1998, UBC 7-2-1997, NFPA-80 and CFR Part 36 (ADA) guidelines. Provide only hardware, which has been tested and listed by UL for types and sizes of doors scheduled. All hardware shall conform to ADA requirements. These requirements take precedence over any other requirements or specifications of this section.

#### Category "A" Positive Pressure Installations:

Hardware located above 40" AFF to be listed and labeled in accordance with UBC 7-2-1997 and UL 10C-1998 for use in positive pressure fire rated wood doors.

In order to meet smoke requirements, a smoke seal, listed and labeled for UBC 7-2-1997 Parts 1 and 2 positive pressure installations, must be mounted around the perimeter of the doorframe.

Flat bar type astragals only will be allowed on pairs of doors with fire ratings up to 60 minutes with concealed intumescent inside the door structure.

Provide strikes with extended lips as necessary.

Provide wrought strike boxes.

Provide doors to loading platforms, boiler and mechanical rooms, stages or platforms, utility stairs, and electrical closets with knurling on inside of lever.

Locksets: Provide Grade 1 mortise locksets as scheduled, with standard 03 lever trim and full face L escutcheon. All cylinder key cores shall be interchangeable type, removable cores. Provide original manufacturer's pins and brass key blanks.

Provide CODE required tactile warning surfaces (knurling) for all door operating hardware for doors leading to mechanical, boiler, electrical, or chemical storage areas.

### **KEYING REQUIREMENTS**

Provide removable construction cores, Owner will change when buildings are accepted.

Keying: By the manufacturer to the existing system. All locks and cylinders to be construction master keyed, and grand master keyed to the school's existing grand master key system. Provide 4 keys per cylinder, stamped with keying symbol. All cylinders standard 6-pin type.

Keying system shall be as follows:

Hook Number	Site ID	Site	Key Number	Key System	Keyway	Alternate Hook Number
1	160	Central Service	W	Primus	EP	
2	161	Facility Support Operations	F	Primus	CP	
3	162	Transportation	G	Primus	CP	
4	163	All Physical Plants	GGM	Primus	HP	
5	165	Food Service Warehouse	163E	Old Primus		
6	304	Atlantic Elementary	A	Primus	CP	
7	306	Bogue Sound Elementary	S	Primus	CEP	
8	308	Beaufort Elementary	J	Primus	CP	
9	310	Beaufort Middle	U	Primus	CEP	
10	311	Broad Creek Middle	G	Primus	XP-CEP	
11	312	Bridges School	S	Primus	CEP	
12	313	East Carteret High School	R	Primus	XP-CEP	
13	314	Croatan High School	T	Primus	XP-CEP	
14	316	Harkers Island Elementary	C	Primus	CP	
15	317	Morehead Elementary @ Camp Glenn	B	Primus	CP	
16	318	Morehead Middle	K	Primus	CP	
17	322	Morehead Primary School	F	Primus	CP	
18	324	Newport Elementary	N	Primus	CEP	
19	326	Newport Middle	E	Primus	CP	
20	332	Down East Middle – Smyrna	L	Primus	CP	
21	344	West Carteret High School	N	Primus	XP-CEP	
22	352	White Oak Elementary	B	Primus	XP-CP	
23	N/A	Boys & Girls Club – Beaufort	FA10	Primus	CP	
24	N/A	Boys & Girls Club – Morehead	FA5	Primus	CP	
25	CPC	Carteret Pre School Center	S	Primus	EP	
		Electronic Override	163E			
		Contractor Alarm Code	15632			

Keys and cores shall be shipped direct from manufacturer to Owner, Carteret County Schools, Facility Services, Attention: LOCKSMITH.

Hardware supplier shall meet with the Architect and Owner's Hardware Leadman to receive keying instructions before preparing keying schedule for approval.

Representative from the key company is required to meet with Owner's representative prior to turning cylinders and to turn all cylinders, and set up key cabinet.

One Manufacturer: Following items within each classification shall be furnished totally by one manufacturer.

Hinges	Locksets
Exit devices	Closers

Door Stops: All doors shall be provided with wall stops or overhead stops, to suit condition. For example, doors opening onto millwork or open space shall receive overhead stops. Solid wood blocking to be installed at all gypsum wallboard wall stop locations. Provide floor stops at fire doors with magnetic hold open devices.

Fire rated openings: All fire rated openings, except classrooms, shall receive closers and ball bearing hinges, whether scheduled or not.

Coordinators: All door pairs with closers to be provided with coordinator devices as necessary for proper sequential closing operation.

Astragals: Non-fire rated door pair with flush bolts shall receive steel astragal on exterior side edge of the active leaf. Pairs of smoke or fire doors shall receive steel astragals, coordinators, and smoke seals and necessary hardware to meet fire rating designated.

Keyed Removable Mullions: All interior and exterior mullions to be removable with keyed operation, with cylinder and cores installed by the general contractor and turned by the hardware supplier.

Hinges: Unless otherwise noted, 3 butt hinges shall be provided each interior door to 36" width and 86" height. 3 heavy-duty butt hinges shall be provided for interior doors exceeding 36" width or 86" height.

Exterior hinges shall be heavy-duty continuous.

Materials and Finishes: (All products except closers, thresholds, weatherstripping to have brass or bronze base metal unless otherwise noted).

	<u>Materials</u>	<u>Finishes</u>
Continuous Hinges, Exterior Doors	6063 T6 Aluminum	Clear Anodized
Butt Hinges, Interior Doors	Steel	US 26 D
Pivots	Satin Chrome Plate	US 26 D
Exit Devices	Satin Chrome Plate	US 26 D
Cylindrical Lock Trim	Satin Chrome Plate	US 26 D
Dead Lock Trim	Satin Chrome Plate	US 26 D
O.H. Holders & Stops	Satin Chrome Plate	US 26 D
Door Stop and Holders	Satin Chrome Plate	US 26 D
Box Strikes	Wrought	Prime
Thresholds	Aluminum	Aluminum
Thresholders	Steel	Galvanized Steel
Weatherstrip	Aluminum	Aluminum
Flatgoods	Stainless	US 32 D

Fasteners:

Use concealed fasteners whenever possible.

Hardware to be installed on metal work shall be furnished with machine screws.

For exposed fasteners on interior in bronze or brass, use matching color and material for fasteners. For all other exposed fasteners on interior, use stainless steel except where noted specifically otherwise.

Furnish stainless steel screws for all exterior work.

Install fixed locking screw in strike plate for exterior locksets after final adjustments made during 6-Month Service and Adjustment Inspection.

**HARDWARE ITEMS:**

All Products shall be by one of the following manufacturers - no exceptions:

- a. Butt Hinges: Hager, Stanley, McKinney
- b. Heavy Duty Continuous Gear Hinges, all exterior doors: Select Products SL24HD, or equal heavy duty by Markar, Hager or Pemko
- c. Electric Hinges: ETW electric through wire hinge, with four continuous electric conductors, full mortise ball bearing, with Molex type connectors, by Hager.
- d. Surface Closers: LCN 4040XP, Closer can mount hinge side, top jamb, or parallel arm (with PA bracket) on either right or left swinging doors. Provide metal covers with set screw anchors, in matching finish. Provide ADA rated features.
- e. Locksets: Schlage L9000 Series extra heavy-duty mortise locksets. Provide lever handle, full face escutcheon. Exterior door locksets shall be compatible with Locknetics entry systems.
- f. Electrified Mortise Lockset: Schlage L909x Series, complete assembly with power supply, and electric thru wire ETW hinges.
- g. Cylinders: Schlage Full Size Interchangeable Core, all interior and exterior cylinders to be provided with interchangeable cores
- h. Exits Devices: Von Duprin 99 Series, each with a cylinder for trims and a cylinder for dogging.
- i. Wherever doors are equipped with exit devices, view windows shall have concealed / flush glass beads.
- j. Exit Devices at Electronic Access Control doors (Furnished and installed by the General Contractor's Division 8 Subcontractor): Von Duprin QEL, with electric ETW hinges for hinge edge power transfer for interior doors. Provide EPT-2 for exterior doors continuous hinges.
- k. Removable Mullions: Von Duprin, Yale, Detex, keyed type with cylinder.
- l. Overhead Holders/Stops: Glynn-Johnson, ABH Manufacturing.
- m. Thresholds: National Guard, Pemko, Hager.
- n. Push/Pulls: Rockwood Manufacturing, Ives, Hager.
- o. Stops: Glynn-Johnson, Rockwood Manufacturing, Ives, Hager.
- p. Flush Bolts: Glynn-Johnson, Rockwood Manufacturing, Ives, Hager.

- q. Silencers: Glynn-Johnson, Rockwood Manufacturing, Ives.
- r. Kick Plates: Rockwood Manufacturing, Ives, Hager.
- s. Automatic Flush Bolts: Glynn-Johnson, Rockwood Manufacturing.
- t. Coordinator: Glynn-Johnson, Rockwood Manufacturing, Trimco
- u. Weather strip & Rain Drips: National Guard, Pemko, Hager, Reese.
- v. Door Bottoms: National Guard, Pemko, Hager.
- w. Smoke Perimeter Door Frame Gaskets: Pemko, Hager, Reese
- x. Smoke Door Bottom Sweep: Pemko, Hager, Reese
- y. Magnetic Door Holders: LCN SEM 7800 Series, with adjustable extension length.

Other items shall be as scheduled.

Provide the following hardware material as scheduled in the door schedule:

Hinges with closer	BB 1279 4 ½ x 4 ½
St/Stl hinges with closer	BB 1191 4 ½ x 4 ½
HD hinges with closer	BB 1168 4 ½ x 4 ½
St/Stl HD hinges w closer	BB 1199 4 ½ x 4 ½
Hinges without closer	1279 4 ½ x 4 ½
St/Stl hinges without closer	1191 4 ½ x 4 ½
HD continuous hinges	SL24HD all exterior doors
Privacy set	L9040
Staff Toilet Privacy set	L9040
Passage set	L9010
Classroom security lockset	L9071
Entrance lockset	L9050
Office lockset	L9050
Entry/Office with Occupied Indicator Sectional Trim	L9050 x L283-722
Storeroom lockset	L9080
Push/Pull latchset	HL6
Exit device (interior)	99 L all interior locations (F as req'd)
Exit device (exterior)	99 NL x DT exterior doors scheduled
Exit Device at EAC	QEL with EPT where EAC (Electronic Access Control) is scheduled.
Mullion	4954 (9954 as req'd), keyed type.
Electric Strike:	Von Duprin 6000 Series
Cylinder	Standard 6-pin
Closer	4040XP, with 3049 hold-open arm at all exterior doors, metal cover
Closer with backstop	4040XP – 3077CNS, metal cover with set screws
Kick plate	1935 8 x 2 LDW
Wall stop	232 W
Floor stop	241 F
Overhead stop	9-331
Flush bolts	282 D
Threshold	Pemko 2005AV
Upper rain drip	Reese R201C
Lower rain drip/sweep	Pemko 345_V
Frame Smoke gasketing	Pemko 332CR

Door Bottom Smoke Sweep	Pemko 307AV
Perimeter gasketing	Pemko 296_R
HD Interlock gasketing	Pemko 336
Push plate	70C 4 x 16
Pull handle	107 x 70C 4 x 16
Key cabinet	Expand existing key cabinet as required for additional keys

General and Special Hardware Notes:

1. All doors to receive hinges as specified
2. All doors to receive wall or overhead stops to suit condition of use. Doors with magnetic hold opens to receive floor stops.
3. Provide closers with backstops for exterior doors and to suit condition of use.
4. All steel frames to be provided with silencers.
5. Exterior doors to be provided with weather-stripping and thresholds.
6. All exit devices to be provided with cylinders.
7. At pairs of doors, pull side, provide pull or lever right side only.
8. Provide cylinders for keyed mullions supplied by aluminum door supplier.
9. Exit devices at exterior doors to NL with pull, unless otherwise indicated.
10. Exit devices at interior doors to be classroom function with lever.

**ELECTRONIC ACCESS CONTROL SYSTEM / ENTRY HARDWARE DEVICES**

1. WHERE INDICATED ON DRAWINGS, PROVIDE ACCESS CONTROL SYSTEM DEVICES AND COMPONENTS LISTED, DOOR HARDWARE AND ACCESSORIES, FULLY COMPATIBLE WITH AN S2 SECURITY ACCESS CONTROL SYSTEM AND SOFTWARE PROGRAM, INCLUDING BUT NOT LIMITED TO THE FOLLOWING COMPONENTS. ALL HARDWARE / EQUIPMENT SPECS SHALL COMPLY WITH CARTERET COUNTY SCHOOL STANDARDS.
  - a. FOR EXPANSION, PROVIDE AN ACCESS CONTROL SYSTEM FIELD PANEL: S2 NETWORK NODE, S2-NN-E2R-WM, HOUSING UP TO SEVEN (7) S2 APPLICATION BLADES, SUPPORTING UP TO 14 DOORS, WITH NETWORK DROP - PROVIDED BY THE DIVISION 17 ACCESS CONTROL CONTRACTOR. ELECTRICAL CONTRACTOR TO PROVIDE ELECTRICAL POWER.
  - b. DOOR CONTACTS FOR NEW DOOR/FRAMES: RECESSED DOOR SWITCH SETS, GRI 180 SERIES, 195-12WG, BY GEORGE RISK INDUSTRIES. DOUBLE POLE, DOUBLE THROW, WIDE GAP. PROVIDED BY THE DIVISION 17 ACCESS CONTROL CONTRACTOR. ELECTRICAL CONTRACTOR TO PROVIDE RACEWAY TO DOOR FRAME.
  - c. CARD / PROXIMITY READER UNIT, MODEL HID THINLINE II, BUILT-IN AND CONCEALED WITHIN THE EXTERIOR FRP DOORS, ALL LOCATIONS WHERE EAC (ELECTRONIC ACCESS CONTROL) IS REQUIRED. PROVIDED BY THE FRP DOOR SUPPLIER, CONNECTED TO THE S2 SECURITY SYSTEM BY THE DIVISION 17 ACCESS CONTROL SYSTEM CONTRACTOR.
  - d. FOR EAC DOORS INDICATED, VON DUPRIN QUIET ELECTRIC LATCH RETRACTION – QEL EXIT DEVICE 98/99 SERIES. PROVIDED AND INSTALLED BY DIVISION 8 DOOR HARDWARE SUPPLIER. PROVIDE HINGE EDGE POWER TRANSFER FOR EXTERIOR DOORS WITH AN EPT-2 FOR EXTERIOR DOORS CONTINUOUS HINGES.
  - e. FOR EAC DOORS INDICATED, ELECTRIFIED MORTISE LOCKSET: SCHLAGE L909x SERIES. PROVIDED AND INSTALLED BY DIVISION 8 DOOR HARDWARE SUPPLIER.
  - f. ELECTRIC HINGES: FOR USE WITH INTERIOR QEL EXIT DEVICES AND ELECTRIFIED MORTISE LOCKSETS; HAGER ETW ELECTRIC THROUGH WIRE HINGE, WITH FOUR CONTINUOUS ELECTRIC CONDUCTORS,

FULL MORTISE BALL BEARING, WITH MOLEX TYPE CONNECTORS, BY HAGER. PROVIDED AND INSTALLED BY DIVISION 8 DOOR HARDWARE SUPPLIER.

- G. POWER SUPPLIES, FOR ALL POWERED DOOR LOCKING HARDWARE / EXIT DEVICES. PROVIDED AND INSTALLED BY DIVISION 8 DOOR HARDWARE SUPPLIER.
2. CONTROLLED ACCESS SYSTEM DEVICES PROPOSED SHALL BE COMPLETE, WITH ALL NECESSARY COMPONENTS; TO INCLUDE BUT NOT LIMITED TO POWER SUPPLIES, CABLES AND CABLING, CIRCUITS IN REQUIRED VOLTAGES, RACEWAYS, BOXES, TRANSFORMERS, CONTACTORS, RELAYS, SOLENOIDS, ELECTRIC DOOR STRIKES, ETC.

### **PART 3: EXECUTION**

#### **GENERAL:**

Consult project drawings and details and otherwise become familiarized with work so that all items furnished will conform to openings to which applied.

Coordinate hardware with other allied trades such as carpentry, millwork, metal frames, etc.

Prepare and submit to Architect for approval as promptly as possible three (3) copies of completed detailed schedule.

Immediately after award of hardware contract, request approved shop drawings from such trades with which hardware must be coordinated.

After checking approved shop drawings, supply promptly such template information, template drawings, approved hardware schedule, etc., as may be required to facilitate progress on job.

#### **APPLICATION:**

Apply hardware in accordance with approved Shop Drawings, with fastenings of proper size, quantity, and finish, and in accordance with Manufacturer's instructions coordinate.

Operation: All items of hardware shall fit and operate properly.

#### **HARDWARE LOCATIONS:**

Door Pulls: 42" from finished floor to center of grip.

Push-Pull Bar: 42" from finished floor to center of bar of center between bars and combination.

Top Hinge: To frame Manufacturer's standard, but not greater than 10" from head of frame to centerline of hinge.

Bottom Hinge: To frame Manufacturer's standard but not greater than 12-1/2" from finished floor to centerline of hinge.

Intermediate Hinges: Equally spaced between top and bottom hinge. Doors exceeding 36" width shall be provided with 2 pair hinges.

Locks and Latches: 38" from finished floor to center of knob.

Deadlocks (with separate latch-set and/or pull): 60" from finished floor to centerline of strike.



Locate pivots in accordance with Pivot Manufacturer's requirements.

**FINAL INSPECTION:** After installation of all finish hardware is completed, and before building is accepted, General Contractor shall have capable representative of hardware manufacturers, minimum of an AHC, visit building to inspect and approve installation; to make all necessary adjustments; and to carefully instruct Owner in proper use, servicing, adjusting and maintaining of hardware.

**SIX MONTH SERVICE AND REPORT:** Six months after acceptance of each area of the project, readjust each item of hardware and restore to proper function. Install fixed locking screw in strike plate for exterior locksets after final adjustments made during 6-Month Service and Adjustment Inspection. Consult with Owner regarding recommended additions or modifications to maintenance procedures. Clean and lubricate as required. Replace items, which have deteriorated or failed due to faulty design, materials, or installation. Provide Architect with written report upon completion of above.

*END OF SECTION*

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, apply to the work specified in this Section.

**PART 1: GENERAL**

**SUMMARY:**

Provide glass, glazing, and special fire glass as indicated below, complete.

Work Included This Section:

Glass and Glazing For:

- Aluminum Entrances
- Steel and Wood Doors
- View Windows and Panels
- Exterior Windows
- Special fire glass, frames and doors

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

**QUALITY ASSURANCE:**

Completed assemblies shall comply with all current NC Building code requirements.

Performance Requirements: Provide exterior glazing systems that meet all requirements of Florida High Velocity Hurricane Zone (HVHZ) Protocols, South Florida Building Code Protocols TAS 201, TAS 202, and TAS 203, ASTM E 1886, ASTM E 1996 and comply with performance requirements indicated, as demonstrated by testing manufacturer's assemblies in accordance with test method indicated:

1. Small Missile Level A Impact Test conducted on test units in accordance with TAS 201 or ASTM E 1886/E 1996. Upon completion of the missile impact tests, the test units shall be tested in accordance with TAS 203 or ASTM E 1996 cyclic load test.
2. Large Missile Level (C or D) Impact Test conducted on test units in accordance with TAS 201 or ASTM E 1886/E 1996. Upon completion of the missile impact tests, the test units shall be tested in accordance with TAS 203 or ASTM E 1996 cyclic load test.
3. Hurricane Resistant Openings: Exterior hurricane opening assemblies to be tested according to ASTM E330, ASTM E1886, ASTM E1996 standards, and certified by a qualified independent third party testing agency acceptable to authority having jurisdiction, with labeling indicating compliance with the wind load and design pressure level requirements specified for the Project.

Provide safety glass (tempered, laminated, hurricane and impact rated) complying with requirements of the IBC Code, ANSI Z97.1 - American National Standard for Glazing Materials Used in Buildings -- Safety Performance Specifications and Method of Test.

Label each piece of glass designating type and thickness of glass. Do not remove label prior to installation.

Permanently identify each unit of tempered glass. Etch or ceramic fire identification on glass; identification shall be visible when unit is glazed.

Warranty: Provide manufacturer's standard 10 year warranty, including include replacement of sealed glass units exhibiting seal failure or leakage, interpane dusting or misting.

Manufacturers:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured or furnished by following manufacturers:

- American St. Gobain Corporation
- Libby-Owens-Ford Glass Company
- Mississippi Glass Company
- Pittsburg Plate Glass Company
- Technical Glass Products
- Nippon Electric Glass Co., Ltd.
- Pilkington

**SUBMITTALS:**

Glass and Glazing: Submit samples of each type of glass, metal insulated panel, glazing compound, sealant and tapes for Architect's approval.

Product Data: Submit copy of manufacturer's specifications and installation instructions for each type of glass and glazing material. Include test data or certification substantiating that glass complies with specified requirements and manufacturer's warranties.

Submit manufacturer's standard 10 year warranty for insulated glass units.

**MANUFACTURER'S LABELS:**

Labels showing Glass Manufacturer's identity, type of glass, thickness and quality will be required on each piece of glass. Labels must remain on glass until it has been set and inspected.

Containers: All glazing compounds shall arrive at project site in unopened, labeled containers.

**PRODUCT HANDLING:**

Sizes of glass indicated on Drawings are approximately only. Determine actual size required by measuring frames to receive glass at project site, or from guaranteed dimensions provided by Frame Supplier.

Cutting: All glass shall be cleancut. Nipping to remove flares or to reduce oversized dimensions of any type of glass will not be permitted.

Deliver glass to site in suitable containers that will protect glass from weather and from breakage. Store material in safe place to minimize breakage, but deliver sufficient glass to allow for normal breakage.

#### **DESIGN AND PERFORMANCE REQUIREMENTS:**

Watertight and airtight installation of each piece of glass is required. Each installation must withstand normal temperature changes, wind loading, impact loading (for operating doors) without failure of any kind including loss or breakage of glass, failure of sealants or gaskets to remain watertight and airtight, deterioration of glazing materials, and other defects in work.

#### **PART 2: PRODUCTS**

##### **GLASS:**

Low-E Insulating Glass: Unless otherwise noted, 1 5/16" thick impact-rated panels, 1/4" thick "neutral gray tint" plate glass to exterior, 9/16" laminated clear plate glass to interior (1/4"/ 1/16" lamination / 1/4"); Low-E shall be on the 3<sup>rd</sup> surface, with 1/2" space between glass by dessicant filled spacer and sealant device.

All exterior glazing systems shall be impact-resistant meeting requirements of IBC Chapter 1609.1.2, and ASTM E 1996 and E 1886. Indicate compliance with Large Missile Level (C or D) Impact Test conducted on test units in accordance with TAS 201 or ASTM E 1886/E 1996. Upon completion of the missile impact tests, the test units shall be tested in accordance with TAS 203 or ASTM E 1996 cyclic load test.

Provide impact resistant glass throughout where required under Chapter 24, Section 2406, North Carolina State Building Code Current Edition, Category I and II, CPSC 16 CFR Part 1201.

Fire Rated Glass: Provide fire-rated impact resistant glass for protected openings as indicated, "Pyrostop" manufactured by Technical Glass Products. Conform to UL 10 C, UBC 7-2, and UBC 7-4, UL File No. R-19207, design U533. Frame tests to pass ASTM E-119, NFPA 251, UL 263, UL 9, UL 10C, UBC 7-2 and UBC 7-4.

Exterior Aluminum and FRP Entrance Doors: 9/16" laminated "neutral gray tint" Low-E tempered plate glass (1/4"/ 1/16" lamination / 1/4"), impact resistant as required, complying with and tested with Large Missile Level (C or D) Impact Test, and cyclic load test.

Interior Doors: 1/4" clear tempered safety glass, CAT II Impact-Rated as required.

Interior Windows: 1/4" clear tempered safety glass, CAT II Impact-Rated as required.

##### **SETTING BLOCKS AND SPACER SHIMS:**

Fabricate blocks and shims from neoprene. Shape to required size and thickness. Material used for blocks and spacers must be compatible with type of compounds and sealants used and shall not cause staining or discoloration of sealant or frame.

Shore A durometer hardness of setting block and shim material shall be 70 to 90 points for setting blocks and 50 points for spacer shims, or as recommended by compound or sealant manufacturer.

**GLAZING MATERIALS:**

Glazing for exterior impact and hurricane rated glazing systems shall be manufacturer's standard glazing stops with EPDM glazing gaskets to prevent water infiltration at the exterior, and Dow Corning® 995 Structural Silicone Sealant with fixed stops at the interior.

Compatibility: Where combination of sealing materials is required for glazing in same frame, manufacturer shall certify that all glazing materials furnished are compatible with each other and compatible with material used for setting blocks and spacer shims.

**PART 3: EXECUTION**

**CONDITION OF SURFACES:**

Preparation: Check all frames prior to glazing. Openings shall be square, plumb, and with uniform face and edge clearances. Maintain 1/8" minimum bed clearance between glass and frame on both sides.

Clean all surfaces to be glazed with xylol, a 50-50 mixture of acetone and xylol, or other solvents recommended by compound or sealant Manufacturer. Any defects affecting satisfactory installation of glass shall be corrected before starting of glazing.

Temperature: Do not apply any compound or sealant at temperatures lower than 40 degrees F.

**INSTALLATION:**

Workmanship: Apply glazing compound uniformly with accurately formed corners and bevels. Remove excess compound from glass and frame. Use only recommended thinners, cleaners and solvents. Do not cut or dilute glazing compound without approval from Architect. Make good contact with glass and frame when glazing and facing off.

Cleaning: Compound shall be removed from glass before it hardens. Remove any excess sealants from glass and adjoining surfaces during working time of material, within two to three hours.

Blocks and Spacers: Where setting blocks and spacer shims are required to be set into glazing compound or sealant, they may be butted with compound or sealant, placed in position, and allowed to set firmly prior to installation of glass.

Miscellaneous Interior Glazing: Unless otherwise indicated, all interior glass shall be channel glazed with glazing compound. Apply as follows:

Apply ample back compound to rabbet so that it will ooze out when glass is pressed into position and completely cover glass in rabbet. Press glass into position.

Secure glass in place by application of stop beads. Bed stop beads against glass and bottom of rabbet with compound, leaving proper thickness between glass and stop beads. Secure stop beads in place with suitable fastenings. Strip surplus compound from both sides of glass and tool at slight angle to provide clean sight lines.

Glazing Aluminum Entrances and Window Wall System:

Glass shall be set in accordance with aluminum entrances and window walls Manufacturer's shop drawings and instructions.

Install moldings level, plumb and square. Moldings at corners shall be accurately cut, neatly fitted, and joined as recommended by Storefront manufacturer.

**REPLACEMENTS AND CLEANING:**

Condition: At completion of work, all glass shall be free from cracks, sealant smears and other defects.

Protection/Replacement: Protect glass surfaces and edges during the construction period. Keep glass free from contamination by materials capable of staining glass. Any glass that is defective before acceptance, or within one year warranty period, as result of manufacturing, transporting, or performance of Contractor, shall be removed and replaced with new glass without cost to Owner.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1 – GENERAL**

**SUMMARY**

Section includes:

Aluminum Curtain Wall Systems:

1. YKK AP YCW 750 OG Aluminum Curtain Wall System 2 1/2" x 6".

Related Sections:

Sealants: Refer to Division 7 Joint Treatment Section for sealant requirements.

Glass and Glazing: Refer to Division 8 Glass and Glazing Section for glass and glazing requirements.

**SYSTEM DESCRIPTION**

Completed assemblies shall comply with all current NC Building code requirements.

Performance Requirements: Provide aluminum curtain wall systems that comply with performance requirements indicated, as demonstrated by testing manufacturer's assemblies in accordance with test method indicated.

1. Provide internal reinforcing, special members, glazing strength and thickness, and attachment methods as required to meet all wind and lateral load requirements.
2. Wind loads: Completed curtain wall system shall withstand wind pressure loads normal to wall plane calculated in accordance with current N C Building Code requirements.
3. Deflection: Maximum allowable deflection in any member when tested in accordance with ASTM E 330-84 with allowable stress in accordance with AA Specifications for Aluminum Structures.
  - a. Without Horizontals: L/175 or 3/4" (19.1mm) maximum.
  - b. With Horizontals: L/175 or L/240 + 1/4" (6.4mm) for spans greater than 13'-6" (4.1m) but less than 40'-0" (12.2m).
4. Thermal Movement: Provide for thermal movement caused by 180 degrees F (82.2 degrees C) surface temperature, without causing buckling stresses on glass, joint seal failure, undue stress on structural elements, damaging loads to fasteners, reduction of performance, or detrimental affects.
5. Infiltration: Completed curtain wall systems shall have 0.00 CFM/FT2 (0.00m/mm) maximum allowable infiltration when tested in accordance with ASTM E 283-84 at differential static pressure of 6.24 PSF (299 Pa).
6. Water Infiltration: No uncontrolled water on indoor face of any component when tested in accordance with ASTM E 331-86 at a static pressure of 20 PSF (958 Pa).
7. Thermal Performance: When tested in accordance with AAMA 1503.1.88 Condensation Resistance Factor (CRF), and ASTM C236-89 Thermal Transmittance (U Value) as follows:
  - a. CRF: A minimum of 59.
  - b. U Value: 0.66 BTU/HR/FT2/F or less.

**SUBMITTALS**

General: Prepare, review, approve, and submit specified submittals in accordance with "Conditions of the Contract" and Division 1, Submittals Section. Product data, shop drawings, samples, and similar submittals are defined in "Conditions of the Contract".

Product Data: Submit product data for each type curtain wall series specified.

Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including anchorage, accessories, finish colors, and textures. Shop drawings shall include wind load design and reactions and shall bear the seal of a professional engineer licensed in North Carolina.

Samples: Submit verification samples for colors on actual aluminum substrates indicating full color range expected in installed system.

Quality Assurance / Control Submittals:

1. Test Reports: Submit certified test reports showing compliance with specified performance characteristics and physical properties.
2. Installer Qualification Data: Submit installer qualification data.

Close-Out Submittals:

1. Warranty: Submit warranty documents specified herein.
2. Project Record Documents: Submit project record documents for installed materials in accordance with Division 1 Project Close-Out (Project Record Documents) Section.

## **QUALITY ASSURANCE**

Qualifications:

Installer Qualifications: Installer experienced (as determined by Contractor) to perform work of this section who has specialized in the installation of work similar to that required for this project. If requested by Owner, submit reference list of completed projects.

Manufacturer Qualifications: Manufacturer capable of providing field service representation during construction, approving acceptable installer and approving application method.

Mock-Ups (Field Constructed): Install at project site a job mock-up using acceptable products and manufacturer approved installation methods. Obtain Owner's and Architect's acceptance of finish color, and workmanship standard.

Mock-Up Size:

Maintenance: Maintain mock-up during construction for workmanship comparison; remove and legal dispose of mock-up when no longer required.

Incorporation: Mock-up may be incorporated into final construction upon Owner's approval.

Pre-Installation Meetings: Conduct pre-installation meeting to verify project requirements, substrate conditions, manufacturer's installation instructions, and manufacturer's warranty requirements.

## **PROJECT CONDITIONS / SITE CONDITIONS**

Field Measurements: Verify actual measurements / openings by field measurements before fabrication; show recorded measurements on shop drawings. Coordinate field measurements, fabrication schedule with construction progress to avoid construction delays.



## **WARRANTY**

Project Warranty: Refer to “Conditions of the Contract” for project warranty provisions.

Manufacturer’s Warranty: Submit, for Owner’s acceptance, manufacturer’s standard warranty document executed by authorized company official. Manufacturer’s warranty is in addition to, and not a limitation of, other rights Owner may have under the Contract Documents.

Beneficiary: Issue warranty in the legal name of the project Owner.

Warranty Period: 5 years commencing on Date of Substantial Completion.

Warranty Acceptance: Owner is sole authority who will determine acceptability of manufacturer’s warranty documents.

Anodized Finish Warranty: 10-year warranty commencing on Date of Substantial Completion.

## **PRODUCT 2 – PRODUCTS**

### **MANUFACTURERS**

Acceptable Manufacturers: YKK AP America, Inc., Kawneer, EFCO

Curtain Wall Systems:

1. YKK AP YCW 750 OG Aluminum Curtain Wall System 2 ½” x 6”

Curtain Wall Framing System:

Description: Framing shall be thermally improved. Horizontal and vertical framing members shall have a nominal face dimension of 2 ½”. Depth as indicated on drawings. Framing system shall provide an outside glazed appearance on all sides with no protruding glass stops. Provide structural silicone vertical glazing where indicated.

### **MATERIALS**

Extrusions: ASTM B 221 (ASTM B 221M), 6063-T5 Aluminum Alloy.

Aluminum Sheet:

Anodized Finish: ASTM B 209 (ASTM B 209M), 5005-H14 Aluminum Alloy, 0.050” (1.27mm) minimum thickness.

Painted Finish: ASTM B 209 (ASTM B 209M), 3003-H14 Aluminum Alloy, 0.080” (1.95mm) minimum thickness.

### **ACCESSORIES**

Manufacturer’s Standard Accessories:

Fasteners: Zinc plated steel concealed fasteners; hardened aluminum alloys or A131 300 Series stainless steel exposed fasteners, countersunk, finish to match aluminum color.

Sealant: Non-skinning type, AAMA 803.3.

Glazing: Setting blocks, edge blocks, and spacers in accordance with ASTM C 864, shore durometer hardness as recommended by manufacturer; glazing gaskets in accordance with ASTM C 864.

**RELATED MATERIALS** (Specified in Other Sections)

Glass: Refer to Division 8 Glass and Glazing Section for glass materials.

**FABRICATION**

Shop Assembly: Fabricate and assemble units with joints only at intersection of aluminum members with hairline joints, rigidly secure, and sealed in accordance with manufacturer's recommendations.

Welding: Conceal welds on aluminum members in accordance with AWS recommendations or methods recommended by manufacturer. Members showing welding bloom or discoloration on finish or material distortion will be rejected.

Fabrication Tolerance:

Material Cuts: Square to 1/32" (0.8mm) off square, over largest dimension; proportionate amount of 1/32" (0.8mm) on the two dimensions.

Maximum Offset: 1/64" (0.4mm) in alignment between two consecutive members in line, end to end.

Maximum Offset: 1/64" (0.4mm) between framing members of glazing pocket corners.

Joints (Between adjacent members in same assembly): Hairline and square to adjacent member.

Variation (In squaring diagonals for doors and fabricated assemblies): 1/16" (1.6mm).

Flatness (For doors and fabricated assemblies): + / - 1/16" (1.8mm) off neutral plane.

**FINISHES AND COLORS**

Anodized Finish: YKK AP America, Inc. Anodized Finish

Clear Anodized, with protective composite coating.

Shop Finishing: Prepare aluminum surfaces for specified finish; apply shop finish in accordance with the following:

1. Anodized Coating: Electrolytic color coating followed by an organic top coating applied to aluminum extrusions produced from quality controlled billets meeting AA-6063-T5.
  - a. Exposed surfaces shall be free of scratches and other serious blemishes.
  - b. Extrusion shall be given a caustic etch followed by an anodic oxide treatment and sealed with an organic electrodeposition applied protective top coating.
  - c. Overall coating thickness for finishes shall be a minimum of 0.7 mils.
  - d. Coating shall conform to Aluminum Association (AA) standard AAM12C22A4X designation shall signify an anodic coating of 0.4 mils minimum followed by an organic top coating of a minimum 0.3 mils.
  - e. In addition to Aluminum Standard above, finish shall conform to the following:
    - 1) AAMA 605.2 Mortar Resistance Test Specifications; Test Method per ASTM C207, 24 Hour Pat Test.
    - 2) CASS Corrosion Resistance Test: CASS 240/ASTM B368 Test Method.

- 3) Other AAMA 605.2 Performance Tests specified in these specifications, such as 7.3 Dry Film Hardness; 7.8.2 Salt Spray Resistance; 7.9.1.2 Color Retention, South Florida; 7.9.1.4 Gloss Retention, South Florida.

**Finishes Testing:**

1. Apply 0.5% solution NaOH, sodium hydroxide, to small area of finished sample area; leave in place for sixty minutes, lightly wipe off NaOH; Do not clean area further.
2. Submit samples with test area noted on each sample.

Anodized Finish Warranty: 10-year warranty commencing on Date of Substantial Completion.

**PART 3 – EXECUTION**

**MANUFACTURER’S INSTRUCTIONS / RECOMMENDATIONS**

Compliance: Comply with manufacturer’s product data, including product technical bulletins, product catalog installation instructions, and product carton instructions.

**EXAMINATION**

Site Verification of Conditions: Verify substrate conditions (which have been previously installed under other sections) are acceptable for product installation in accordance with manufacturer’s instructions.

**PREPARATION**

Adjacent Surfaces Protection: Protect adjacent work areas and finish surfaces from damage during product installation.

**INSTALLATION**

General: Install manufacturer’s system in accordance with shop drawings, and within specified tolerances.

1. Protect aluminum members in contact with masonry, steel, concrete, or dis-similar materials using nylon pads or bituminous coating.
2. Shim and brace aluminum system before anchoring to structure.
3. Verify curtain wall system allows water entering system to be collected in gutters and weeped to exterior. Verify weep holes are open, and metal joints are sealed in accordance with manufacturer’s installation instructions.
4. Seal metal to metal curtain wall system joints using sealant recommended by system manufacturer.

**FIELD QUALITY CONTROL**

Manufacturer’s Field Services: Upon Owner’s request, provide manufacturer’s field service consisting of product use recommendations and periodic site visit for inspection of product installation in accordance with manufacturer’s instructions.

Field Test: Conduct field test to determine water-tightness of curtain wall system. Conduct test in accordance with NAAMM FC-1-76 at locations selected by Architect.

Perform minimum of three tests. Perform test in Architect’s presence.

**ADJUSTING AND CLEANING**

Adjusting: Adjust operating items as recommended by manufacturer.

Cleaning: The General Contractor shall clean installed products in accordance with manufacturer's instructions prior to Owner's acceptance, and remove construction debris from project site. Legally dispose of debris.

Protection: The General Contractor shall protect installed product's finish surfaces from damage during construction.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Under this Section, provide gypsum board for wall assemblies (non-fire rated and fire-rated), partitions, ceilings, ceiling access doors, fireproofing for beams and columns as indicated on drawings and as specified herein.

Note all gypsum drywall, except as noted on drawings, shall be provided with a LEVEL 4" gypsum wallboard finish.

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this Section refer to Section 01068.

**QUALITY ASSURANCE:**

Manufacturers:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured or furnished by United States Gypsum Company.

Acceptable Manufacturers: Products of following manufacturers which meet all requirements of these specifications will be acceptable:

- U.S. Gypsum
- CertainTeed Corporation
- Georgia-Pacific
- National Gypsum Company

Source: Products for use on this Project shall be of one Manufacturer for same function, unless noted specifically otherwise herein.

**SUBMITTALS:**

Manufacturer's Data: Submit (in duplicate) Manufacturer's printed catalog cuts, installation instructions, and finishing instructions.

Test Reports: Submit (in duplicate) reports from Underwriter's Laboratories, Inc. or other acceptable testing agencies, on fire tests of designs referred to in Contract Documents.

Mock-up Sample: When required, fabricate a field sample mock-up of gypsum wallboard with the specified "orange peel" texture applied, for review and approval by Architect. Approved mock-up will stand on site for reference as the project standard for all orange peel textured walls.

Mock-up Sample: Fabricate a field sample mock-up of gypsum wallboard aluminum reveals, for review and approval by Architect. Approved mock-up will stand on site for reference as the project standard for all aluminum reveal walls.

**PRODUCT HANDLING:**

Delivery: Deliver materials in original packages, containers or bundles bearing brand name and name of manufacturer or supplier for whom product is manufactured.

Storage: Gypsum board and insulation material delivered prior to use shall be stored within completely weather tight structure, off ground, and completely enclosed within weather tight covering. Stack all board materials on 2"x 4" risers, spaced 16" o.c. Weather tight covering shall also extend completely under stacked material to prevent seepage of moisture if over uncovered ground or damp slab.

Handling: Exercise care, during handling and storage, to avoid undue sagging or damage to edges, ends, and surfaces.

**ENVIRONMENTAL CONDITIONS:**

Building: Application of gypsum board shall commence only after structure is completely weather -tight.

Temperature: In cold weather and during period of gypsum board application and joint finishing maintain temperatures in building uniformly within range of 55 degrees to 70 degrees F. Provide adequate ventilation to eliminate excessive moisture in building during same period.

**PART 2: PRODUCTS**

**MATERIALS:**

Gypsum Board shall be furnished in 48" widths and in lengths of at least 2" greater than height from floor to finished ceiling to permit vertical installation of all boards. Contractor shall have option to furnish boards for vertical installation full height to structure above where required in one sheet, 48" wide.

Types: Gypsum Board shall conform to following:

1. Gypsum Board shall be fire-resistive type throughout of various thicknesses indicated, equivalent to Sheetrock Brand Firecode C. Provide impact resistant gypsum wallboard at locations indicated on Drawings.
2. All 5/8" thick gypsum board shall be taper-edged, fire-resistive, conforming to ASTM C 1396.
3. Mold and Mildew Resistant Gypsum Board shall be "Sheetrock Mold Tough Gypsum Wallboard" 5/8" tapered-edge with treated manila paper finish and "Sheetrock Mold Tough Fire-code C Wallboard, 5/8" tapered-edge with treated manila paper finish for 1 hour rated partitions. Use 5/8" mold and mildew resistant gypsum board for ceilings of janitor closets, shower rooms, tub rooms.
4. Tile Backer Board: Use 5/8" tile backer board for backup of all areas scheduled to receive thin set ceramic tile. Moisture resistance silicone core reinforced with inorganic glass fiber matt. "DenShield Tile Guard" by Georgia-Pacific, or equal products by approved manufacturers.
5. Exterior Wall Sheathing Board shall be 5/8" thick fire retarding fiberglass reinforced gypsum board, with sealed and taped joints: "Dens-Glass Gold" by Georgia-Pacific, or equal products by approved manufacturers.

6. Gypsum Soffit board shall be 5/8" thick, fire coded, exterior gypsum soffit board by Bestwall, U. S. Gypsum, or equal products by approved manufacturers.
7. Wall Spray Texture: SHEETROCK Wall & Ceiling Spray Texture, SHEETROCK Wall & Ceiling Texture (TUF-TEX), SHEETROCK Wall & Ceiling Spray Texture – Ready Mixed.
8. Sheetrock Brand First Coat drywall finishing primer.

**FASTENERS:**

Screws for attachment of board to metal studs and metal ceiling and wall furring shall be 7/8" or 1" US Drywall Screw, Type S. All screws shall have bugle head.

**METAL AND PLASTIC CORNER BEADS AND TRIM:**

Interior Work:

Plastic: All external corners are to be bullnozed radius trimmed unless otherwise indicated.

Metal: Fabricate metal corner beads from galvanized steel, not lighter than 0.02" nominal thickness, in following shapes and sizes.

1. Corner Beads for all 90 degree external corners shall be equivalent to USG No. 100-Perf-A-Bead.
2. Corner Beads for all radiused external corners shall be heavy duty plastic, equivalent to No. BCB100, radiused bullnoze corner bead by Vinyl Corporation.
3. Metal Trim shall be equivalent to USG 200 Series Perf-A-Trim, sized for wallboard thickness.
4. Anodized Aluminum Reveals: Continuous anodized aluminum reveals shall be provided in profile and layout indicated on Drawings, with factory fabricated intersections. Install or provide mock-up installation samples for Architect's review and obtaining final approval prior to proceeding with installations. Fry Reglet or equivalent.

**REINFORCING TAPE AND JOINT TREATMENT (INTERIOR)**

Tape shall be equivalent to "Perf-A-Tape".

Compound for embedding and fill coat application shall be equivalent to "Perf-A-Tape Joint Compound".

Compound for finishing shall be equivalent to "Perf-A-Tape Topping Compound".

**ADHESIVE AND CAULKING:**

Laminating Adhesive: Laminating adhesive for face layer application in double-layer systems shall be equivalent to "Perf-A-Tape Joint Compound, embedding type".

Caulking Compound: Acoustical type sealant, furnished by Gypsum Board products manufacturer.

**CRACK CONTROL JOINTS:**

Crack control joints shall be provided in pre-approved locations as directed by the Drawings and the Architect, at each jamb of windows exceeding 10' in width, in walls at 40' intervals, and in ceilings at 30' intervals. Provide manufacturer standard metal exp/control joint material.

### PART 3: EXECUTION

#### CONDITION OF SURFACES:

Inspection: Examine surfaces to receive gypsum board for defects, which might impair quality of finished installation. Do not start work until such defects have been corrected.

Framing Spacing: Framing members to which gypsum board will be fastened shall be straight and true, and spaced as indicated on Drawings, not to exceed 16" o.c. for walls and ceilings. Framing and bridging members shall be adequate to carry design or code loading. Bridging members shall be spaced 48" o.c.

Supplemental Framing: Provide back blocking and framing as necessary for support of fixtures and all mounted equipment.

Coordination: Conduit, piping, retainers for corner guards and other items to be concealed by or penetrating, wallboard shall be installed and tested before applying wallboard.

#### INSTALLATION OF GYPSUM BOARD:

##### Cutting and Fitting:

Cut gypsum board by scoring and breaking, or by sawing. Work from face side.

Cut edges and ends of gypsum board shall be smoothed where necessary, in order to obtain neat jointing when board is erected.

Cut-outs for pipes, fixtures or other small openings shall be scored on face and back in outline before removal, or shall be cut out with saw or other suitable tools.

Where gypsum board meets projecting surfaces, scribe and cut neatly, fitting closely for caulked joint.

##### Application of Gypsum Board:

Apply continuous bead of Acoustical Sealant on floor at line of contact of board.

Walls: Apply gypsum board vertically, pressing into sealant, with boards in moderate contact, but not forced into place. At interval and external corners conceal cut edges of boards by overlapping covered edges of abutting boards. Arrange joints on opposite sides of partitions so as to occur on different framing members. Place long dimensions of panels parallel to furring or framing members. Panels shall be of length required to reach from 2" above ceiling line to floor line in one continuous length. Make joints over framing or furring members.

Ceilings: Apply board to ceilings with long dimension of board at right angles to furring members. At perimeters of all ceilings, edge joint shall be laid on metal trim strip against continuous bead of caulking, applied in advance of board application.

Gypsum Board End Joint at masonry walls shall be laid on metal trim strip against continuous bead of caulking, applied in advance of board application.

Corner Beads and Metal Trim: Internal corners do not require corner beads, but shall be reinforced with tape. External corners shall have corner bead fitted neatly over corner, and secured with same type fasteners used for applying wallboard.



**ATTACHMENT:**

Method: Space fasteners not less than 3/8" nor more than 1/2" from edge and ends of board. While fasteners are being driven, hold board in firm contact with under laying support. Application of fasteners shall proceed from central portion of board to ends and edges. If paper surface is broken by fastener in attachment, drive another fastener approximately 2" from faulty fastener.

Drive screws to provide screw head penetration just below gypsum board surface.

Spread adhesive over laminating surface of face or base layer gypsum board. Extend adhesive up to ends and edges of all board.

Spacing of Fasteners shall be as follows:

Screw Method: Space screws at maximum of 12" o.c. for ceilings and 16" o.c. for walls.

Corner Beads and Trim shall have fasteners spaced 6" o.c. driven through gypsum board into framing members.

**JOINT FINISHING AND FASTENER CONCEALMENT:**

Provide "LEVEL 4" gypsum wallboard finish at all areas, unless indicated otherwise.

Provide total coverage coat of Sheetrock Brand First Coat Primer or equivalent prior to paint coats. Reference 09900.

Method: Mix and use joint compound and topping compound in accordance with manufacturer's recommendations printed on bag. Apply by machine or hand tool. Allow minimum drying time of 24 hours between adhesive coats. Sand all coats as necessary after each application. Clean excess compound from surface of gypsum board as compound is applied.

Reinforcement: Reinforce wall and ceiling angles and inside vertical corner angles with tape folded to conform to adjoining surfaces, and to form straight, true angle. All gypsum board joints except joints at metal trim shall be tapered.

Embedment Coat: Apply thin, uniform layer of joint compound (embedding type) approximately 3" wide over joint to be reinforced. Center tape over joint and seat into compound; leaving sufficient compound under tape to provide proper bond. Apply skim coat of compound immediately after embedding tape.

Fill Coat: After drying, cover embedding compound with fill coat of compound. Spread evenly over and slightly beyond tapered edge area of board. Feather at edges.

Topping: Cover fill coat with topping compound. Spread evenly over and slightly beyond edge of proceeding coat. Feather with smooth, uniform finish.

Fastener Concealment: Treat dimples at fasteners (and holes where temporary fasteners are removed) with three coats of joint compound applied as each coat is applied to joints.

Conceal flanges of all corner beads and trim members by minimum of two coats of compound applied strictly in accordance with Manufacturer's directions.

Caulking:

Joints at Penetrations: Where pipes, conduits, ducts, electrical devices, etc., penetrate gypsum board, seal joint around perimeter with caulking compound.

Joints between ceilings and walls shall be sealed continuously with acoustical sealant, as specified above.

**DRYWALL CEILING ACCESS DOORS:** Provide 24" x 24" x 16 gauge minimum primed steel ceiling access doors each space with drywall ceiling, hinged and with key lock. Provide UL Listed fire-rated doors all locations where a rating is required. Provide USG No. 200-B metal trim on all edges of gypsum board. Finish as specified in 09900 Paint.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Work under this section includes providing metal stud partition system, metal ceiling furring system, metal wall furring system and metal ceiling suspension system, for installation of gypsum board.

**RELATED WORK:**

Section 05400 Cold-Formed Metal Stud Framing  
Section 09250 Gypsum Drywall Systems

**INDUSTRY STANDARDS:**

For listing of names of industry standard agencies mentioned by abbreviation in this section refer to Section 01068.

**QUALITY ASSURANCE:**

Manufacturers:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured or furnished by United States Gypsum Company.

Acceptable Manufacturers: Products of following manufacturers, which meet all requirements of these specifications, will also be acceptable:

- ClarkDietrich Building Systems
- MarinoWARE
- Telling Industries

Source: Products for use on this Project shall be of one manufacturer for same function, unless noted specifically otherwise herein.

**SUBMITTALS:**

Shop Drawings: Show complete details of construction, including gauges of metal, anchors, fastenings, special fittings, and accessories. Show ceiling framing and furring, special wall framing, and framed openings.

Manufacturer's Data: Submit (in duplicate) Manufacturer's printed data on materials and installation for work specified herein. Include reports on fire tests and physical data.

**PRODUCT HANDLING:**

Delivery: Deliver materials to Project site in the original packages, containers or bundles, bearing brand name, and name of manufacturer or supplier for whom product is manufactured.

Storage: Store materials to prevent damage from exposure to elements.

## **PART 2: PRODUCTS**

**METAL STUD PARTITION SYSTEM:** Metal stud partition system shall be USG Metal Stud System, or approved equal, designed for screw attachment of gypsum board, furnished with required fasteners and accessories for complete system.

Steel Studs shall be C-shaped, formed from not less than 20-gauge galvanized steel sheets, USG width as shown on drawings. Stud webs shall have punched holes throughout for utility lines or wiring.

Metal Floor and Ceiling Runners shall be channel-shaped, formed from not less than 25-gauge galvanized steel sheets, with minimum 1-1/4" flanges and web-sized to nest with steel studs specified.

Screws for attachment of studs to runner and other framing fastening where specified shall be 3/8" USG Drywall Screw, Type S, pinhead.

**WALL FURRING SYSTEM:** Wall furring system shall be USG Drywall Wall Furring System, designed for screw attachment of gypsum board furnished with required fasteners and accessories for complete system.

Furring Channels shall be hat-shaped USG Drywall Furring Channels, or equal, roll-formed from not less than 25-gauge galvanized steel, 2-3/4" wide by 7/8" deep with 1/2" minimum wing flanges and 1-3/8" minimum crown width for gypsum board attachment.

Fasteners for attachment of furring channels (or wall furring brackets) shall be as recommended by furring manufacturer.

Brackets for furred-out utility space shall be USG adjustable wall furring brackets, formed from not less than 20-gauge galvanized steel. Horizontal leg shall have serrated edges for wire-tie of carrying channels.

Carrying Channels shall not be less than 16-gauge cold-rolled channels, 3/4" web width and 1/2" flange depth, spaced 48" on center maximum. Finish with black asphaltum.

Tie Wire shall be not less than 16-gauge soft annealed carbon steel wire.

**CEILING FRAMING SYSTEM:** Ceiling-framing system for furred and suspended gypsum board ceilings shall be USG Drywall Ceiling System, designed for screw attachment of gypsum board, furnished with required fasteners and accessories for complete system.

Furring Channels for gypsum board applied to ceiling framing shall be hat-shaped USG Drywall Furring Channels, roll-formed from not less than 25-gauge galvanized steel, 2-3/4" wide by 7/8" deep with 1/2" minimum wing flanges and 1-3/8" minimum crown width for gypsum board attachment. Provide cross-carrying channels as specified at 48" centers.

Furring Channels for dropped ceilings, soffits, and where indicated at expansion joints shall be C-shaped studs, formed from not less than 25-gauge galvanized steel sheets, and of sizes indicated on Drawings.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1: GENERAL**

**DESCRIPTION OF WORK:**

Extent of painting work is shown on drawings and schedules, and as herein specified.

The work includes painting and finishing of all interior and exterior exposed items and surfaces throughout project, except as otherwise indicated.

Surface preparation, priming and coats of paint specified are in addition to shop-priming and surface treatment specified under other sections of work.

**"PAINT"** as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

Paint all exposed surfaces, unless otherwise noted, whether or not colors are designated in "schedules", except where natural finish of material is specifically noted as a surface not to be painted. Where items or surfaces are not specifically mentioned, paint same as adjacent similar materials or areas. If color or finish is not designated, Architect will select these from standard light colors available for materials systems specified. Where indicated, "accent" colors are medium to deep shades, which shall require no more than one additional paint coat.

Following categories of work are not included as part of field-applied finish work, or are included in other sections of these specifications.

Shop Priming: Unless otherwise specified, shop priming of ferrous metal items is included under various sections for structural steel, miscellaneous metal, hollow metal work, and similar items. Also, for fabricated components such as architectural woodwork, wood casework, and shop-fabricated or factory-built mechanical and electrical equipment or accessories.

Pre-Finished Items: Unless otherwise indicated, do not include painting when factory-finishing or installer finishing is specified for such items as (but not limited to) metal toilet enclosures, prefinished partition systems, acoustic materials, architectural woodwork and casework, finished mechanical and electrical equipment including light fixture, switchgear and distribution cabinets, elevator entrance frames, doors and equipment.

Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

**SUBMITTALS:**

Product Data: Submit manufacturer's technical information including paint label analysis and application instructions for each material proposed for use.

Samples: Submit samples for Architect's review of color and texture only. Provide a listing of material and application for each coat of each finish sample.

On 12"x12" hardboard, provide sample of each color and material, with texture to simulate actual conditions. On CMU face shell, provide sample of each color and material, with texture to simulate actual

conditions Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved.

Wall Mockup: Paint 10'x10' section of wall with permanent lighting illumination for Architect's review and approval, prior to ordering paint materials.

Epoxy Paint Product Data: Epoxy paint manufacturer shall provide documentation that the epoxy product is tested and approved for application in such locations and for application on the surface material that is being used, and use is in compliance 2012 NC Building Code Sections 1210.2 and 1210.3; and in compliance with 2012 Plumbing code Sections 419.3 and 417.4.1 for providing smooth, hard non-absorbent surfaces adjacent to urinals and water closets and shower heads.

**DELIVERY AND STORAGE:**

Deliver materials to job site in original, new and unopened packages and containers bearing manufacturer's name and label, and following information:

- Name or title of material
- Fed. Spec. number, if applicable
- Manufacturer's stock number and date of manufacturer
- Manufacturer's name
- Contents by volume, for major pigment and vehicle constituents
- Thinning instructions
- Application instructions
- Color name and number

**JOB CONDITIONS:**

Apply water-base paints only when temperature of surfaces to be painted and surrounding air temperatures are between 50 degrees F (10 degrees C) and 90 degrees F (32 degrees C), unless otherwise permitted by paint manufacturer's printed instructions.

Apply solvent-thinned paints only when temperature of surfaces to be painted and surrounding air temperatures are between 45 degrees F (7 degrees C) and 95 degrees F (35 degrees C), unless otherwise permitted by paint manufacturer's printed instructions.

Do not apply paint in snow, rain, fog or mist; or when relative humidity exceeds 85%; or to damp or wet surfaces; unless otherwise permitted by paint manufacturer's printed instructions.

Painting may be continued during inclement weather if areas and surfaces to be painted are enclosed and heated within temperature limits specified by paint manufacturer during application and drying periods.

**PART 2: PRODUCTS**

**COLORS AND FINISHES:**

Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

Paint Coordination: Provide finish coats which are compatible with prime paints used. Review other sections of these specifications in which prime paints are to be provided to ensure compatibility of total coatings system for various substrates.

Federal Specifications establish minimum acceptable quality for paint materials. Provide written certification from paint manufacturer that materials provided meet or exceed these minimums.

Provide undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits.

**EXTERIOR PAINT SYSTEMS:**

- A. GALVANIZED METAL - (G60 Galvanized Steel; including Structural Steel Columns, Beams, Miscellaneous Structural Steel Members, Miscellaneous Steel Framing, Miscellaneous Stair & Ornamental Iron excluding treads, Catwalks excluding steel bar grating and treads, Fire Escapes, Hydrants). Note: G90 hot-dipped galvanized surfaces shall not be painted.

1. Acrylic Systems

a. Gloss Finish

- i. Surface Preparation: Refer to Part 3 Surface Preparations of these specifications for Cleaning & Testing/Evaluations; Manufacturer's guidelines and recommendations stand as requirements of this work.
- ii. 1<sup>st</sup> Coat: S-W Pro-Cryl Universal Primer, B66-310 Series (10 mils wet, 4.0 mils dry film thickness)
- iii. 2<sup>nd</sup> Coat: S-W Sher-Cryl HPA High Performance Acrylic, B66-300 Series (10 mils wet, 4 mils dry film thickness)
- iv. 3<sup>rd</sup> Coat: S-W Sher-Cryl HPA High Performance Acrylic, B66-300 Series (10 mils wet, 4 mils dry film thickness)

- B. METAL - (Shop Primed Metal Doors and Frames/ Panels, etc.)

1. Acrylic Systems

a. Gloss Finish

- i. Surface Preparation: Manufacturer's guidelines and recommendations stand as requirements of this work
- ii. 1<sup>st</sup> Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-500 Series
- iii. 2<sup>nd</sup> Coat: S-W Pro Industrial Multi-Surface Acrylic, B66-500 Series (4 mils wet, 2 mils dry per coat)

- C. EXTERIOR BRICK WATERPROOFING - (Apply to Existing Exterior Brick Masonry where indicated on Drawings)

1. Silane/Siloxane Penetrating Water Repellant Sealer Systems

- a. Transparent / No Gloss Finish
  - i. Surface Preparation: Manufacturer's guidelines and recommendations stand as requirements of this work
  - ii. 1<sup>st</sup> Coat: W. R. Meadows INTRAQUARD Silane/Siloxane Sealing compound (50 sq. ft. per gallon)
  - iii. 2<sup>nd</sup> Coat: W. R. Meadows INTRAGUARD Silane/Siloxane Sealing compound (50 sq. ft. per gallon)

## INTERIOR PAINT SYSTEMS

- A. MASONRY/CONCRETE - (Walls & Ceilings, Concrete Beams, Concrete Roof Decks, Poured Concrete, Precast Concrete, Unglazed Brick or Block CMU, Cement Board)

- 1. Alkyd Enamel Systems

- a. Semi-Gloss Finish
  - i. 1<sup>st</sup> Coat: Loxon Block Surfacers, LX01W0200 (1 to 2 coats tinted and rolled in to fill all pits and pores completely, 16 wet mils, 8.8 dry mils).
  - ii. 2<sup>nd</sup> Coat: S-W Pro-Classic Interior Alkyd Semi-Gloss, B34 Series
  - iii. 3<sup>rd</sup> Coat: S-W Pro-Classic Interior Alkyd Semi-Gloss, B34 Series (4 mils wet, 1.6 mils dry per coat)

- B. WET AREAS - (All Food Service Area walls, All Toilets and Restrooms CMU walls and Gypsum Board Walls and Ceilings, All Shower Wall and Ceilings, All High Moisture Areas). NOTE: Epoxy paint manufacturer shall provide documentation that the epoxy product is tested and approved for application in such locations and for application on the surface material that is being used.

- 1. Epoxy Systems

- a. Gloss Finish
  - i. 1<sup>st</sup> Coat for Existing Walls Oil Based Painted: S-W Extreme Bonding Primer, B51W00150 (3.1 mils wet, 0.9 mils dry)
  - ii. 1<sup>st</sup> Coat New CMU: S-W Loxon Block Surfacers, LX01W0200 (1 to 2 coats tinted and rolled in to fill all pits and pores completely, 16 wet mils, 8.8 dry mils).
  - iii. 1<sup>st</sup> Coat New Gyp. Bd.: S-W ProMar 200 Zero VOC Latex Primer, B28W02600 (4 mils wet, 1.0 mils dry)
  - iv. 2<sup>nd</sup> Coat: S-W Water Based Catalyzed Epoxy Gloss, B73-300 Series (8 mils wet, 4 mils dry)
  - v. 3<sup>rd</sup> Coat: S-W Water Based Catalyzed Epoxy Gloss, B73-300 Series (8 mils wet, 4 mils dry)

- C. CONCRETE FLOORS – (Auditorium Floors, Shop Floors, Utility Equipment Platforms, Custodial Spaces, Stairwells, Electrical Equipment Rooms, Boiler Rooms).



1. Urethane Systems

a. Gloss Finish (TBD pigment color)

- i. 1<sup>st</sup> Coat: Pressure wash, and SSPC prep
- ii. 2<sup>nd</sup> Coat: S-W Armorseal Rexthane I, B65-60 Series Gloss (3.0 – 4.5 mils wet, 2.0 – 3.0 dry)
- iii. 3<sup>rd</sup> Coat: S-W Armorseal Rexthane I, B65-60 Series Gloss (3.0 – 4.5 mils wet, 2.0 – 3.0 dry), (shop floors with anti-slip additive)

D. METAL – (Structural Steel Columns, Joists, Trusses, Beams, Miscellaneous Structural Steel Members, Miscellaneous & Ornamental Iron, Sashes, Doors, Door Frames, Partitions, Cabinets, Lockers, Radiators, Wall Louvers, Pumps, Motors, Machines, Convector, Ducts [Ventilating], Electrical Raceways & Conduits, Elevator Cabs, Copper, Non-Galvanized Metal)

1. Alkyd Systems

a. Gloss Finish

- i. 1<sup>st</sup> Coat: S-W Kem Bond HS, Universal Metal Primer, B50 Series (10 mils wet, 3.8 mils dry film thickness)
- ii. 2<sup>nd</sup> Coat: S-W Industrial Enamel - Alkyd Gloss Enamel, B54-100 Series
- iii. 3<sup>rd</sup> Coat: S-W Industrial Enamel - Alkyd Gloss Enamel, B54-100 Series (9 mils wet, 3.9 mils dry per coat)

2. Dryfall Systems (EXPOSED CEILING; Structure, Ceilings, Ductwork, Conduits, where Scheduled)

a. Flat Sheen Finish

- i. 1<sup>st</sup> Coat: S-W Pro-Cryl Universal Primer, B66-310 Series (10 mils wet, 4.0 mils dry film thickness)
- ii. 2<sup>nd</sup> Coat: S-W Waterborne Acrylic Dry Fall, B42BW3 (9.0 mils wet, 3.5 mils dry)
- iii. 3<sup>rd</sup> Coat: S-W Waterborne Acrylic Dry Fall, B42BW3 (9.0 mils wet, 3.5 mils dry)

E. METAL - (Galvanized)

1. Alkyd Systems

a. Gloss Finish

- i. Surface Preparation: Refer to Part 3 Surface Preparations of these specifications for Cleaning & Testing/Evaluations; Manufacturer's guidelines and recommendations stand as requirements of this work.
- ii. 1<sup>st</sup> Coat: S-W Pro Industrial Pro-Cryl Primer, B66-1300 Series (10 mils wet, 3.8 mils dry film thickness)

- iii. 2<sup>nd</sup> Coat: S-W Industrial Enamel - Alkyd Gloss Enamel, B54-100 Series
  - iv. 3<sup>rd</sup> Coat: S-W Industrial Enamel - Alkyd Gloss Enamel, B54-100 Series (9 mils wet, 3.9 mils dry per coat)
- F. NON-TEXTURED SMOOTH DRYWALL (Walls, Ceilings, Gypsum Board, Wood Pulp Board, Plaster Board, Etc.)
- 1. Alkyd Enamel Systems
    - a. Satin Finish (UNLESS NOTED OTHERWISE)
    - b. FLAT SHEEN WHITE for drywall prosceniums, bulkheads, overhead drywall ceilings
    - c. Base Coat: SHEETROCK Brand First Coat (drywall finishing surface coat for equalizing textures, coordinate with 09250)
      - i. 1<sup>st</sup> Coat: S-W Premium Wall & Wood Primer, B28W08111 (4 mils wet, 1.6 mils dry)
      - ii. 2<sup>nd</sup> Coat: S-W Pro-Classic Interior Alkyd Satin, B33 Series
      - iii. 3<sup>rd</sup> Coat: S-W Pro-Classic Interior Alkyd Satin, B33 Series (4 mils wet, 1.7 mils dry per coat)
- G. CANVAS PIPE WRAP (exposed to view)
- 1. Latex Systems
    - a. Flat Finish
      - i. 1<sup>st</sup> Coat: S-W PrepRite 200 Latex Primer, B28W200 (add fungicidal agent) (4 mils wet, 1.2 mils dry)
      - ii. 2<sup>nd</sup> Coat: S-W ProMar 200 Latex Flat B30W200 Series (4 mils wet, 2 mils dry)
      - iii. 3<sup>rd</sup> Coat: S-W ProMar 200 Latex Flat B30W200 Series (4 mils wet, 2 mils dry)
- J. BONDING PRIMER (Does not apply to existing or new "Spectraglaze" block): (Interior Hard, Slick, Glossy Surfaces such as Existing Oil Based Wall Paint, Existing Painted CMU, PVC Piping, Plastics, Glass, Laminate, Aluminum, Varnished Woodwork, Ceramic Wall Tile, Glazed Block, Fluoropolymer Coatings)
- 1. Acrylic Systems
    - b. S-W Extreme Bonding Primer, B51W00150 (3.1 mils wet, 0.9 mils dry)

**PART 3: EXECUTION**

**INSPECTION:**

Applicator must examine areas and conditions under which painting work is to be applied and notify Contractor in writing of conditions detrimental to proper and timely completion of manner acceptable to Applicator.

Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area.

Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

**SURFACE PREPARATION:**

General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions, SSPC-SP, and as herein specified, for each particular substrate condition.

SSPC-SP: Steel Structures Paint Council Surface Preparation Specification

Clean surfaces to be painted before applying paint or surface treatments. Remove oil and grease prior to mechanical cleaning. Program cleaning and painting so that contaminants from cleaning process will not fall onto wet, newly-painted surfaces.

Wood: Clean wood surfaces to be painted. Remove dirt, oil, or other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sandpaper smooth those finished surfaces exposed to view, and dust off. Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

Ferrous Metals: Clean ferrous surface, which are not galvanized or shop-coated, of oil, grease, dirt, loose mill scale and other foreign substances by solvent or mechanical cleaning.

Touch-up shop-applied primed coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.

Galvanized Surfaces:

Hot-Dipped Galvanizing: Allow hot-dipped galvanized items to weather 6 months prior to surface preparations, and then steam clean per SSPC-SP 1. Do not use hydrocarbon solvents, vinegar or other mild acids for cleaning hot dipped galvanized surfaces. After cleaning, perform spot testing for any manufacturer's pre-treatments, using the procedure from ASTM D2092, Method B201, Volume 06.01. After pre-treatments testing, apply 2' x 2' paint test patch for evaluation of paint surface adhesion. Evaluate the adhesion at three locations of the surface area, by performing a tape adhesion test per ASTM Method D3359. Grade the tape adhesion of the coating by following ratings as set forth in ASTM D3359-97.

Galvalume: Clean free of grease, oil, dirt, soil, and other surface contaminants with hydrocarbon free solvent cleaner. Perform a light brush blasting per SSPC-SP7 if necessary. After cleaning, apply 2' x 2' paint test patch for evaluation of paint surface adhesion. Evaluate the adhesion at three locations of the surface area, by performing a tape adhesion test per ASTM Method D3359. Grade the tape adhesion of the coating by following ratings as set forth in ASTM D3359-97.

Special Food Service Area Wall Preparation: Special preparation will be required to assure that required Food Service area CMU wall surfaces are pointed and patched is in strict accordance with the drawing's CMU surface preparation General Notes for on-site approval by local Health Department. All work resulting from inspection comments and requirements are to be provided at no additional cost.

Previously Coated Surfaces:

Maintenance painting will frequently not permit or require removal of old coatings prior to repainting. However, all surface contaminants such as oil, grease, loose paint, mill scale, dirt, foreign matter, rust, mold, mildew, efflorescence, and sealers must be removed to assure sound bonding to the tightly adhering old paint. Glossy surfaces of old paint films must be clean and dulled, and/or sanded before repainting. Thorough washing with an abrasive cleaner will clean and dull in one operation, or wash thoroughly and dull by sanding. Spot prime any bare areas with appropriate primer. Adhesion to existing glossy surfaces may require bonding primers.

Adhesion Testing: Check for adhesion by applying a test patch of the recommended coating system, covering at least 2 to 3 square feet. Allow to dry one week before testing adhesion per ASTM D3359. If the coating system adhesion fails, report findings to Architect. Provide bonding primers where adhesion testing has failed or is in question.

Existing Stained Wood:

Wood must dry and cleaned of dirt, grease, wax, polish, and marks. Old finishes in poor condition should be completely removed and the surface treated as a new surface. Sand wood to a smooth surface with 100-120 grit paper. Remove sanding dust with a vacuum or tack cloth. Avoid sanding wood that has only stain on it, sanding will remove some of the stain creating an uneven appearance. Sand down bare spots and scratches, and stain to match adjacent color. Very lightly scuff sand between finish coats, 180 grit paper or finer, removing any raised graining. Perform adhesion testing, identifying any presence of any sanding sealer, which can prevent bonding and cause peeling.

**SURFACE RESTORATIONS**

Existing surfaces requiring restoration, including but not limited to existing steel door frames or existing window frame surfaces, require total surface cleaning complete, down to bare sound metal, in accordance with the applicable SSPC method required, and then surfaces immediately primed with applicable primer coats in DFT thicknesses required, prior to further ensuing work sequences; i.e. finish paint coats, re-glazings, frame preparations for hardware.

In addition to the Part 3 SURFACE PREPARATIONS specified, removal of all rust from existing surfaces may require sand blasting. Adhere to sandblasting requirements complying with 02070 Selective Demolition.

Once metal sections have been cleaned of all corrosion, small holes, depressions, and uneven areas resulting from rusting are to be filled with a patching material and sanded smooth to eliminate pockets where water can accumulate, and primed coated. Patching material shall be of high content steel fibers in an epoxy binder, similar to industrial steel repair or auto body patching materials

**LEAD-BASED PAINT RENOVATION, REPAIR, AND PAINTING:**

Applicators who perform painting renovations in housing or child occupied facilities built before 1978 must be certified by the Health Hazards Control Unit (HHCU). All work shall comply with requirements as published by the EPA Lead-Based Paint Renovation, Repair and Painting Rule in the Code of Federal Regulations.

Samples: For determining whether components are free of lead-based paint, certified applicators may collect paint chip samples and submit samples to a laboratory recognized by NLLAP for analysis. Required paint chip samples documentation shall be prepared and maintained by the certified applicator for three years.

**MATERIALS PREPARATION:**

Mix and prepare painting materials in accordance with manufacturer's directions.

Stir materials before application to produce a mixture of uniform density, and stir as required during application. Do not stir surface film into material. Remove film and, if necessary, strain material before using.

**APPLICATION:**

General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

Apply additional coats when undercoats, stains or other conditions show through final coat of paint, until paint film is of uniform finish, color and appearance, and complete hide. Give special attention to insure that surfaces, including edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.

Special Food Service Area Wall Application: Roll-in two coats of masonry block filler coating in Food Service areas as necessary to completely fill all pits and pores prior to application of top coats. Final finished topcoat in Food Service areas to be free of all pits and pores, with a smooth completely washable surface. Apply additional coats when final coat of paint does not uniformly fill all pits and pores. Provide all work described as necessary to obtain an on-site approval by local Health Department.

Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.

Sand lightly between each succeeding enamel or varnish coat.

Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in occupied spaces.

Completed Work: Match approved samples for color, texture and coverage. Remove, refinish or repaint work not in compliance with specified requirements.

**CLEAN-UP AND PROTECTION:**

Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others by protection of their work, after completion of painting operations.

At the completion of work of other trades, touch-up and restore all damaged or defaced painted surfaces.

**EXTRA STOCK:**

Furnish extra paint in manufacturer's sealed shipping containers. Provide one gallon for each type and color of paint applied in the project. Containers shall only be opened by the painter manufacturer/supplier to formulate required colors/mixes. These extra materials shall not be opened or used by the Contractor without written permission from the Owner. Place a label, protected by clear plastic on the lid of each container with the following typewritten information:

1. Paint Manufacturer
2. Product name and number
3. Mixing and color formulation
4. Painting contractor
5. Date that the paint container is put in the Owner's inventory
6. Room or area number where the paint applied was used

*END OF SECTION*

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions, and General Requirements, and Division 1 specifications that apply to the work specified in this Section.

**PART 1 GENERAL**

**1.1 SUMMARY**

- A. Section includes: Pre-engineered and pre-finished extruded aluminum walkway covers, canopies, and sun shade awnings.
- B. Related Sections:
  - 1. 03100-Concrete Forms and Accessories
  - 2. 03300-Cast-in-Place Concrete

**1.2 SYSTEM DESCRIPTION**

- A. Design Requirements:
  - 1. Columns, beams, decking with flat soffit and trim shall be aluminum extrusions. Structural framing shall consist of heli-arc welded, one-piece rigid bents and bolt connected members] with interlocking deck sections secured by screws.
  - 2. Walkway canopies shall be self-draining from deck through bents to discharge point at ground level as shown on Drawings.
  - 3. Wall supported sun shade awnings shall be self-draining from deck out a built-in outer corner side discharge scupper.
  - 4. Building Code: IBC and North Carolina Building code current editions.
  - 5. Design Loads:
    - a. Comply with Building Code for site location.
    - b. Collateral Loads: Additional loads imposed by other materials or systems identified in contract documents.
  - 4. Structural Design: Prepare complete structural design calculations and detailed design for canopy members and foundations. Provide to Architect within 45 days of Contract Award to General Contractor and coordinate structural work as required with Architect.

**1.3 SUBMITTALS**

- A. Reference Section 01330-Submittal Procedures; submit following items:
  - 1. Product data.
  - 2. Shop Drawings: Layout and erection drawings showing roof framing, deck panels, cross sections and trim details clearly indicating proper assembly, foundation design, with Structural Design Calculations,
  - 3. Samples: Color selection samples consisting of actual coating material or anodizing process on aluminum extrusions.
  - 4. North Carolina regulatory review approval: Structural design and calculations sealed by a structural engineer registered to practice in the state of North Carolina.
  - 5. Quality Assurance/Control Submittals:
    - a. Qualifications: Letter certifying manufacturer's required qualifications.
    - b. Structural Design: Calculations sealed by a structural engineer registered to practice in the state of North Carolina.
    - c. Complete design and detail drawings for canopy and foundations.
    - d. Manufacturer's Installation Instructions.

**1.4 QUALITY ASSURANCE**

- A. Overall Standards: Structural engineering design documents shall be certified and sealed by a structural engineer registered to practice in the state of North Carolina.
- B. Qualifications:
  - 1. Manufacturer Qualifications: Minimum ten years experience in producing covers/canopies with welded bents and of the type specified.
  - 2. Installer Qualifications: Minimum five years experience in erecting covers/canopies of the type specified. Installations shall be in accordance with manufacturer's shop drawings.

### **1.5 DELIVERY STORAGE AND HANDLING**

- A. Reference Section 01660-Product Storage and Handling Requirements.
- B. Follow manufacturer's instructions.

## **PART 2 PRODUCTS**

### **2.1 MANUFACTURERS**

- A. Manufacturer / Basis of Design: Mapes Company (Super Lumideck with Flat Soffit system for canopies)

Equivalent products from the following manufacturers are acceptable. Reference AIA A701 Instructions To Bidders - Product Substitution Procedures.

Perfection Architectural Systems, Inc.  
E.L. Burns Co., Inc.  
Superior Metal Products  
Peachtree Protective Covers

### **2.2 MATERIALS**

- A. Aluminum Extrusions: 6063 alloy, T-6 temper.
- B. Grout: 1 part portland cement, 3 parts masonry sand; 2,000 psi (13.8 MPa) compressive strength.
- C. Foam Block-Outs: Rigid foam blocks sized as required for column embedment depth and shape.

### **2.3 COMPONENTS**

- A. Columns:
  - 1. Radius-cornered aluminum tubular extrusions [of size shown on Drawings] [as required by structural engineering design].
  - 2. Grout Key: Provide two 1 ½ inch (38 mm) diameter holes in column base, one each in opposite sides.
  - 3. Provide clear acrylic protection coat on surfaces in contact with grout.
- B. Beams: Open top aluminum tubular extrusions as required by structural engineering design.
- C. Deck: Rigid-Roll-Lock extruded aluminum, 2 ¾" extruded .018" self-flashing, interlocking sections with flat soffit, as required by structural engineering design.
  - 1. Provide welded endplate water dams where sections terminate at other than drainage channels.



- D. Hanger Rods: Powder coated to match canopy awning. Sized and attached as shown in drawings and as required by structural engineering design.
- E. Fascia: Provide manufacturer's standard extruded aluminum fascia and gutter sections as shown on Drawings and as required to complete the installation resulting in a neat finished appearance.
- F. Flashing: Aluminum sheet, thickness as recommended by manufacturer for specific condition.
- G. Conduit Cover: Extruded aluminum pre-finished continuous cap. Anchored down to the roof deck upper section to provide a continuous watertight enclosure for routing of electrical conduits and concealed weather protected roof deck penetrations.

#### **2.4 ACCESSORIES**

- A. Fasteners:
  - 1. Deck Screws: No. 14 x 1 inch (25 mm), self tapping, Type 18-8 stainless steel with neoprene washer.
  - 2. Trim Screws: No. 10 x ½ inch (13 mm), self tapping, Type 18-8 stainless steel.

#### **2.5 FABRICATION**

- A. Shop Assembly: Fabricate cross beams and columns for field assembled bolted connections.

#### **2.6 FINISH**

- A. Finish on all exposed components shall be a Fluoropolymer Coating: 70 percent PVDF resin based fluoropolymer, AA-C-12C-42R-1, selected from manufacturer's standard colors by Architect, comply with AAMA605.
- B. Color: Clear Anodized

### **PART 3 EXECUTION**

#### **3.1 EXAMINATION**

- A. Examine footings in which bents will be set and building surfaces to which canopy will connect. Verify footing locations, details and elevations comply with shop drawings.
- B. Coordinate with responsible entity to perform corrective work on unsatisfactory footings or surfaces.
- C. Commencement of work by installer is acceptance of existing conditions.

#### **3.2 ERECTION**

- A. Erect canopy in accordance with manufacturer's installation instructions.
- B. Set bents plumb, straight and true to line, adequately braced to maintain position until grout has cured.

#### **3.3 CLEANING**

- A. Clean surfaces soiled by work as recommended by manufacturer.
- B. Remove surplus materials and debris from the site.

**3.4 PROTECTION**

- A. Protect finished aluminum surfaces from damage due to subsequent operations through final acceptance by the Owner.

*END OF SECTION*

**RELATED DOCUMENTS:**

The general provisions of the Contract, including General and Supplementary Conditions and General Requirements, apply to the work specified in this Section.

**PART 1 - GENERAL**

**DESCRIPTION OF WORK:**

Furnish and install the following:

1. Flush, Recessed Entrance Mat Systems.

**QUALITY ASSURANCE:**

Manufacturers:

Standard: For purposes of designating type and quality for work under this Section, Drawings and Specifications are based on products manufactured or furnished by Manufacturers listed with products.

**SUBMITTALS:**

Manufacturer's Data: Submit for approval three (3) copies of folder containing complete Manufacturer's data and installation procedures for all items to be furnished in work of this Section of Specifications.

Shop Drawings: Submit for each specialty item specified in accordance with General Conditions.

**PART 2 - PRODUCTS**

**MATERIALS:**

1. Flush, recessed Entrance Mat System shall be C / S Group M2 Pedimat AA or equivalent product by Balco or K.N. Crowder Mfg. Provide units roll-up function and carpeted inserts, vinyl / acrylic tread rails, and aluminum hinge connectors, bronze anodized finish.

**PART 3 - EXECUTION**

INSTALLATION: Install products in strict accordance with manufacturer's printed instructions. General Contractor shall coordinate requirements by other prime contractors.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**SCOPE OF WORK:**

The scope of work consists of the furnishing and installing of complete plumbing (exterior and interior) and HVAC systems including miscellaneous systems. The Mechanical Contractor (hereafter referred to as "the Contractor", either Plumbing or HVAC) shall provide all supervision, labor, materials, equipment, machinery, and any and all other items necessary to complete the systems. The Contractor shall note that all items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items of equipment as indicated on the drawings and as required for complete systems.

It is the intention of the Specifications and Drawings to call for finished work, tested and ready for operation.

Any apparatus, appliance, material, or work not shown on the drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered, and installed by the Contractor without additional expenses to the Owner. Minor details not usually shown or specified, but necessary for proper installation and operation, shall be included in the Contractor's estimate, the same as if herein specified or shown.

With submission of bid, the Contractor shall give written notice to the Architect of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules, and any necessary items or work omitted. In the absence of such written notice, it is mutually agreed that the Contractor has included the cost of all required items in his proposal, and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensation.

NOTICE TO BIDDERS, INSTRUCTIONS TO BIDDERS, SUPPLEMENTARY INSTRUCTIONS, GENERAL CONDITIONS, SUPPLEMENTARY GENERAL CONDITIONS, SPECIAL CONDITIONS, GENERAL REQUIREMENTS bound in the front of this document are included as a part of the specifications for this work.

**MECHANICAL DRAWINGS AND SPECIFICATIONS:**

The mechanical drawings are diagrammatic and indicate the general arrangement of fixtures, equipment, and work included in the contract. Consult the architectural, structural and electrical drawings and details for exact location and dimensions of fixtures and equipment; where same are not definitely located, obtain this information from the Architect.

The Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, the Architect shall be notified before proceeding with installation. If directed by the Architect, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

The plans and these specifications are intended to describe, imply and convey the materials and equipment as well as necessary labor, required for the installation as outlined in the paragraph entitled "Scope of Work". Any omissions from either the drawings or these specifications are unintentional, and it shall be the responsibility of this Contractor to call to the attention of the Architect or Engineer any pertinent omissions before submission of a bid. The drawings which accompany these specifications are not intended to show in complete detail every fitting which may be required; however wherever reasonable implied by the nature of

the work, any such material or equipment shall be installed by this Contractor as a part of his contract price. In no case will any extra charge be allowed unless authorized in writing by the Architect or Engineer.

The Contractor shall arrange with the General Contractor for required concrete and masonry chases, openings, and sub-bases so as not to delay progress of work. Work shall be installed sufficiently in advance of other construction to conceal piping and to permit work to be built in where required.

It shall be understood and agreed by all parties that where the words "Furnish", "Install", and / or "Provide" appear, the following definitions apply:

- Furnish - to supply or give
- Install - to place, establish or fix in position
- Provide - to furnish and install as defined above

**CODES, PERMITS, AND FEES:**

The Contractor shall give all necessary notices, including electric and telephone utilities, obtain all permits, and pay all government taxes, fees, and other costs, including utility connections or extensions in connection with his work file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction; obtain all required certificates of inspection for his work and deliver same to the Architect before request for acceptance and final payment for the work.

The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to contract drawing and documents) in order to comply with all applicable laws, ordinances, rules, and regulations, whether or not shown on drawings and / or specified.

Work and materials shall conform to the latest rules of the National Board of Fire Underwriter's Code and Regulations of the State Fire Marshall, and, or guarding of any moving parts, or otherwise hazardous conditions. Nothing in these specifications shall be construed to permit work not conforming to the most stringent of applicable codes.

The State Plumbing and Mechanical codes, and the mechanical requirements as established by the State and Local Fire Marshall, and rules and regulations of the local utilities serving the project are hereby made part of this specification. Should any changes be necessary in the drawings or specifications to make the work comply with these requirements, the Contractor shall notify the Architect.

**VERIFICATION OF DIMENSIONS, DETAILS, EXISTING FIELD CONDITIONS:**

The Contractor shall visit the premises prior to bidding, and thoroughly familiarize himself with all details of the work, working conditions, verify dimensions in the field, provide advice of any discrepancy, and submit shop drawings of any changes he proposes to make in quadruplicate for approval before starting any work. The Contractor shall install all equipment in a manner to avoid building interference. No Change Order for extra work will be considered for items that were evident during a site visit.

The locations of existing underground utilities are shown in an approximate way only and have not been independently verified by the Owner or its representative. The Contractor shall determine the exact location of all existing utilities before commencing work and agrees to be fully responsible for any and all damages which might be occasioned by the Contractor's failure to exactly locate and preserve any and all underground utilities.

**ACCEPTABLE MANUFACTURERS:**

Acceptable manufacturers, as specified in the Contract Documents, implies that the specified manufacturer may produce acceptable products equal in quality of materials and performance to such item specified. The

Contractor will be required to provide products meeting or exceeding the "Standard of Quality and Performance" as dictated by the product selection noted.

**SHOP DRAWINGS AND EQUIPMENT SUBMITTALS:**

The Contractor shall submit minimum of five (5) and maximum of seven (7) copies of the shop drawings to the Architect for approval within thirty (30) days after the award of the general contract. If such a schedule cannot be met, the Contractor may request in writing for an extension of time to the Architect. If the Contractor does not submit shop drawings in the prescribed time, the Architect has the right to select the equipment.

Shop drawings shall be submitted on all major pieces of mechanical equipment. Each item of equipment proposed shall be a standard catalog product of an established manufacturer. Certain major groups of equipment shall be provided from a singular manufacturer. The shop drawing shall give complete information on the proposed equipment. Each item of the shop drawings shall be properly labeled, indicating the intended service of the material, the job name, and the MC's name.

The shop drawings shall be neatly bound in five (5) sets and submitted to the Architect with a letter of transmittal. The letter of transmittal shall list each item submitted along with the manufacturer's name.

Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.

**AS-BUILT DRAWINGS:**

The Contractor shall maintain accurate records of all deviations in work as actually installed from work indicated on the drawings. On completion of the project, two (2) complete sets of marked-up prints shall be delivered to the Architect.

**MAINTENANCE AND OPERATING MANUALS:**

Upon completion, the MC shall turn over to the Architect three (3) sets of complete maintenance manuals and parts list for all mechanical equipment used on the job. Manuals shall include equipment data, manufacturer's recommended maintenance, parts list, assembly drawings, warranties, and name, address, and phone numbers of suppliers of equipment. Indicate project name on cover and binder side.

**COORDINATION WITH OTHER TRADES:**

Coordinate all work required under this section with work of other sections of the specifications to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings and shall make sure that proposed equipment can be accommodated. If interferences occur, Contractor shall bring them to attention in writing, prior to signing of contract; or, Contractor shall at his own expense provide proper materials, equipment, and labor to correct any damage due to defects in his work caused by such interference.

**INSPECTION AND CERTIFICATES:**

On the completion of the entire installation, the approval of the Architect and Owner shall be secured, covering the installation throughout. The Contractor shall obtain and pay for Certificate of Approval from the public authorities having jurisdiction. A final inspection certificate shall be submitted to the Architect prior to final payment. Any and all costs incurred for fees shall be paid by the Contractor.

**EQUIVALENTS:**

When material or equipment is mentioned by name, it shall form the basis of the Contract. When approved by the Architect in writing, other material and equipment may be used in place of those specified, but written application for such substitutions shall be made to the Architect as described in the Bidding Documents. The difference in cost of substitute material or equipment shall be given when making such request. Approval of substitute is, of course, contingent on same meeting specified requirements and being of such design and dimensions as to comply with space requirements.

**WORKMANSHIP AND MATERIALS:**

All workmanship shall be of the best quality, and all equipment and materials incorporated in the work under this Contract shall be new and equal to or better than the grade specified. Deviations in workmanship or materials will be corrected by the Contractor at his expense.

**WARRANTY:**

The Contractor shall submit upon completion of the work, a warranty by his acceptance of the contract, that all work installed will be free from defects in workmanship and materials. If, during the period of one year, or as otherwise specified from date of Certificate of Completion and acceptance of work, any such defects in workmanship, materials, or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within reasonable time to be specified in notice from the Architect. In default, the Owner may have such work done and charge cost to Contractor.

**CUTTING AND PATCHING:**

The Mechanical Contractor (both Plumbing and HVAC) shall furnish sketches to the General Contractor showing the locations and sizes of all openings and chases, and furnish and locate all sleeves and inserts required for the installation of the mechanical work before the walls, floors, and roof are built. The Mechanical Contractor shall reimburse the General Contractor for the cost of cutting and patching, and shall be responsible for the cost of cutting and / or patching where any mechanical items were not installed or where incorrectly sized or located. The Contractor shall do all drilling required for the installation of his hangers. See also Section 01050, Cutting and Patching.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1 - GENERAL**

**1.1 DESCRIPTION**

- A. Basic methods and requirements for Division 15, MECHANICAL, applies to all sections of Division 15.
- B. Definitions:
  - 1. Exposed: Piping, ductwork, and equipment exposed to view in finished rooms.
  - 2. Option or optional: Contractor's choice of an alternate material or method.

**1.2 RELATED WORK**

- H. Section 15250, INSULATION.
- K. Section 15980, TESTING, ADJUSTING, AND BALANCING.
- L. Section 16400, SERVICE AND DISTRIBUTION.

**1.3 QUALITY ASSURANCE**

- A. Section 15980, TESTING, ADJUSTING, AND BALANCING.
- B. Equipment Vibration Tolerance:
  - 1. The allowable vibration tolerance shall be in accordance with 1999 ASHRAE Applications Handbook, Table 1, 46.3. Equipment specifications require factory balancing of equipment to this tolerance.
  - 2. After air balance work is completed and permanent drive sheaves are in place, perform field mechanical balancing and adjustments required to meet the specified vibration tolerance.
- C. Products Criteria:
  - 1. Standard Products: Material and equipment shall be the standard products of a manufacturer regularly engaged in the manufacture of the products for at least 3 years. See other specification sections for any exceptions.
  - 2. Equipment Service: Products shall be supported by a service organization which maintains a complete inventory of repair parts and is located reasonably close to the site.
  - 3. Multiple Units: When two or more units of materials or equipment of the same type or class are required, these units shall be products of one manufacturer.
  - 4. Assembled Units: Manufacturers of equipment assemblies, which use components made by others, assume complete responsibility for the final assembled product.
  - 5. Nameplates: Nameplate bearing manufacturer's name or identifiable trademark shall be securely affixed in a conspicuous place on equipment, or name or trademark cast integrally with equipment, stamped or otherwise permanently marked on each item of equipment.
  - 6. Asbestos products or equipment or materials containing asbestos shall not be used.
- D. Manufacturer's Recommendations: Where installation procedures or any part thereof are required to be in accordance with the recommendations of the manufacturer of the material being installed, printed copies of these recommendations shall be furnished to the Resident Engineer prior to installation. Installation of the item will not be allowed to proceed until the recommendations are received. Failure to furnish these recommendations can be cause for rejection of the material.



E. Warranty: Section 01001, GENERAL CONDITIONS.

#### 1.4 SUBMITTALS

- A. Submit in accordance with General Provisions.
- B. Manufacturer's Literature and Data: Submit under the pertinent section rather than under this section.
  - 1. Submit belt drive with the driven equipment.
  - 2. Submit electric motor data and variable speed drive data with the driven equipment.
  - 3. Equipment and materials identification.
  - 4. Fire-stopping materials.
  - 5. Hangers, inserts, supports and bracing. Provide load calculations for variable spring and constant support hangers.
  - 6. Wall, floor, and ceiling plates.
- C. Coordination Drawings; provide where required in accordance with Section 01001, GENERAL CONDITIONS, Article, SUBCONTRACTS AND WORK COORDINATION. Provide:
  - 1. Mechanical equipment rooms.
  - 2. Interstitial space.
  - 3. Hangers, inserts, supports, and bracing.
  - 4. Pipe sleeves.
  - 5. Duct or equipment penetrations of floors, walls, ceilings, or roofs.
- D. Maintenance Data and Operating Instructions:
  - 1. Maintenance and operating manuals in accordance with Section 01010, GENERAL REQUIREMENTS, Article, INSTRUCTIONS, for systems and equipment.
  - 2. Provide a listing of recommended replacement parts for keeping in stock supply, including sources of supply, for equipment. Include in the listing belts for equipment: Belt manufacturer, model number, size and style, and distinguished whether of multiple belt sets.
- E. Provide copies of approved HVAC equipment submittals to the Testing, Adjusting and Balancing Subcontractor.

#### 1.5 APPLICABLE PUBLICATIONS

- A. The publications listed below form a part of this specification to the extent referenced. The publications are referenced in the text by the basic designation only.
- B. Federal Specifications (Fed. Spec.):
  - FF-S-325 ..... Shield, Expansion; Nail, Expansion; and Nail, Drive Screw  
(Devices, Anchoring, Masonry)
- C. Air Conditioning and Refrigeration Institute (ARI):
  - 430-89 ..... Central Station Air-Handling Units
- D. American National Standard Institute (ANSI):
  - B31.1-98 ..... Power Piping
- E. Rubber Manufacturers Association (ANSI/RMA):
  - IP-20-88 ..... Drives Using Classical V-Belts and Sheaves - Cross Sections A,  
B, C, D, and E
  - IP-21-91 ..... Drives Using Double-V (Hexagonal) Belts (AA, BB, XX, DD Cross  
Sections)
  - IP-22-91 ..... Drives Using Narrow Multiple V-Belts (3V, 5V, and 8V Cross  
Sections)
- F. Air Movement and Control Association (AMCA):
  - 410-96 ..... Recommended Safety Practices for Air Moving Devices
- G. American Society of Mechanical Engineers (ASME):
  - Boiler and Pressure Vessel Code (BPVC):

- SEC IX-98 ..... Qualifications Standard for Welding and Brazing Procedures, Welders, Brazers, and Welding and Brazing Operators
- H. American Society for Testing and Materials (ASTM):
  - A36/A36M-97 ..... Carbon Structural Steel
  - A575-96 ..... Steel Bars, Carbon, Merchant Quality, M-Grades
  - E84-98 ..... Surface Burning Characteristics of Building Materials
  - E119-98 ..... Fire Tests of Building Construction and Materials
- I. Manufacturers Standardization Society (MSS) of the Valve and Fittings Industry, Inc:
  - SP-58-93 ..... Pipe Hangers and Supports-Materials, Design and Manufacture
  - SP-69-96 ..... Pipe Hangers and Supports-Selection and Application
- J. National Association of Plumbing - Heating - Cooling Contractors (NAPHCC):
  - 1996 ..... National Standard Plumbing Code
- K. National Fire Protection Association (NFPA):
  - 90A-96 ..... Installation of Air Conditioning and Ventilating Systems
  - 101-97 ..... Life Safety Code

**PART 2 - PRODUCTS**

**2.1 BELT DRIVES**

- A. Type: ANSI/RMA standard V-belts with proper motor pulley and driven sheave. Belts shall be constructed of reinforced cord and rubber.
- B. Dimensions, rating and selection standards: ANSI/RMA IP-20 and IP-21.
- C. Minimum Horsepower Rating: Motor horsepower plus recommended ANSI/RMA service factor (not less than 20 percent) in addition to the ANSI/RMA allowances for pitch diameter, center distance, and arc of contact.
- D. Maximum Speed: 5000 feet per minute.
- E. Adjustment Provisions: For alignment and ANSI/RMA standard allowances for installation and take-up.
- F. Drives may utilize a single V-Belt (any cross section) when it is the manufacturer's standard.
- F. Multiple Belts: Matched to ANSI/RMA specified limits by measurement on a belt measuring fixture. Seal matched sets together to prevent mixing or partial loss of sets. Replacement, when necessary, shall be an entire set of new matched belts.
- H. Sheaves and Pulleys:
  - 1. Material: Pressed steel, or close grained cast iron.
  - 2. Bore: Fixed or bushing type for securing to shaft with keys.
  - 3. Balanced: Statically and dynamically.
  - 4. Groove spacing for driving and driven pulleys shall be the same.
- I. Drive Types, Based on ARI 435:
  - 1. Provide adjustable-pitch or fixed-pitch drive as follows:
    - a. Fan speeds up to 1800 RPM: 7.5 horsepower (10 kW) and smaller.
    - b. Fan speeds over 1800 RPM: 2.2 horsepower (3 kW) and smaller.
  - 2. Provide fixed-pitch drives for drives larger than those listed above.
  - 3. The final fan speeds required to just meet the system CFM and pressure requirements, without throttling, shall be determined by adjustment of a temporary adjustable-pitch motor sheave or by fan law calculation if a fixed-pitch drive is used initially.

**2.2 DRIVE GUARDS**

- A. For machinery and equipment, provide guards as shown in AMCA 410 for belts, chains, couplings, pulleys, sheaves, shafts, gears and other moving parts regardless of height above the floor. Drive

guards may be excluded where motors and drives are inside factory fabricated air handling unit casings.

- B. Materials: Sheet steel, cast iron, expanded metal or wire mesh rigidly secured so as to be removable without disassembling pipe, duct, or electrical connections to equipment.
- C. Access for Speed Measurement: 1" diameter hole at each shaft center.

### **2.3 ELECTRIC MOTORS**

- A. Section 15170, MOTORS, specifies the applicable requirements for electric motors. Provide special energy efficient motors as scheduled. Unless otherwise specified for a particular application use electric motors with the following requirements.
- B. Single-phase Motors: Capacitor-start type for hard starting applications. Motors for centrifugal fans and pumps may be split phase or permanent split capacitor (PSC).
- C. Poly-phase Motors: NEMA Design B, Squirrel cage, induction type. Each two-speed motor shall have two separate windings. Provide a time-delay (20 seconds minimum) relay for switching from high to low speed.
- D. Rating: Continuous duty at 100 percent capacity in an ambient temperature of 104 degrees F; minimum horsepower as shown on drawings; maximum horsepower in normal operation not to exceed nameplate rating without service factor.
- E. Insulation Resistance: Not less than one-half meg-ohm between stator conductors and frame, to be determined at the time of final inspection.

### **2.4 VARIABLE SPEED MOTOR CONTROLLERS**

- A. Removed

### **2.5 EQUIPMENT AND MATERIALS IDENTIFICATION**

- A. Use symbols, nomenclature and equipment numbers specified, shown on the drawings and shown in the maintenance manuals.
- B. Interior (Indoor) Equipment: Engraved nameplates, with letters not less than 3/16" high of brass with black-filled letters, or rigid black plastic with white letters permanently fastened to the equipment. Identify unit components such as coils, filters, fans, etc.
- C. Exterior (Outdoor) Equipment: Brass nameplates, with engraved black filled letters, not less than 3/16" high riveted or bolted to the equipment.
- D. Control Items: Label all temperature and humidity sensors, controllers and control dampers. Identify and label each item as they appear on the control diagrams.

### **2.6 FIRESTOPPING**

See Sheet FP – 001. FIRESTOPPING specifies an effective barrier against the spread of fire, smoke and gases where penetrations occur for piping and ductwork. Refer also to Section 15250, INSULATION, for firestop pipe and duct insulation.

### **2.7 GALVANIZED REPAIR COMPOUND**

Mil. Spec. DOD-P-21035B, paint form.

### **2.8 PIPE AND EQUIPMENT SUPPORTS AND RESTRAINTS**

- A. Vibration Isolators: see drawing details.

- B. Supports For Roof Mounted Items:
  - 1. Equipment: Equipment rails shall be galvanized steel, 8 gauge, with integral baseplate, continuous welded corner seams, factory installed 2 by 4 treated wood nailer, 18 gauge galvanized steel counter flashing cap with screws, built-in cant strip, (except for gypsum or tectum deck), minimum height 11 inches. For surface insulated roof deck, provide raised cant strip to start at the upper surface of the insulation.
  - 2. Pipe/duct pedestals: Provide a galvanized unistrut channel welded to U-shaped mounting brackets which are secured to side of rail with galvanized lag bolts.
  
- D. For Attachment to Concrete Construction:
  - 1. Concrete insert: Type 18, MSS SP-58.
  - 2. Self-drilling expansion shields and machine bolt expansion anchors: Fed. Spec. FF-S-325, permitted in concrete not less than four inches thick. Applied load shall not exceed one-fourth the proof test load listed in Fed. Spec. FF-S-325.
  - 3. Power-driven fasteners: Permitted in existing concrete or masonry not less than four inches thick when approved by the Resident Engineer for each job condition. Applied load shall not exceed one-fourth the proof test load listed in Fed. Spec. FF-S-325.
  
- F. For Attachment to Steel Construction: MSS SP-58.
  - 1. Welded attachment: Type 22.
  - 2. Beam clamps: Types 20, 21, 28 or 29. Type 23 C-clamp may be used for individual copper tubing up to 7/8-inch outside diameter.
  
- F. Attachment to Metal Pan or Deck: As required for materials specified in Division 5.
  
- G. For Attachment to Wood Construction: Wood screws or lag bolts.
  
- H. Hanger Rods: See Section 15060.
  
- J. Multiple (Trapeze) Hangers: Galvanized, cold formed, lipped steel channel horizontal member, not less than 1-5/8 inches by 1-5/8 inches, No. 12 gauge, designed to accept special spring held, hardened steel nuts. Not permitted for steam supply and condensate piping.
  - 1. Allowable hanger load: Manufacturers rating less 91kg ( 200 pounds).
  - 2. Guide individual pipes on the horizontal member of every other trapeze hanger with 6 mm (1/4-inch) U-bolt fabricated from steel rod. Provide Type 40 insulation shield, secured by two 13mm (1/2-inch) galvanized steel bands, or preinsulated calcium silicate shield for insulated piping at each hanger.
  
- K. Pipe Hangers and Supports:
  - 1. Convertor and Expansion Tank Hangers: May be Type 1 sized for the shell diameter. Insulation where required will cover the hangers.
  - 2. Plumbing Piping (Other Than General Types):
    - a. Horizontal piping: Type 1, 5, 7, 9, and 10.
    - b. Chrome plated piping: Chrome plated supports.
    - c. Hangers and supports in pipe chase: Prefabricated system ABS self-extinguishing material, not subject to electrolytic action, to hold piping, prevent vibration and compensate for all static and operational conditions.
    - d. Blocking, stays and bracing: Angle iron or preformed metal channel shapes, 1.3 mm (18 gage) minimum.
  
- L. Pre-insulated Calcium Silicate Shields:
  - 1. Provide 360 degree water resistant high density 965 kPa (140 psi) compressive strength calcium silicate shields encased in galvanized metal.
  - 2. Pre-insulated calcium silicate shields to be installed at the point of support during erection.
  - 3. Shield thickness shall match the pipe insulation.
  - 4. The type of shield is selected by the temperature of the pipe, the load it must carry, and the type of support it will be used with.

- a. Shields for supporting chilled or cold water shall have insulation that extends a minimum of 1 inch past the sheet metal. Provide for an adequate vapor barrier in chilled lines.
  - b. The pre-insulated calcium silicate shield shall support the maximum allowable water filled span as indicated in MSS-SP 69. To support the load, the shields may have one or more of the following features: structural inserts 4138 kPa (600 psi) compressive strength, an extra bottom metal shield, or formed structural steel (ASTM A36) wear plates welded to the bottom sheet metal jacket.
5. Shields may be used on steel clevis hanger type supports, roller supports or flat surfaces.
- M. Seismic Restraint of Piping:
1. Design criteria is as follows:
    - a. Piping resiliently supported: 120 percent of the weight of the systems and components and contents.
    - b. Piping not resiliently supported: 60 percent of the weight of the system components and contents.
    - c. Except as noted above, meet the more severe requirements of the Local Code and the latest Uniform Building Code for determining seismic force  $F_p$ .
  2. Provide one of the following options:
    - a. Design and installation to meet the criteria listed above, and meet requirements of the latest Sheet Metal and Air Conditioning Contractors National Association (SMACNA), Seismic Restraint Manual Guidelines for Mechanical Systems for the prescribed Seismic Hazard Level
    - b. Design and installation to meet the criteria listed above, and meet the most current requirements of the National Uniform Seismic Installation Guidelines (NUSIG). Contractor shall submit all design tables and information for the design force levels, stamped and signed by a professional engineer registered in the State where project is located.
    - c. Where SMACNA or NUSIG requirements are not met completely, submit proposed alternate details and calculations to completely address seismic bracing requirements. Such designs shall use more severe of the Local Code and the Uniform Building Code requirements for determining seismic forces, and be performed, stamped and signed by a professional engineer registered in the State where project is located. Revise if necessary any details shown on the contract drawings for vertical support and lateral bracing, and submit for the approval of the Owner to meet the design criteria listed above.

## **2.9 PIPE PENETRATIONS**

- A. Install sleeves during construction for other than blocked out floor openings for risers in chases.
- B. To prevent accidental liquid spills from passing to a lower level, provide the following:
  1. For sleeves: Extend sleeve 25 mm (one inch) above finished floor and provide sealant for watertight joint.
  2. For blocked out floor openings: Provide 40 mm (1-1/2 inch) angle set in silicone adhesive around opening.
  3. For drilled penetrations: Provide 40 mm (1-1/2 inch) angle ring or square set in silicone adhesive around penetration.
- C. Penetrations are not allowed through beams or ribs, but may be installed in concrete beam flanges. Any deviation from this requirements must receive prior approval of Resident Engineer.
- D. Sheet Metal, Plastic, or Moisture-resistant Fiber Sleeves: Provide for pipe passing through floors, interior walls, and partitions, unless brass or steel pipe sleeves are specifically called for below.
- E. Cast Iron or Zinc Coated Pipe Sleeves: Provide for pipe passing through exterior walls below grade. Make space between sleeve and pipe watertight with a modular or link rubber seal. Seal shall be applied at both ends of sleeve.
- F. Galvanized Steel or an alternate Black Iron Pipe with asphalt coating Sleeves: Provide for pipe passing through concrete beam flanges, except where brass pipe sleeves are called for. Provide sleeve for pipe passing through floor of mechanical rooms and similar. Except in mechanical rooms, connect sleeve with floor plate.
- G. Brass Pipe Sleeves: Provide for pipe passing through quarry tile, terrazzo or ceramic tile floors. Connect sleeve with floor plate.
- H. Sleeves are not required for wall hydrants for fire department connections or in drywall construction.

- I. Sleeve Clearance: Sleeve through floors, walls, partitions, and beam flanges shall be one inch greater in diameter than external diameter of pipe. Sleeve for pipe with insulation shall be large enough to accommodate the insulation. Interior openings shall be caulked tight with fire stopping material and sealant to prevent the spread of fire, smoke, and gases.
- J. Sealant and Adhesives: Shall be as specified in Section 07920, SEALANTS AND CAULKING.

## **2.10 TOOLS AND LUBRICANTS**

- A. Furnish, and turn over to the Owner special tools not readily available commercially, that are required for disassembly or adjustment of equipment and machinery furnished.
- B. Grease Guns with Attachments for Applicable Fittings: One for each type of grease required for each motor or other equipment.
- C. Tool Containers: Hardwood or metal, permanently identified for intended service and mounted, or located, where directed by the Owner.
- D. Lubricants: A minimum of 0.95 L (one quart) of oil, and 0.45 kg (one pound) of grease, of equipment manufacturer's recommended grade and type, in unopened containers and properly identified as to use for each different application.

## **2.11 WALL, FLOOR AND CEILING PLATES**

- A. Material and Type: Chrome plated brass or chrome plated steel, one piece or split type with concealed hinge, with set screw for fastening to pipe, or sleeve. Use plates that fit tight around pipes, cover openings around pipes and cover the entire pipe sleeve projection.
- B. Thickness: Not less than 2.4 mm (3/32-inch) for floor plates. For wall and ceiling plates, not less than 0.64 mm (0.025-inch) for up to 80 mm (3-inch pipe), 0.89 mm (0.035-inch) for larger pipe.
- C. Locations: Use where pipe penetrates floors, walls and ceilings in exposed locations, in finished areas only. Use also where insulation ends on exposed water supply pipe drop from overhead. Provide a watertight joint in spaces where brass or steel pipe sleeves are specified.

## **PART 3 - EXECUTION**

### **3.1 INSTALLATION**

- A. Coordinate location of piping, sleeves, inserts, hangers, ductwork and equipment. Locate piping, sleeves, inserts, hangers, ductwork and equipment clear of windows, doors, openings, light outlets, and other services and utilities. Follow manufacturer's published recommendations for installation methods not otherwise specified.
- B. Protection and Cleaning:
  - 1. Equipment and materials shall be carefully handled, properly stored, and adequately protected to prevent damage before and during installation, in accordance with the manufacturer's recommendations and as approved by the Owner. Damaged or defective items in the opinion of the Owner, shall be replaced.
  - 2. Protect all finished parts of equipment, such as shafts and bearings where accessible, from rust prior to operation by means of protective grease coating and wrapping. Close pipe openings with caps or plugs during installation. Tightly cover and protect fixtures and equipment against dirt, water chemical, or mechanical injury. At completion of all work thoroughly clean fixtures, exposed materials and equipment.
- C. Concrete and Grout: Use concrete and shrink compensating grout 25 MPa (3000 psi) minimum, specified in Section 03300, CAST-IN-PLACE CONCRETE.
- D. Install gages, thermometers, valves and other devices with due regard for ease in reading or operating and maintaining said devices. Locate and position thermometers and gages to be easily read by operator or staff standing on floor or walkway provided. Servicing shall not require dismantling adjacent equipment or pipe work.
- E. Install steam piping expansion joints as per manufacturer's recommendations.
- F. Work in Existing Building:
  - 1. Perform as specified in Article, OPERATIONS AND STORAGE AREAS, Article, ALTERATIONS, and Article, RESTORATION of the Section 01010, GENERAL REQUIREMENTS for relocation of existing equipment, alterations and restoration of existing building(s).

2. As specified in Section 01010, GENERAL REQUIREMENTS, Article, OPERATIONS AND STORAGE AREAS, make alterations to existing service piping at times that will least interfere with normal operation of the facility.
  3. Cut required openings through existing masonry and reinforced concrete using diamond core drills. Use of pneumatic hammer type drills, impact type electric drills, and hand or manual hammer type drills, will be permitted only with approval of the Owner. Locate openings that will least effect structural slabs, columns, ribs or beams. Refer to the Owner for determination of proper design for openings through structural sections and opening layouts approval, prior to cutting or drilling into structure. After Owner's approval, carefully cut opening through construction no larger than absolutely necessary for the required installation.
- G. Exterior: Seal all pipe and duct penetrations with silicone sealant to prevent entrance of insects.
- H. Switchgear Drip Protection: Every effort shall be made to eliminate the installation of pipe above electrical and telephone switchgear. If this is not possible, encase pipe in a second pipe with a minimum of joints.
- I. Inaccessible Equipment:
1. Where the Engineer / Owner determines that the Contractor has installed equipment not conveniently accessible for operation and maintenance, equipment shall be removed and reinstalled or remedial action performed as directed at no additional cost to the Owner.
  2. The term "conveniently accessible" is defined as capable of being reached without the use of ladders, or without climbing or crawling under or over obstacles such as motors, fans, pumps, belt guards, transformers, high voltage lines, piping, and ductwork.

### **3.2 PIPE AND EQUIPMENT SUPPORTS**

- A. Where hanger spacing does not correspond with joist or rib spacing, use structural steel channels secured directly to joist and rib structure that will correspond to the required hanger spacing, and then suspend the equipment and piping from the channels. Drill or burn holes in structural steel only with the prior approval of the Owner.
- B. Use of chain, wire or strap hangers; wood for blocking, stays and bracing; or, hangers suspended from piping above will not be permitted. Replace or thoroughly clean rusty products and paint with zinc primer.
- C. Use hanger rods that are straight and vertical. Turnbuckles for vertical adjustments may be omitted where limited space prevents use. Provide a minimum of 15 mm (1/2-inch) clearance between pipe or piping covering and adjacent work.
- D. HVAC Horizontal Pipe Support Spacing: Refer to MSS SP-69. Provide additional supports at valves, strainers, in-line pumps and other heavy components. Provide a support within one foot of each elbow.
- E. HVAC Vertical Pipe Supports:
1. Up to 150 mm (6-inch pipe), 9 m (30 feet) long, bolt riser clamps to the pipe below couplings, or welded to the pipe and rests supports securely on the building structure.
  2. Vertical pipe larger than the foregoing, support on base elbows or tees, or substantial pipe legs extending to the building structure.
- F. Plumbing horizontal and vertical pipe supports, refer to the State Plumbing Code.

### **3.3 MOTOR AND DRIVE ALIGNMENT**

- A. Belt Drive: Set driving and driven shafts parallel and align so that the corresponding grooves are in the same plane.
- B. Direct-connect Drive: Securely mount motor in accurate alignment so that shafts are free from both angular and parallel misalignment when both motor and driven machine are operating at normal temperatures.

### **3.4 LUBRICATION**

Field check and lubricate equipment requiring lubrication prior to initial operation.

### **3.5 STARTUP AND TEMPORARY OPERATION**

Start up equipment as described in equipment specifications. Verify that vibration is within specified tolerance prior to extended operation. Temporary use of equipment is specified in Section 01010, GENERAL REQUIREMENTS, Article, TEMPORARY USE OF MECHANICAL AND ELECTRICAL EQUIPMENT.

### **3.6 OPERATING AND PERFORMANCE TESTS**

- A. Prior to the final inspection, perform required tests as specified in Section 01010, GENERAL REQUIREMENTS, Article, TESTS and submit the test reports and records to the Owner.
- B. Should evidence of malfunction in any tested system, or piece of equipment or component part thereof, occur during or as a result of tests, make proper corrections, repairs or replacements, and repeat tests at no additional cost to the Owner.
- C. When completion of certain work or system occurs at a time when final control settings and adjustments cannot be properly made to make performance tests, then make performance tests for heating systems and for cooling systems respectively during first actual seasonal use of respective systems following completion of work.

*END OF SECTION*



**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART I: GENERAL**

- A. Design channel support systems for piping to support multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
- B. Submittals: Provide Product Data for each type of pipe hanger, channel support system component, and thermal-hanger shield insert indicated.

**PART II: PRODUCTS**

- A. Pipe Hangers, Supports, and Components: MSS SP-58, factory fabricated components.
  - 1. Galvanized, Metallic Coatings: For piping and equipment that will not have field-applied finish.
  - 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- B. Channel Support Systems: MFMA-2, factory-fabricated components for field assembly.
  - 1. Coatings: Manufacturer's standard finish, unless bare metal surfaces are indicated.
  - 2. Nonmetallic Coatings: On attachments for electrolytic protection where attachments are in direct contact with copper tubing.
- C. Thermal-Hanger Shield Inserts: 100-psi (690-kPa) minimum compressive strength insulation, encased in sheet metal shield.
  - 1. Material for Cold Piping: ASTM C 552, Type I cellular glass or water-repellant-treated, ASTM C 533, Type I calcium silicate with vapor barrier.
  - 2. Material for Hot Piping: ASTM C 552, Type I cellular glass or water-repellent-treated, ASTM C 533, Type I calcium silicate.
  - 3. For Clevis or Band Hanger Insert and shield cover lower 180 degrees of pipe.
  - 4. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.
- D. Mechanical-Anchor Fasteners: Insert-type attachments with pull-out and shear capacities appropriate for supported loads and building materials where used.
- E. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars, black and galvanized.
- F. Grout ASTM C 1107, Grade B, factory-mixed and -packaged, non-shrink and nonmetallic, dry, hydraulic-cement grout.
  - 1. Characteristics: Post hardening and volume adjusting; recommended for both interior and exterior applications.
  - 2. Properties: Non-staining, non-corrosive, and non-gaseous.

**PART III: EXECUTION**

- A. Specific hanger requirements are specified in Sections specifying equipment and systems.

- B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Specification Sections.
- C. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Adjustable Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN15 to DN750).
  2. -Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN20 to DN600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
  3. Adjustable Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN15 to DN200).
  4. U-Bolts (MSS Type 24): For support of heavy pipe, NPS 1/2 to NPS 30 (DN15 to DN750).
- D. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Tumbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
  2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.
- E. Building Attachments: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
  2. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
  3. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
  4. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
  5. C-Clamps (MSS Type 23): For structural shapes.
  6. Welded-Steel Brackets: For support of pipes from below or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    - a. Light (MSS Type 31): 750 lb. (340 kg).
    - b. Medium (MSS Type 32): 1500 lb. (675 kg).
    - c. Heavy (MSS Type 33): 3000 lb. (1 350 kg).
  7. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
  8. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.
- F. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Specification Sections, install the following types:
1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
  2. Protection Shields (MSS Type 40): Of length recommended by manufacturer to prevent crushing insulation.
- G. Pipe Hanger and Support Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
- H. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

1. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
- J. Load Distribution: Install hangers and supports so that piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
- K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9, "Building Services Piping," is not exceeded.
- L. Insulated Piping: Comply with the following:
  1. Attach clamps and spacers to piping.
    - a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    - b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    - c. Do not exceed pipe stress limits according to ASME B31.9.
  2. Install MSS SP-58, Type 39 protection saddles, if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
  3. Install MSS SP-58, Type 40 protective shields on cold piping with vapor barrier. Shields shall span arc of 180 degrees.
  4. Shield Dimensions for Pipe: Not less than the following:
    - a. NPS 1/4 to NPS 3-1/2 (DN8 to DN90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
  5. Insert Material: Length at least as long as protective shield.
  6. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.
- M. Cut, drill, and fit miscellaneous metal fabrications for heavy-duty steel trapezes and equipment supports. Fit exposed connections together to form hairline joints. Field-weld connections that cannot be shop-welded because of shipping size limitations. Comply with AWS DI.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
  1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  2. Obtain fusion without undercut or overlap.
  3. Remove welding flux immediately.
  4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.
- N. Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.
- O. Touching Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces. Apply paint by brush or spray to provide a minimum dry film thickness of 2.0 mils (0.05 mm).
- P. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.
- Q. Install all hangers and supports prior to application of fire-proofing by GC. Any fire-proofing damaged by this Contractor shall be repaired by this Contractor.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART I: GENERAL**

A. Submittals: Submit Product Data for each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.

**PART II: PRODUCTS**

A. Pressure and Temperature Ratings: As required to suit system pressures and temperatures.

B. Sizes: Same size as upstream pipe, unless otherwise indicated.

C. Operators: Use specified operators and handwheels, except provide the following special operator features:

1. Handwheels: For valves other than quarter turn.

2. Lever Handles: For quarter-turn valves 6 inches (DN 1 50) and smaller, except for plug valves, which shall have square heads. Furnish Owner with 1 wrench for every 1 0 plug valves.

D. Threads: ASME B1.20.1.

E. Flanges: ASME B16.1 for cast iron, ASME B16.5 for steel, and ASME B16.24 for bronze valves.

F. Solder Joint: ASME B16.18. Where soldered end connections are used, use solder having a melting point below 840 deg F (450 deg C) for gate, globe, and check valves; below 421 deg F (216 deg C) for ball valves.

G. Gate Valves, 2-1/2 Inches (DN65) and Smaller: MSS SP-80; Class 125, 200-psi (1380-kPa) cold working pressure (CWP), or Class 150, 300-psi (2070-kPa) CWP; ASTM B 62 cast-bronze body and bonnet, solid-bronze wedge, copper-silicon alloy rising stem, teflon-impregnated packing with bronze packing nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.

H. Ball Valves, 4 Inches (DN 1 00) and Smaller: MSS SP-1 1 0, Class 150, 600-psi (4140-kPa) CWP, ASTM B 584 bronze body and bonnet, 2-piece construction; chrome-plated brass ball, standard port for 1/2-inch (DN15) valves and smaller and conventional port for 3/4-inch (DN20) valves and larger; blowout proof; bronze or brass stem; teflon seats and seals; threaded or soldered end connections:

1. Operator: Vinyl-covered steel lever handle with hole for valve tag chains.

2. Stem Extension: For valves installed in insulated piping.

3. Memory Stop: For operator handles.

I. Globe Valves, 2-1/2 Inches (DN65) and Smaller: MSS SP-80; Class **125**, 200-psi (1 380-kPa) CWP, or Class 150, 300-psi (2070-kPa) CWP; ASTM B 62 cast-bronze body and screwed bonnet, rubber, bronze, or teflon disc, silicon bronze-alloy stem, teflon-impregnated packing with bronze nut, threaded or soldered end connections; and with aluminum or malleable-iron handwheel.

J. Globe Valves, 3 Inches (DN80) and Larger: MSS SP-85, Class 125, 200psi (1 380-kPa) CWP, ASTM A 126 cast-iron body and bolted bonnet with bronze fittings, renewable bronze seat and disc, brass-alloy stem, outside screw and yoke, teflon-impregnated packing with cast-iron follower, flanged end connections; and with cast-iron handwheel.

**PART III: EXECUTION**

- A. Install valves as indicated, according to manufacturers written instructions.
- B. Piping installation requirements are specified in other Division 15 Sections. Drawings indicate the general arrangement of piping, fittings, and specialties.
- C. Install valves with unions or flanges at each piece of equipment arranged to allow servicing, maintenance, and equipment removal without system shutdown.
- D. Locate valves for easy access and provide separate support where necessary.
- E. Install valves in horizontal piping with stem at or above the center of the pipe.
- F. Install valves in a position to allow full stem movement.
- G. Installation of Check Valves: Install for proper direction of flow. Install in a horizontal position with hinge pin level.
- H. Select valves with the following ends or types of pipe/tube connections:
  - 1. Copper Tube Size, 2-1/2 Inches (DN65) and Smaller Solder ends, except provide threaded ends for heating hot water and low-pressure steam service.
- I. General Application: Use gate, ball, and butterfly valves for shutoff duty; globe, ball, and butterfly for throttling duty. Refer to piping system Specification Sections for specific valve applications and arrangements.
- J. Domestic Water Systems Applications: Use the following valve types:
  - 1. Gate Valves: Class 125, bronze or cast-iron body to suit piping system.
  - 2. Ball Valves: Class 150, 600-psi (4140-kPa) CWP, with stem extension.
  - 3. Plug Valves: Neoprene-faced plug, Buna N packing.
  - 4. Globe Valves: Class 125, bronze or cast-iron body to suit piping system, and bronze or teflon disc.
  - 5. Butterfly Valves: Nickel-plated ductile iron, aluminum bronze, or elastomer-coated ductile iron disc; EPDM or Buna N sleeve and stem seals.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART I - GENERAL**

**SCOPE:**

This Section includes basic requirements for motors. It includes motors that are factory-installed as part of equipment and appliances as well as field-installed motors.

**QUALITY ASSURANCE:**

1. Comply with NFPA 70, "National Electrical Code.
2. Comply with NEMA MG-1, "Motors and Generators".
3. Comply with UL 1004, "Motors, Electric".
4. Comply with NCSBC, Volume X, Chapter 4, Section 401.2, "Electric Motors".

**PART II - PRODUCTS**

**A. MOTORS, GENERAL**

1. General: Requirements below apply to motors covered by this Section except as otherwise indicated.
2. Motors 1 hp and larger: Polyphase.
3. Motors Smaller Than  $\frac{3}{4}$ " hp and less: Single-phase.
4. Frequency Rating: 60 Hz.
5. Voltage Rating: Determined by voltage of circuit to which motor is connected for the following motor voltage ratings (utilization voltages):
  - a. 120V Circuit: 115V - motor rating.
  - b. 208V Circuit: 200V - motor rating.
  - c. 480V Circuit: 460V - motor rating.
6. Service factors indicated for motors are minimum values and apply at frequency and utilization voltage at which motor is connected. Provide motors which will not operate in service factor range when supply voltage is within 10 percent of motor voltage rating.
7. Capacity: Sufficient to start and operate connected loads at designated speeds in indicated environment, and with indicated operating sequence, without exceeding nameplate ratings. Provide motors rated for continuous duty at 100 percent of rated capacity.
8. Temperature Rise: Based on 40 deg C ambient except as otherwise indicated.
9. Enclosure: Open dripproof.
10. Minimum full-load efficiency per tables 401.2.1 a & b of NCSBC Volume X Energy Code.

**B. POLYPHASE MOTORS**

1. General: Squirrel-cage induction-type conforming to the following requirements except as otherwise indicated.

2. NEMA Design Letter Designation: "b".
3. Internal Thermal Overload protection For Motors: For motors so indicated, protection automatically opens control circuit arranged for external connection. Protection operates when winding temperature exceeds safe value calibrated to the temperature rating of the motor insulation.
4. Bearings: Double-shielded, prelubricated ball bearings suitable for radial and thrust loading of the application.
5. Rugged Duty Motors: Totally enclosed with 1.25 minimum service factor. Provide motors with regreasable bearings and equipped with capped relief vents. Insulate windings with nonhygroscopic material. External finish shall be chemical resistant paint over corrosion resistant primer. Provide integral condensate drains.

**C. SINGLE-PHASE MOTORS**

1. General: Conform to the following requirements except as otherwise indicated.
2. Energy Efficient Motors: One of the following types as selected to suit the starting torque and other requirements of the specific motor application.
  - a. Permanent Split Capacitor.
  - b. Split-Phase Start, Capacitor-Run.
  - c. Capacitor-Start, Capacitor-Run.
3. Shaded-Pole Motors: Use only for motors smaller than 1/20 hp.
4. Internal Thermal Overload Protection for Motors: For motors so indicated, protection automatically opens the power supply circuit to the motor, or a control circuit arranged for external connection. Protection operates when winding temperature exceeds a safe value calibrated to the temperature returns to normal range except as otherwise indicated.
5. Bearings, belt connected motors and other motors with high radial forces on motor shaft shall be ball bearing type. Sealed, prelubricated sleeve bearings may be used for other single phase motors.

**PART III - EXECUTION**

**INSTALLATION:**

Install motors in accordance with manufacturer's published instruction.

**PART IV - COMMISSIONING**

1. Check operating motors, both factory and field-installed, for unusual conditions during normal operation. Coordinate with the commissioning of the equipment for which the motor is a part.
2. Report unusual conditions.
3. Correct deficiencies of field-installed units.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART 1 - GENERAL**

**DESCRIPTION OF WORK:**

This section contains the requirements relating to the materials and methods used to identify items described in Division 15.

**PART 2 - PRODUCTS**

**ENGRAVED PLASTIC-LAMINATE SIGNS:**

Provide engraving stock melamine plastic laminate, in the sizes and thickness indicated, engraved with engraver's standard letter style of the sizes and wording indicated, punched for mechanical fastening except where adhesive mounting is necessary because of substrate. Plastic laminate thickness shall be 1/16" for units up to 20 square inches or 8" length; 1/8" for larger units. Provide self-tapping stainless steel screws.

**PART 3 - EXECUTION**

**INSTALLATION REQUIREMENTS:**

A. **COORDINATION:**

Coordinate new labeling with existing labeling through Project Manager. Where identification is to be applied to surfaces that require insulation, painting or other covering or finish, including valve tags in finished mechanical spaces, identification shall be installed after completion of covering and painting. Identification is to be installed prior to installation of acoustical ceilings and similar removable concealment.

B. **DUCTWORK IDENTIFICATION:**

1. **General:** Provide for identification of air supply, return, exhaust, intake, and relief ductwork with stenciled signs and arrows, showing ductwork service and direction of flow, in black and white.
2. **Locations:** Ductwork shall be identified every 20' in spaces with removable ceilings and at each access door in spaces with hard ceilings. Exposed ductwork shall be identified every 20' in mechanical rooms. As described above, ductwork shall be labeled on both sides of floor and wall penetrations.

C. **MECHANICAL EQUIPMENT IDENTIFICATION:**

Provide for engraved plastic laminate sign on or near each major item of mechanical equipment and each operational device. Provide signs for the following general categories of equipment and operational devices:

1. Main control and operating valves, including safety devices.
2. Air conditioning indoor and outdoor units.

*END OF SECTION*



**PART I: GENERAL**

Furnish and install insulation for hydronic and air distribution systems where shown on plans, and specified below.

**HW PIPE INSULATION:**

Insulate hydronic system piping, fittings, flanges, unions, etc. Insulation shall be a jacketed glass fiber pipe covering, 1.5" thick for pipe sizes 1.5" & less, 2" thick for pipes sizes 2" & above with flame resistant vapor barrier jacket meeting ASTM C547 and UL Classified.

Insulation shall be Knauf Earthwool 1000 or equal by Owens-Corning or Johns-Mansville. Provide pre-formed PVC jacket covers over insulated fittings such as els, tees, valves, etc. and over all piping in boiler room (see below).

**CHILLED WATER PIPE INSULATION:**

Insulate chilled water system piping, fittings, flanges, unions, etc. Insulation shall be a condensation control jacketed glass fiber pipe covering, 1.5" thick for pipe sizes 2 1/2" & less, 2.0" thick for pipes 3" to 4", & 2.5" thick for pipes 5" & above with flame resistant vapor barrier jacket meeting ASTM C547 and UL Classified.

Insulation shall be Knauf Earthwool 1000 or equal by Owens-Corning or Johns-Mansville. Provide pre-formed PVC jacket covers over insulated fittings such as els, tees, valves, etc. and over all piping in boiler room (see below).

**BOILER ROOM PIPE INSULATION COVER:**

Furnish & install pre-formed PVC jacketing over insulated piping & fittings in boiler room equal to Proto Corporation LoSmoke 161°F PVC 25/50 Rated. Provide following colors: HEAT = red, CHILLED WATER = blue, MAKE-UP WATER = DOMESTIC WATER by P.C. = green.

**EQUIPMENT INSULATION:**

Insulate hydronic system equipment including but not limited to chilled water expansion or compression tanks, pumps, storage tanks, heat exchanger vessels, etc. Insulation shall be a cellular block or urethane unicellular type with flame resistant vapor barrier jacket meeting ASTM and UL standards.

**DUCTWORK INSULATION:**

Furnish and install all-service faced duct wrap consisting of a blanket of glass fibers factory-laminated to a reinforced foil / kraft (FRK) vapor retarder facing on all supply, ventilation, and non-lined return air ductwork.

Duct wrap shall comply with NFPA 90 performance standards. Duct wrap insulation shall be Knauf Multi-purpose, 2-3/16" minimum thickness 0.75 lb/cf or 2" thick 1 lb/cf density with installed R-value = 6.0, or approved equal by Owens-Corning or Schuller.

**PART II: EXECUTION**

Install system according to manufacturer's written instructions. Drawings indicate only general arrangement of piping, fittings, and specialties

**PIPE INSULATION INSTALLATION:**

The Contractor shall provide all insulation as required on all piping as specified hereinafter and/or as indicated. All insulation shall be installed in a workmanlike manner by qualified workers in the regular employ of the Contractor.

Install insulation according to manufacturer's instructions.

All insulation shall be applied to clean, dry surfaces butting all sections firmly together and finishing as specified hereinafter. All vapor barriers shall be sealed and shall be continuous throughout. No staples shall be used on any vapor barrier jacket. All vapor barriers shall be of the fire-retardant type.

Insulation of all insulated lines shall be interpreted as including all pipe, valves, fittings, and specialties comprising the lines, except flanged unions and screwed unions on hot piping. Insulation over fittings shall be of equal thickness as the adjoining pipe insulation. Unless otherwise specified or directed, insulation for fittings and flanges shall be of the permanent type.

**PIPE INSULATION PROTECTION:**

Support of pipe shall be on the outside of the insulation. The insulation at each support shall be rigid and of an equal thickness and finish as the adjoining pipe insulation; the length to coincide with the saddles.

**PIPE IDENTIFICATION:**

Furnish and install flexible, permanent, color-coded, plastic-sheet pipe markers that comply with ANSI A13.1 on all chilled, hot, & condensate piping (including piping above lay-in ceiling & visible from utility platform) not to exceed 15' o.c. manufactured by Seton Products, MSI, or equal. Provide directional arrows. Verify verbiage with Engineer, i.e., chilled water supply or return, hot water supply and return, etc.

**DUCT SEALANT:**

Prior to insulating, all duct joints (except gasketed joints), seams and connections shall be sealed with brush-on type water-based sealant equal to United-McGill Duct Sealant. Apply in accordance to manufacturer's instructions and / or recommendations.

**DUCT INSULATION INSTALLATION:**

Before applying duct wrap, sheet metal ducts shall be clean, dry, tightly sealed at all joints and seams as specified, sealant applied and inspected by Engineer.

Duct wrap insulation shall be cut to "stretch-out" dimensions as provided in instructions, and a 2" piece of insulation removed from the facing at the end of the piece of insulation to form an overlapping staple and tape flap.

Install duct wrap insulation with facing outside so that tape flap overlaps insulation and facing at other end of piece of duct wrap. Insulation shall be tightly butted. If ducts are rectangular or square, install so insulation is not excessively compressed at duct corners. Seams shall be stapled approximately 6" on center with outward clinching staples. Where a vapor barrier is required, seal with pressure-sensitive tape matching the facing, either plain foil or PRK backing stock.

Where rectangular ducts are 24" in width or greater, duct wrap insulation shall be additionally secured to the bottom of the duct with mechanical fasteners such as pins and speed clip washers, spaced on 18" centers (maximum) to prevent sagging of insulation. Adjacent sections of duct wrap insulation shall be tightly butted with the 2" tape flap overlapping. Where a vapor barrier is required, seal all tears, punctures,

and other penetrations of the duct wrap insulation facing with tape or mastic to provide a vapor tight system.

DUCT LINER:

Removed from Spec, not allowed on this project.

**PART III: WARRANTY**

Manufacturer shall guarantee all insulation as installed to be free from manufacturing defects for a period of one year from startup not to exceed twenty-four months from shipping to job site under normal use.

**PART IV: COMMISSIONING**

Prior to pre-final construction review, Contractor shall repair all insulation tears and damage.

*END OF SECTION*

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

CONDENSATE PIPING:

Condensate piping shall be 1-1/4" diameter minimum PVC pipe and fittings installed in strict accordance with the Plastic Pipe Institute guidelines unless noted otherwise on the drawings. Provide copper or cast-iron piping above corridor ceilings below utility platforms or in similar fire-rated assemblies. Slope pipe a minimum of 1/4" per foot and support with clevis-type hangers at 5'-0" o.c.

INSULATION:

Insulate pipe with 3/8" wall white Polymer foam insulation by IMCOA or 1/2" thick closed cell rubber pipe insulation, Armstrong AP Armaflex or equal by Rubatex, prior to making joints. Fabricate mitered covers over elbow fittings. Insulation sections shall be jointed using Armstrong 520 Adhesive. Follow all manufacturers' installation instructions in strict accordance. Splitting insulation or the use of duct tape to join insulation sections will not be permitted on this project.

PIPE SUPPORT:

Provide clevis-type hangers on 5'-0" centers and within 12" of elbows.

TESTING:

Fill fan coil and air handler condensate pans from utility sinks and allow to flow into storm sewer prior to ceiling installation and pipe insulation. Repair all observed leaks as required.

PIPE IDENTIFICATION:

Furnish and install permanent color-code plastic sheet pipe markers with directional arrows. See also section 15740-4.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**SCOPE OF WORK:**

Provide complete systems of piping and fittings for all services, including water system piping, cold water make-up, valves, fittings, joints, hangers, supports, expansion joints, pipe guides, and insulation.

**SUBMITTALS:**

Shop drawings shall be submitted for the following:

- a. piping & fittings
- b. welding procedure & qualification specification
- c. valves / strainers / flow control devices / test plugs
- d. gauges

**BUILDING PIPE INSTALLATION:**

All pipe, valves and fittings shall comply with American Standards Association Code and/or local codes and ordinances (no foreign fittings accepted). Cut pipe accurately to measurements established at building or site, and work into place without springing or forcing, properly clearing all windows, doors and other openings or obstructions. Excessive cutting or other weakening of building to facilitate piping installation will not be permitted. Piping shall line up flanges and fittings freely and shall have adequate unions and flanges so that all equipment can be disassembled for repairs. Test all piping prior to concealing.

All welded pipe and fittings shall be delivered to job with machine beveled ends. Where necessary, beveling may be done in field by gas torch, in which case surfaces shall be thoroughly cleaned of scale and oxidation after beveling. No miter connections will be permitted in welded work.

Screwed piping shall have tapered threads cut clean and true, and shall be reamed out clean before erection. Each length of pipe, as erected, shall be upended and rapped to free it of any foreign matter. All piping shall be closed with factory installed caps until prior to installation.

Threaded fittings shall be malleable iron conforming to ANSI B16.3 (150 psig W.O.); welded fittings shall be standard weight Schedule 40 black steel conforming to ASTM A-120. Weld-o-lets may be used in lieu of fitting for branch take-offs from mains 2" or larger provided that the branch take-offs is two or more sizes smaller than the main. No "stub-ins" will be permitted. Threaded joints shall be made with Teflon sealing compound applied to the male threads only.

The Contractor shall coordinate the routing of all piping with other contractors prior to installation. Furnish and install valves as required to allow for complete system drain down.

**ABOVE GROUND PIPING:**

Above ground piping inside building shall be:

Schedule 40 black steel pipe bearing name of manufacturer and weight at regular intervals. Fittings for pipe 2-1/2" and smaller shall be malleable iron 150 lb. screwed and bonded (ASA B16.3). Fittings for pipe 3" and larger shall be welded forged carbon steel (ASTM 234) with same thickness as adjacent piping. Use only long radius elbows. Contractor may choose to use grooved steel piping (Victaulic or Equal) in systems that do not exceed 180F degree water temperatures in lieu of welded steel piping.

Carbon Steel or Copper tubing utilizing a mechanical compression joint (Viega MegaPress, ProPress or Equal) for pipe sizes 4" and less may also be used. *See Form of Proposal for Alternate bid regarding providing Aquatherm Non-Metallic piping in lieu of metallic pipe.*

#### WELDING QUALITY ASSURANCE

Piping shall comply with the provisions of the latest edition of the ASME code for pressure piping, ANSI/ASME B31.1 - Power Piping.

All welding shall be performed by persons currently having an ASME license in accordance with Section IX of the ASME Code. All welding shall be performed in accordance with the North Carolina Boiler Rules. Names, identification stamps, and copy of certification of all welders on job shall be submitted to the Designer and kept for historical purposes in the project files. At the request of the Designer, this contractor shall (at his or her expense) have an independent testing agency test and qualify the welding procedures used in the construction of weldments and the performance of welders who apply these procedures.

At least two weeks before any welding is performed, the Contractor shall submit to the Designer a copy of each welding procedure specification required for the job, together with the procedure qualification record as required by Section IX of the ASME boiler and pressure vessel code.

At least two weeks before any welder shall perform any welding the Contractor shall submit to the Designer a copy of the manufacturer's record of welder or welding operator qualification tests as required by Section IX of the ASME boiler and pressure vessel code.

Welded joints shall be made by first properly beveling the surfaces to be welded, cleaning the mating surfaces, then tack-welding the joint to assure proper alignment prior to completing the weld. Weld metal shall be continuous around the joint and shall be deposited in such a manner that the sides and bottom of the surfaces or edges joined are thoroughly fused with the surface of the weld and have proper reinforcement and width.

The first weld of each welder shall be witnessed and visually inspected and approved by Engineer before further welding by that welder is permitted. Provide at least five (5) working days notice to Engineer.

Weld examination shall be in accordance with ANSI/ASME B31.1 - Power Piping. In addition, the Owner may at any time hire an independent agent to examine the welds using whatever method he or she deems suitable, whether required by ANSI/ASME B31.1 or not.

Any welds not meeting the acceptance criteria of ANSI/ASME B31.1 – Power Piping for the examination technique used shall be repaired in accordance with ANSI/ASME B31.1., at no cost to the Owner.

#### VALVES:

For pipe sizes 3" and larger, valves shall be threaded lug butterfly type, with ductile iron body, teflon or neoprene seat, and bronze disc; Grinnell Series 8000 or equal by Posi-Seal or DEMCO. For pipe sizes 2.5" and smaller, use ball valves non-shock pressure rated up to 400 psi equal to Grinnell Series 3500 with cast bronze body and ball. Soft solder ends at temperatures less than 470°F to prevent damage to seat. Nibco or Apollo shall be considered equal.

Check valves shall be spring loaded, manufactured by Febco, Watts or equal.

#### STRAINERS:

Strainers shall be placed at pumps, coils, chillers, boilers, make-up water and where indicated on the drawings. Strainer body specs shall be same as valves. Screen element shall be rated for 20 mesh/850 microns up to 1-1/2", perforations shall not exceed 1/16" for 2" units and larger.

#### AUTOMATIC FLOW CONTROL VALVES / STRAINERS

Combination automatic flow control valves strainers with pressure and temperature parts shall be installed where shown on the drawings to control the water flow to the scheduled values. These valves shall automatically control the flow of water to the units to within 5% of the indicated flow over a pressure range of not less than 14 times the minimum necessary for proper flow. All internal working parts shall be nickel plated brass or type 300 passivated stainless steel. Where indicated on drawings, provide plug blow down drain, manual air vent, add dielectric union options. See details on drawings. Flow control devices shall be Auto Flow FV-BC/SV-BC by Flow Design Inc. or Flow-ConY, or Ultra-Z by Griswold.

#### TEST PLUGS:

Provide where shown on drawings, 1/4" brass, 1000 psi, 250 degrees F test plugs with Nordel penetrable membrane for measuring pressure and temperature. The plug shall have a firm fitting brass cap. The case shall have a double insert of Nordel to prevent momentary leakage after long periods of penetration. Test plugs shall be manufactured by Peterson Engineering (Pete's plugs) or approved equal.

#### PIPE SLEEVES:

Provide pipe sleeves where pipe passes through floors, beams, walls, roofs, etc. Size sleeves for insulated pipe to accommodate both pipe and insulation. Sleeves for piping masonry or concrete walls, floors, beams, or roof, shall be of black steel pipe of standard weight, unless otherwise specified or shown. Vertical sleeves through floors shall extend at least 1" above finished floor.

#### PIPE HANGERS AND SUPPORTS:

Pipe hangers and supports shall be of a size to support water filled piping with a safety factor of 5 based on hanger or support ultimate tensile strength. Hangers and supports shall be manufactured by B-Line Systems or approved equal by Grinnell or PHD. Size hangers for all insulated piping to fit over insulation with an acceptable clearance.

Clevis hangers for water piping shall be equal to B-Line Fig. 3100. Roller type hangers shall be equal to B-Line Fig B-3110. Vertical pipes shall be supported by wall brackets equal to Grinnell Fig. 261. Hanger rod shall be equal to B-Line Systems Fig B-3205. Pipe insulation protection shield shall be B-Line Fig. 3151. Piping hanger and support installation shall allow for uniform expansion and contraction at all times. Use B-Line Fig. B-3050 or equal universal C-clamps for attachment to structure.

#### PIPE INSULATION:

See Section 15500, Mechanical Insulation.

#### PRESSURE TESTING:

Test all piping and connections installed under this contract. Do testing prior to painting, backfilling, insulating or concealment within building construction. Trenches may be backfilled prior to pressure tests, but not before work has been visually inspected by the Owner. If pressure tests indicate leaks in piping, it shall be the Contractor's responsibility to determine location of leaks, excavate as required, repair leaks, and backfill at his expense.

Perform each test as specified hereinafter and continue or repeat until the lines under test are proven tight to the satisfaction of the Owner. Furnish all materials, pumps, gauges, plugs, etc., required for tests. Notify the Engineer in advance of tests so he may witness same. Sections of the system may be tested separately, but when so tested, any defect which may develop in a section already tested and accepted shall be corrected and that section retested. Devices or equipment which may be harmed by test pressures shall be removed or protected during tests. After testing, test systems for complete drainability by draining all water from piping using permanent caps, plugs, drain valves, etc. Test building water piping at 100 psi for a minimum of 4 hours before it is witnessed by Engineer. Final test system shall be performed at 100 psi for a minimum of 24 hours.

**PIPE AND VALVE IDENTIFICATION:**

Furnish and install flexible, permanent, color-coded, plastic-sheet pipe markers that comply with ANSI A13.1 on all piping (including piping above lay-in ceiling) not to exceed 15' o.c. manufactured by Seton Products, MSI, or equal. Provide directional arrows. Verify verbiage with Engineer, i.e., chilled water supply or return, hot water supply and return, etc. Stencil-type spray-on pipe labels will not be accepted on this project.

Furnish and install brass valve tags with 1/4" high letters identifying operation / maintenance of piping system.

**TEMPERATURE GAUGES:**

Thermometer shall be a dial type, minimum 4.5" diameter black on white dial, stainless case, variable angle mount, copper bulb, with magnifying glass cover. Temperature range shall be 30°F to 240°F (-10°C to 110°C) with a 1% scale range accuracy. Approved manufacturers are Weiss, Trerice, Marsh Instruments, and Weksler.

**PRESSURE GAUGES:**

Pressure gauges shall have a minimum 4.5" diameter black on white dial, be stem-mounted, provided with stop locks, have a phosphor-bronze bourdon tube and a corrosion resistant brass movement with a 1% scale range accuracy. Pressure Range shall be selected by Engineer. Approved manufacturers are Trerice, Weiss, and Marsh instruments.

**THERMOMETER WELLS:**

Provide thermometer wells constructed of brass or stainless steel, pressure rated to match piping system design pressure. Provide 2" extension for insulated piping and cap nut with chain fastened permanently to thermometer well.

**HEAT TRACING:**

Furnish and install UL approved self-regulating heat tracing cable for freeze protection of all hydronic piping outside insulation envelope (unless system contains antifreeze solution). The heat trace cable shall consist of two (2) 16 AWG nickel plated copper bus wires embedded parallel in a self-regulating polymer core that varies its power output in response to temperature along its entire length. The heat trace jacket shall be a radiation cross linked polyolefin dielectric rated at 300 VAC at 105°F with a VW-1 flame resistance and shall have a outer braid of tinned copper for a ground path.

Heat trace shall be installed in strict accordance with manufacturer's instructions after pressure testing and immediately before pipe insulation. The heat trace shall be resistance tested and connected to GFCI protected power by a licensed Electrician at the expense of the Contractor.



**DIVISION 15B**  
**SECTION 15740**

**HEATING, VENTILATING, AND AIR CONDITIONING**  
**HYDRONIC PIPING SYSTEMS**

---

Domestic water heat trace cable shall be Model HSX-A-120V manufactured by Thermon or equal by RayChem.

**ALUMINUM JACKET:**

Furnish and install an aluminum jacket on all piping located on the building exterior or in other places subject to physical damage. Wrap insulated pipe and heat race wiring with 0.016 inch thick embossed aluminum jacketing with longitudinal slip joints, secured with 3/8" wide bands.

*END OF SECTION*

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

PART 1 – GENERAL

SUMMARY

This Section includes pipe and fitting materials, joining methods and specialty items for the following:

1. Chilled Water piping.
2. Air control devices – air separators / expansion tanks

REFERENCE DOCUMENTS

- A. ASTM F 2389-07 - Standard Specification for Pressure-rated Polypropylene (PP) Piping Systems
- B. CSA B137.11 - Polypropylene (PP-R) Pipe and Fittings for Pressure Applications
- C. NSF/ANSI 14 – Plastic Piping System Components and Related Materials
- D. DIN-DVS 2207-11 2017 – Welding thermoplastic materials – Heated element welding of pipes, piping parts and panels made of polypropylene

DEFINITIONS

- A. Definitions shall be in accordance with local mechanical codes and ASTM F 2389.

SUBMITTALS

- A. Material list naming each product to be used identified by manufacturer and product number, in accordance with Division 1.
- B. Warranty Information
  1. Submit documentation of 10-year warranty with coverage for parts, materials, labor, property damage, and personal injury.

PERFORMANCE REQUIREMENTS

- A. Provide components and installation capable of producing hydronic piping systems with the following working-pressure ratings:
  1. Chilled Water Piping: 12 psig at 42 deg. F

QUALITY ASSURANCE

- A. Material shall be certified by NSF International as complying with NSF 14, and ASTM F 2389 or CSA B137.11.
- B. Material shall comply with manufacturer's specifications.
- C. Special Engineered products shall be certified by NSF International as complying with NSF 14.

- D. Piping Installers: Installers of polypropylene piping shall be certified by the manufacturer of the pipes and fittings as having been trained and qualified to join polypropylene piping using fusion welding of the same type as specified in Drawings (socket).

#### DELIVERY STORAGE AND HANDLING

- A. Inspect the pipe upon receipt to ensure that it has not been damaged during shipping.
- B. Damaged pipe should be cataloged and returned for replacement following distributor's procedures for returns.
- C. Protect piping, valves, fittings, etc. before installation in accordance with manufacturer's written instructions.
- D. Always store the pipe on a flat surface. When storing the pipe on racks or supports on the ground always have at least four supports, evenly spaced, under a 19-ft length. Place plywood on top of the supports to prevent warping.
- E. Piping shall be shipped from the factory with capped ends and stored on supports off the ground with ends covered at all times to prevent nesting of insects, birds, and other animals. Any pipe found to be without end-caps or not raised off of the ground should be cleaned by the contractor prior to installation.
- F. Protect piping from accumulation of dirt and debris in and around piping/components.
- G. If the pipe is removed from its bag, or the bag has been damaged do not store the pipe unprotected from UV rays (sunlight) for longer than six months. Pipe that is exposed to direct sunlight for longer than six months will not be covered under the warranty.
- H. Never place the forks of a forklift into the ends of the pipe. The interior of the pipe may be damaged and can cause it to crack. Handlers may use a padded rug ram inside the pipe or use a crane or lift to handle larger pipe.
- I. In cold weather, take extra care when handling the pipe. Cold temperatures reduce the pipe's flexibility, making it more susceptible to impact damage.

#### PART 2 – PRODUCTS

##### PIPE AND PIPING PRODUCTS

- A. Pipe shall be manufactured from a PP-R or PP-RP(RCT) resin (Fusiolen) meeting the short-term properties and long-term strength requirements of ASTM F 2389 or CSA B137.11. The pipe shall contain no rework or recycled materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material. All pipe shall be made in an extrusion process. All pipe shall comply with the rated pressure requirements of ASTM F 2389 or CSA B137.11. All pipe shall be certified by NSF International as complying with NSF 14, and ASTM F 2389 or CSA B137.11.
- B. Pipe shall be Aquatherm, Niron or equal.

##### FITTINGS

- A. Fittings shall be manufactured from a PP-R resin (Fusiolen) meeting the short-term properties and long-term strength requirements of ASTM F 2389. The fittings shall contain no rework or recycled materials except that generated in the manufacturer's own plant from

resin of the same specification from the same raw material. All fittings shall be certified by NSF International as complying with NSF 14, and ASTM F 2389 or CSA B137.11.

#### WARRANTY

- A. Manufacturer shall warrant pipe and fittings for 10 years to be free of defects in materials or manufacturing.
- B. Warranty shall cover labor and material costs of repairing and/or replacing defective materials and repairing any incidental damage caused by failure of the piping system due to defects in materials or manufacturing.
- C. Installers shall be trained and certified to install the pipe according to the manufacturer's guidelines. Contact your local Aquatherm representative for training.
- D. Warranty shall be extended to prefabricated parts constructed by the manufacturer.

#### POLYPROPYLENE VALVES

- A. Polypropylene Valves shall be manufactured in accordance with the manufacturer's specifications and shall comply with the performance requirements of ASTM F 2389 or CSA B137.11. The valves shall contain no rework or recycled thermoplastic materials except that generated in the manufacturer's own plant from resin of the same specification from the same raw material.

#### SMOKE AND FIRE RATINGS

- A. Where indicated on the drawings that a Plenum-rated Piping System is needed, the pipe shall be wrapped and/or insulated with standard fiberglass or mineral wool pipe insulation, field installed, with bare fittings no closer than every 6 ft. of pipe. The pipe wrap or insulation as a system shall meet the requirements of CAN/ULC-S102.2-03 or ASTM E84. The system shall have a Flame Spread Classification of less than 25 and Smoke Development rating of less than 50.

#### PART 3 - EXECUTION

##### PIPING APPLICATIONS

Drawing plans, schematics, and diagrams indicate general location and arrangement of hydronic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved prior to installation.

- A. Installers shall be trained and certified to install the pipe according to the manufacturer's guidelines.
- B. Install listed pipe materials and joining methods below in the following applications:
  - 1. Aboveground: Polypropylene (PP-R) or PP-RP(RCT) piping in SDR 7.4, 9, 11, or 17.6 based on the required minimum pressure rating and use temperature, in accordance with manufacturer's instructions and ASTM F2389.

- C. Installation must be accomplished with the proper tools for installing piping following manufacturer's instructions.
- D. Install hydronic piping level and plumb.
- E. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

#### FUSION WELDING OF JOINTS

- A. Install fittings and joints using socket-fusion, All fusion-weld joints shall be made in accordance with the pipe and fitting manufacturer's specifications and product standards.
- B. Fusion-weld tooling, welding machines, and electrofusion devices shall be as specified by the pipe and fittings manufacturer.
- C. Prior to joining, the pipe and fittings shall be prepared in accordance with ASTM F 2389 and the manufacturer's specifications.
- D. Joint preparation, setting and alignment, fusion process, cooling times and working pressure shall be in accordance with the pipe and fitting manufacturer's specifications.
- E. Data Loggers shall be used to log each joint made. Data logger shall record at least the date, time of day and person making each joint. Data logger shall also record the required pressure/leak test for manufacturer's warranty.

#### VALVE APPLICATIONS

- A. Install gate valves close to the main on each branch and riser serving 2 or more equipment connections and where indicated.
- B. Install gate or ball valves on the inlet to each equipment item and elsewhere as indicated.
- C. Install drain valve at the base of each riser, at low points of horizontal runs, and where required to drain hydronic piping system.
- D. Install swing check valve on the discharge side of each pump and elsewhere as indicated.
- E. Install ball valves in each circulating loop and the discharge side of each pump.

#### HANGER AND SUPPORT INSTALLATION

- A. Comply with requirements for pipe hanger, support products, and installation as listed below and in accordance with the Hangars specification.
  - 1. Vertical Piping: MSS Type 8 or 42, clamps.
  - 2. Individual, Straight, Horizontal Piping Runs:
    - a) Adjustable, steel clevis hangers.
    - b) Clamps on strut trapeze.
    - c) Clamps on strut attached to structure.

- d) Clamps attached directly to the structure.
- 3. Base of Vertical Piping: MSS Type 52, spring hangers.
- B. Support vertical piping and tubing at base and 10-ft. intervals or at each floor whichever is less. For piping 2" (63mm) or smaller, install mid-story guides.
- C. Install hangers and supports at intervals specified in the applicable Plumbing Code and/or as recommended by pipe manufacturer.
- D. Hangers and supports shall also be provided within 1-foot of every change of direction and within 1-foot of any pipe fittings and valves.
- E. Use care when installing riser clamps to not over tighten the clamps to cause indentation of the pipe. Riser clamps shall be isolated from the building structure by placing felt or rubber pads between the clamp, the pipe and the structure.
- F. All piping support materials shall be new and manufactured for the specific purpose of supporting systems, equipment, pipes and accessories. No improvised pipe support solutions shall be allowed.
- G. Piping systems shall not have direct contact with the building structure.

#### EXPANSION AND CONTRACTION

- A. Provide expansion and contraction controls, guides and anchors to take into account the expansion and contraction of the pipe. Provide expansion loops or offsets as required and as indicated in the manufacturer's literature.
  - 1. Install anchor points at least every 120 feet.
  - 2. Install expansion loop or offset between each anchor point. Expansion device must be able to absorb all the stresses between the two anchor points. Refer to manufacturer's published instructions, formulas and calculations at [www.aquatherm.com](http://www.aquatherm.com).
  - 3. Vertical risers shall be anchored at each floor.
  - 4. Provide anchor point at branch take-off in vertical riser of piping.

#### PRESSURE/LEAK TESTING

- A. While still accessible all piping shall be pressure/leak tested to the manufacturer's standards.
- B. Tests shall be carried out using water, compressed air or a mixture of the two. The test pressure shall be as indicated in the pressure leak testing procedures required by the manufacturer.
- C. In the event that water is not available for testing it shall be permissible to use compressed air as a testing medium. Contact the engineering department of the manufacturer for guidance. Follow all precautionary procedures recommended by the piping manufacturer.
- D. Any leaks detected shall be repaired at the contractor's expense by removing the leaking part and replacing with new parts welded per the pipe manufacturer's guidelines. See [www.aquatherm.com](http://www.aquatherm.com) for additional details and forms.

#### INSPECTING AND CLEANING

- A. The pipes shall be flushed with cold water after finishing the installation. Flush the system until the water runs clear of debris and dirt.
- B. Inspect and test piping systems following procedures of authorities having jurisdiction and as specified by the piping system manufacturer.

*END OF SECTION*

RELATED DOCUMENTS:

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

SCOPE OF WORK:

Contractor shall be responsible flushing, cleaning, and purging of hydronic system piping and pre-treatment of system with corrosion and deposit inhibitors plus microbiocide.

System treatment shall be performed by a competent water treatment company.

Provide a single two gallon chemical bypass feeder, ChemTreat no. 70600880 or Owner pre-approved equal by Dearborn or Calgon.

SYSTEM FLUSHING & PRE-CLEANING:

Clean and flush system before fan coil or air handler connection. After flushing system thoroughly, provide a written certification to Architect that the piping system is free of all dirt, trash, grease, oil, foreign objects, etc.

Make fan coil or air handler connection and clean and re-flush system.

Remove and clean all system strainers then replace.

SYSTEM CLEANING & PRE-TREATMENT PROCEDURE:

1. Check to verify the system has no leaks by whatever method is applicable (visual, hardness test of water from AHU condensate pans, dye, pressure monitoring, make up water meter readings, etc.).
2. Check the PRV and make up bypass valve for proper operation. Purge expansion tank and strainers to remove accumulated rust.
3. Install ball valve on strainers.
4. If the water is dirty:
  - A. Drain and refill until the water clears. Purge air.
  - B. If the water remains dirty after circulation, or if the system must be cleaned while on line, start a running flush (bleed off while make up maintains system pressures) until the water clears. Make sure all control valves are cycled so the entire system is flushed.
5. Add cleaners and inhibitors to the system.
  - A. 5000ppm CT 30 Chill Water Systems (CT 23 may be substituted in hot water systems where there is a minimum of copper in the system).
  - B. 200 ppm CL4123
  - C. 200 ppm CL4400
6. Circulate system for 8-24 hours. During this time, blow down at all low points and deadlegs. Cycle all control valves to make certain the entire system is cleaned. Blow out and / or clean strainers as needed.
7. If the entire system will completely drain by gravity, turn off system. Drain and refill with clean water. Circulate water and start a running flush. If the system will not completely drain by gravity, start a running flush.



8. Continue the running flush until samples collected prior to the make up point to meet the following requirements:
  - A. The pH is less than 9.0.
  - B. The water is clear.
  - C. Iron content is <0.5 or as low as it will go (old systems will not normally be <0.5 after cleaning).
9. Monitor the above parameters frequently. If the iron content rises on two consecutive samples and the water is clear, consider the flushing as complete.
10. Add the appropriate inhibitors:
  - A. CL2871: 4500 ppm – chill water  
6000 ppm – hot water
  - B. NCL2150: 250 ppm – chill water  
250 ppm – hot water (if water will not be >180 degrees F year round)
11. Use and disposal of chemicals and cleaning solutions should comply with appropriate regulations.
12. The system shall have a minimum of each of the following treatments:
  - A. Molybdenum 300 ppm
  - B. Sodium Nitrite 300 ppm
  - C. Tolytriazole 20 ppm

**WARRANTY:**

Schedule water Treatment Company to take water test samples prior to 11 month warranty inspections.

Make corrections and file report to Architect.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART I - GENERAL**

Mechanical Contractor shall provide all equipment, labor, and accessories shown on drawings and specified in the following, required to install pumps with capacities as scheduled on the drawings.

**PART II - PRODUCTS**

**BASE MOUNTED, FLEXIBLE COUPLED, END-SUCTION PUMPS:**

- A. Pumps shall be base mounted, single stage, end suction design with an integrally cast, foot mounted volute, capable of the impeller and bearing assembly being serviced without disturbing piping connections, pump volute or motor. The pump and motor shall be mounted on a common base plate of heavy structural steel design and securely welded cross members and open grouting area.
- B. The impeller shall be bronze enclosed, single suction type, dynamically balanced, keyed to the shaft. The allowable residual unbalance in the impeller rotating assembly shall conform to ANSI Grade G6.3.
- C. The liquid cavity shall be sealed off by an internally flushed mechanical seal with ceramic seat of 99.5% pure alumina oxide and hardness of 68 Rockwell C, or a tensile strength of 300,000 PSI, and carbon seal ring, suitable for continuous operation at 225 degrees F. The seals and bearings shall be capable of being serviced without disconnecting the pump from piping or disturbing the volute or motor to maintain original alignment. A replaceable bronze shaft sleeve shall completely cover the wetted area of the shaft under the seal. A stuffing box mechanical seal design with longer span between the impeller centerline and first bearing will not be allowed.
- D. The pump casing shall be of Class 30 cast iron with integrally-cast pedestal support feet, suitable for 175 PSI working pressure. The pump volute shall be supplied with plugged vent, drain, and gauge tapings.
- E. The pump bearings shall be regreaseable ball bearing type with provision for purging or flushing through the bearing surface.
- F. A flexible type, spacer design coupler, capable of absorbing torsional vibration, shall be employed between the pump and motor. Coupler shall be shielded by an OSHA coupler guard securely fastened to the base.
- G. Motor shall meet EPACT 92 requirements and NEMA specifications and shall be the size, voltage and enclosure called for on the plans. Pump and motor shall be factory aligned and shall be realigned by mechanical contractor or by an alignment service contractor to factory recommendation.
- H. Pumps shall be capable of withstanding a horizontal load of 0.5 G without adversely affecting pump operation. Pumps used in chilled water applications shall have galvanized drip pans.
- I. Base-mounted end-suction pumps shall be Bell and Gossett 1510 series, Taco FM series, or Armstrong 4030 series.

**IN-LINE PUMPS:**

In-line pumps shall be type for installation in vertical or horizontal piping. Pump must be capable of being serviced without disturbing piping connections.

Pump body shall be class 30 cast iron, rated 175 psi working pressure, with gauge ports at nozzles, and with vent and drain ports. Impeller shall be cast bronze, enclosed type, dynamically balanced, keyed to the shaft and secured by a locking capscrew or nut. The liquid cavity shall be sealed off at the motor shaft by an internally-flushed mechanical seal with ceramic seal seat, and carbon seal ring, suitable for continuous operation at 225° F. A non-ferrous shaft sleeve shall completely cover the wetted area under the seal. Pump bearing bracket shall have oil lubricated bronze journal and thrust bearings. Bracket shaft shall be alloy steel having ground and hardened thrust bearing faces. A flexible coupling to dampen starting torque and torsional vibrations shall be employed. Motor shall meet NEMA specifications and shall be the size, voltage and enclosure called for on the plans. Each pump shall be factory tested. It shall then be thoroughly cleaned and painted with at least one coat of high-grade machinery enamel prior to shipment.

Pumps shall be capable of being serviced without disturbing piping connections. Pumps shall be rated for a minimum of 175 psig working pressure.

Horizontal in-line pump shall be Series 60 as manufactured by Bell and Gossett, or Taco 1600 or VL series, or Armstrong 4300 series.

**TRIPLE DUTY VALVES:**

Furnish and install triple duty valve at system pump designed to perform the functions of a non-slam check valve, throttling valve, shut-off valve and calibrated balancing valve. The valve shall be fitted with a bronze seat, replaceable bronze disc with EPDM seat insert, stainless steel stem and "chatter-preventing" stainless 'S' spring. The valve design shall permit repacking under full system pressure.

The triple duty valve shall be designed for quiet operation. The triple duty valve shall have a non-slam check valve with spring-loaded weighted disc. The unit shall have a calibrated adjustment (multiple turns) for regulation of pump flow. The adjustment shall have "set-memory" position. The unit shall have positive shut-off for servicing the pump. Valve shall be sized equal to pipe branch connection.

The unit shall have gauge tappings at suction and discharge flanges for flow/pressure drop readings using read-out kit. The valve shall be constructed with the body of cast iron, disk and seat of bronze, stem and spring of stainless steel, and the packing of teflon-asbestos. The valve shall be designed to permit repacking while under full line pressure. The valve shall be suitable for 175 psi working pressure.

The valve shall be Bell & Gossett Model No. 3Ds-3S Triple Duty Valve, or Taco Multipurpose Valve or approved equal by Thrush.

**SUCTION DIFFUSERS**

Units shall consist of angle type body with inlet vanes in two planes to assure uniform flow. Units shall have a combination diffuser-strainer-orifice cylinder with 3/16" diameter openings for pump protection. A permanent magnet shall be located within the flow stream and shall be removable for cleaning. The orifice cylinder shall be equipped with a disposable fine mesh strainer which shall be removed after system start-up. Orifice cylinder shall be designed to withstand pressure differential equal to pump shutoff head and

shall have a free area equal to five times cross section area of pump suction opening. Vane length shall be no less than 2 1/2 times the pump connection diameter. Unit shall be provided with pressure gauge tapings to check strainer condition. Unit shall be suitable for 175 psi working pressure. Unit shall be provided with strainer blow-down connection for routine maintenance.

**BRAIDED FLEXIBLE PUMP CONNECTORS:**

Braided flexible metal pump connectors shall be provided on suction and discharge sides of all pumps to absorb vibration, minimize stress and reduce noise.

Flexible metal hose shall be annular, closed pitch hose of 321 stainless steel with 304 stainless steel braid shall be standard. Hose wall thickness for maximum strength and reliability shall be a minimum of .017" for connectors under 1-1/2" and a minimum of .020" for connectors 2" and above. Braid coverage shall be a minimum of 90% to insure maximum operating pressure and an extended cycle life. Pump connector shall have a maximum operating temperature of 1000 degrees Fahrenheit and be able to handle 1/8" misalignment.

**AIR & SEDIMENT REMOVAL SEPARATOR**

The unit shall be capable of air separation and elimination.

The unit shall have tangential inlet and outlet connections to create a low velocity vortex where air and sediments are separated.

The unit shall have a solid separation efficiency of 98% of 200 mesh sand and water solution, and be capable of heavier-than-water, undissolved sediment separation of at least 40 microns. Vessel shell diameter is to be three times the nominal inlet/outlet pipe diameter.

The air separator must be designed, constructed and stamped for 125 psig at 350 degrees F, in accordance with Section VII, Division 1 of the ASME Boiler and Pressure Vessel Code, and registered with the National Board of Boiler and Pressure Vessel Inspectors.

**EXPANSION TANKS:**

Furnish and install pre-charged vertical (and horizontal under ice storage alternate) steel expansion tanks as detailed on drawings.

The bladder Tank shall be pre-charged, vertical steel expansion tank with replaceable, heavy-duty Butyl rubber bladder. The tank shall have 1 1/2" NPT system connection, a 3/4" NPT drain, and a .302"-32 charging valve connection (standard tire valve) to facilitate the on-site charging of the tank to meet system requirements. The tank must be constructed in accordance with Section VIII of the ASME Boiler and Pressure Vessel Code and stamped for 125 psi working pressure. Maximum operating temperature rating shall be 240 degrees Fahrenheit. Tank shall be an ITT Bell & Gossett Series "B" or approved equal.

**PART III - EXECUTION**

**INSTALLATION:**

- A. Install pumps in strict accordance with manufacturer's published instruction manual. Drawings indicate only general arrangement of piping, fittings, and specialties
- B. Piping installation requirements are specified in other Division 15 Sections.
- C. Install pumps to provide access for periodic maintenance, including removing motors, impellers, couplings, and accessories.
- D. The contractor shall level and grout each unit according to the manufacturer's instructions before alignment and start up. Level pump by placing shims under frame as required. Inject non-shrinking grout inside pump base and grout shims.
- E. Support pumps and piping separately so piping is not supported by pumps.
- F. Install shutoff and check valves on inlet of pressure-operated units.
- G. Install inlet strainer and valved bypass to drain at system return connection.
- H. Pull and trim the pump impeller after a proportional balance has been done by the balance contractor. Hydronic systems shall be balanced in a manner to first minimize throttling losses; then the pump impeller shall be trimmed. A balance report from the installer shall be furnished to the Engineer and a copy included in the operating and maintenance manual.
- I. Electrical power and control wiring, and connections are specified in Division 16 Sections. Install electrical connections for power, controls, and devices. Ground equipment.

**PART IV: COMMISSIONING**

Schedule service of factory trained representative for a period of one day to supervise testing, start-up, and instruction on operation and maintenance to Owner.

Pump manufacturer representative shall verify proper sleeve coupler parallel and angular alignment, record suction and discharge pressure, record amperage draw of motor, and complete name plate data of pump and motor.

**PART V: WARRANTY**

Manufacturer shall guarantee the system as installed to be free from manufacturing defects for a period of one year from startup not to exceed eighteen months from shipping to job site under normal use.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**DUCTWORK:**

Material and thickness: Ducts shall be rectangular and fabricated of prime quality, re-squared, tight-coat-galvanized, steel sheets. All duct construction shall equal or exceed SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure.

**DUCT CONSTRUCTION:**

All ductwork shall be fabricated from prime, number one grade galvanized sheet metal conforming to ASTM A-924-94, G-90. Gauges for duct sizes shall be minimum as follows:

<u>Low Pressure, &lt;1" ESP</u>		<u>Medium Pressure, &lt;2" ESP</u>	
26 Ga.	Up to 30 inches	26 Ga.	Up to 26 inches
24 Ga.	Up to 40 inches	24 Ga.	Up to 30 inches
22 Ga.	Up to 54 inches	22 Ga.	Up to 36 inches
20 Ga.	Up to 96 inches	20 Ga.	Up to 84 inches

Standard flat slips and drives shall be used on ductwork with long dimensions not exceeding 18". On ductwork over 18" standing S cleats, Ductmate angles or equivalent reinforcing shall be used.

Ducts shall have supplemental stiffening as required to prevent drumming and to provide a structurally sound assembly. All ducts except those to which rigid board type insulation is to be applied shall have all sides cross-broken. All duct dimensions shown on drawings are "inside clear". The sizes of acoustically lined ducts shall be increased accordingly. Ducts shall be smooth on inside.

Fabricate all ductwork to prevent seams or joints being cut for installation of grilles, diffusers, or registers. All duct joints and seams shall be fabricated and installed with joints and seams made air tight.

**SPIRAL DUCT:**

Where round duct is indicated on the drawings by diameter, provide spiral duct constructed in accordance with ASHRAE and SMACNA standards, and G-60 galvanized steel meeting ASTM A-517. Duct fittings shall be of welded seam construction, and male fitting slip connection shall be a minimum of 2" from bead to end.

Where exposed duct is detailed on the drawings, provide superior fabrication grade double wall insulated spiral duct with 1" thick insulation meeting NFPA 90A flamespread requirements, welds ground smooth, paintable galvanized steel, perforated liner, and paintable flanged type gasketed duct connection fittings.

Spiral pipe shall be manufactured by United McGill, Hamlin Sheetmetal, Linx Ind, or Spiral Pipe of Texas.

**HANGING DUCTS:**

Support ducts from building structure in accordance with SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure.

**OBSTRUCTIONS AND RESTRICTIONS:**

Where possible, avoid locating any pipe, wire, structural member or other obstruction inside of duct. Take particular care to avoid obstructions in elbows. Where obstruction cannot be avoided, the rules

specified by SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure, shall apply. Where ducts pass through non-rated walls, protect ducts and/or insulation from contact with wall by .5 inch filler of noncombustible material and flange perimeter of wall opening with sheet metal.

**CHANGE IN DUCT SHAPE & DIRECTION:**

Where the area at the end of the transformation results in an increase in area from the beginning of the transformation, the slope of the transformation shall meet SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure.

In general, keep changes in direction and changes in shape to minimum permitted by distribution requirements and building conditions. Make turns with ells, as conditions necessitate, in accordance with SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure.

**SPLITTERS AND/OR HAND DAMPERS:**

Provide splitters or butterfly dampers for adjustment of distribution to respective branches where indicated on drawings and elsewhere as required to properly balance system. Dampers shall meet SMACNA "Low Pressure Duct Construction Standards", or SMACNA "High Pressure Duct Construction Standards", depending on system pressure.

**DEFLECTORS:**

Provide deflectors at all branch take-offs, and elsewhere as required. Fabricate of galvanized steel sheet of same thickness as used in ductwork of corresponding size. Securely anchor vanes to duct or casing, and brace free-standing edges as specified for turning vanes in elbows.

**ACCESS DOORS:**

Provide access doors of suitable size where required to service equipment. Fabricate doors of 24 U. S. Gauge galvanized steel hinged to a 24 gauge galvanized mounting frame, and provide with fastening devices to give tight closure on felt gasket. Doors for insulated duct shall be double panel construction with 1" rigid insulation material between metal panels.

**ACCESS PANELS:**

Construct access panels as specified for access doors, and provide at all locations where any operable device occurs inside ducts, i.e., dampers, controls, filters, louvers, fire dampers, etc.

**SPECIALTIES:**

Where drawings or specifications require that ducts be insulated, make provision for neat insulation finish around damper operating quadrants, splitter adjusting clamps, access doors and similar operating devices. A metal collar equivalent in depth to insulation thickness (and of suitable size to which insulation may be finished) shall be mounted on duct. Insulation on duct shall extend continuously through walls, etc.

Provide extension collars for outlets, air guide vanes, and other specialties where they occur in the ducts.

**DUCT SILENCER:**

Provide pre-fabricated sound attenuating duct silencers where indicated on the drawings constructed of minimum 22 ga. galvanized casing metal, perforated metal inner liner with aerodynamic leading & trailing edges constructed in accordance with ASTM E84 for flame & combustion retardancy. Attenuation data

shall be provided with submittal. Pressure drop shall not exceed 0.75" w.g. Approved manufacturers are Rink Sound Control and United McGill.

**AIR DISTRIBUTION DEVICES:**

Diffusers, registers, and grilles shall be installed indicated or implied on drawings. All ceiling diffusers and grilles shall be designed to minimize ceiling and/or wall discoloration, and shall be model and finish as indicated on drawings. Air distribution manufacturer and Contractor shall be jointly responsible for and certify delivery or exhaust. (See Testing Section for duct system.)

Items scheduled on the drawings are used for design purposes. Similar units as manufactured by Nailor Industries, Titus, Krueger, Price and Metal\*Aire shall be considered equal. Maximum dba shall be 30. If indicated on the drawings, supply and return grilles shall be equipped with volume dampers of the opposed blade type. The dampers are to be adjustable from the face. All grilles, registers and diffusers shall have white baked enamel finish, unless indicated otherwise.

**DAMPERS:**

Balancing dampers shall be installed at each branch run to allow for proper balance of the system. Each damper shall be supplied with a quadrant locking device which extends beyond the ductwork for external adjustment.

**FIRE DAMPERS:** See Section 15825

**FLEXIBLE CONNECTIONS:**

For low velocity duct work (less than 2400 FPM), provide flexible connections at inlet and outlet of each fan connected to ductwork and elsewhere as indicated. Flexible connections shall be 6 inches wide, waterproof and fireproof, and shall be 24 gauge Metaledge Ventfab, as manufactured by Ventfabrics, Inc.

**DUCT SEALANT:**

Prior to insulating, all duct joints (except gasketed joints), seams and connections shall be sealed with brush-on type water-based sealant equal to United-McGill Duct Sealant. Apply in accordance to manufacturer's instructions and / or recommendations.

**CLEANING DUCT SYSTEM:**

Upon complete installation of ducts, clean entire system of rubbish, plaster, dirt, etc., before installing any outlets. After installation of outlets and connections to fans are made, blow out entire systems with all control devices wide open.

**DUCTWORK INSULATION:** See Section 15500, Mechanical Insulation

**DUCT LINER:** Removed. Not allowed on this job.

**FLEXIBLE DUCTS:**

Flexible ducts shall be not less than 3' or greater than 8' long of flexible air duct with a sum total of 90° maximum of bends. Flexible duct shall be UL 181 insulated Class 1 rated for medium pressure applications (up to 8" w.g.). Flexible duct shall be ATCO Rubber Products no UPC-018 or as manufactured Owens Corning or approved equivalent. Flexible duct shall meet all requirements of NFPA No. 90A. Duct shall be complete with 1.25" Type B factory applied insulation. Make connection to metal duct take-off with (2) nylon straps over tape.



*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART I: GENERAL**

**SCOPE:**

Provide all plant, labor, materials, accessories, and equipment required to install the fire dampers as shown on the accompanying plans and specified in this document.

**WORK INCLUDED:**

- a. Fire & smoke dampers
- b. Fuse links
- c. Access doors

**PART II: PRODUCTS**

Furnish fire dampers as shown on the drawings as required by the North Carolina State Building Code.

**FIRE DAMPERS:**

Fire dampers shall have the following characteristics:

- a. Fire dampers shall be constructed in accordance with NFPA Bulletin No. 90A, and shall be labeled and listed by Underwriter's Laboratories for the purpose for which they are being used. They shall have fusible links, spring locks, and shall be so arranged that air flow will hold blades closed.
- b. The fire dampers shall be Type B with the opened damper out of the air stream and not restrict free area.
- c. Location and type of fire dampers are shown on the drawings.
- d. Dampers mounted horizontally shall be equipped with spring loading for closure.
- e. Fusible Link shall be rated at 165° F

Fire dampers shall be equal to those manufactured by Ruskin. Access doors shall be insulated sheet metal equal to those manufactured by Ventfabrics.

**ACCESS DOOR:**

See section 15800.

**PART III: EXECUTION**

Install fire dampers in accordance with SMACNA requirements and manufacturer's instructions.

Provide access doors for purpose of resetting fire linkages in the ductwork and, where needed, in the building walls, floors or ceilings. Lay-in ceilings do not require access doors.

*END OF SECTION*

**PART 1 GENERAL**

1.01 WORK INCLUDED: Modular Central Air Handling Units.

1.02 RELATED WORK

- A. Division 15B
- B. Division 16

1.03 REFERENCES

- A. AHRI 430 - Standard for Central Station Air Handling Units.
- B. NFPA 90A - Installation of Air Conditioning and Ventilation Systems.
- C. ANSI/AFBMA 9 - Load Ratings and Fatigue Life for Ball Bearings.
- D. SMACNA - HVAC Duct Construction Standards.
- E. AHRI 410 - Standard for Forced Circulation Air-Cooling and Air-Heating Coils.
- F. ANSI/UL 900 - Test Performance of Air Filter Units.
- G. AMCA 300 - Reverberant Method for Sound Testing of Fans.
- H. AMCA 301 - Method for Publishing Sound Ratings for Air Moving Devices.
- I. ASHRAE 68 - Laboratory Method of Testing In-Duct Sound Power Measurement Procedure for Fans.

1.04 QUALITY ASSURANCE

- A. Air Handling Units: Product of manufacturer regularly engaged in production of components who issues complete catalog data on total product offering.
- B. Constant Volume Air Handling Units: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with AHRI 430. If air handling units are not certified in accordance with AHRI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
- C. Variable Air Volume Air Handling Units with Variable Inlet Vanes: Certify air volume, static pressure, fan speed, brake horsepower and selection procedures in accordance with AHRI 430. Certify units with inlet vanes in wide-open position. If air handling units are not certified in accordance with AHRI 430, contractor shall be responsible for expenses associated with testing of units after installation to verify performance of fan(s). Any costs incurred to adjust fans to meet scheduled capacities shall be the sole responsibility of the contractor.
- D. Air Coils: Certify capacities, pressure drops and selection procedures in accordance with AHRI 410.

1.05 SUBMITTALS

- A. Submit unit performance including: capacity, nominal and operating performance.
- B. Submit Mechanical Specifications for unit and accessories describing construction, components and options.
- C. Submit shop drawings indicating overall dimensions as well as installation, operation and service clearances. Indicate lift points and recommendations and center of gravity. Indicate unit shipping, installation and operating weights including dimensions.
- D. Submit data on electrical requirements and connection points. Include recommended wire and fuse sizes or MCA, sequence of operation, safety and start-up instructions.

1.06 DELIVERY, STORAGE, AND HANDLING

- A. Deliver products to site per manufacturer. Units shall ship fully assembled up to practical shipping and rigging limitations. Units not shipped fully assembled shall have tags and airflow arrows on each section to indicate location and orientation in direction of airflow. Each section shall have lifting lugs or shipping skid to allow for field rigging and final placement of section.
- B. Deliver units to site with fan motors, sheaves, and belts completely assembled and mounted in units. Mount motors as specified in Article 2.05.
- C. Store and protect products per manufacturer.
- D. Store in clean dry place and protect from weather and construction traffic. Handle carefully to avoid damage to components, enclosures, and finish.

**1.07 ENVIRONMENTAL REQUIREMENTS**

Do not operate units for any purpose, temporary or permanent, until ductwork is clean, filters are in place, bearings lubricated, and fan has been test run under observation.

**1.08 EXTRA STOCK :Provide two sets of pleated media filters.**

**PART 2 PRODUCTS**

**2.01 ACCEPTABLE MANUFACTURERS**

- A. Trane
- B. Carrier
- C. Daikin
- D. Substitutions: Under provisions of General Conditions

**(All units shall be equal in quality and performance to the Trane UCCA Series of AHU)**

**2.02 GENERAL**

- A. Manufacturer must clearly define any exceptions made to Plans and Specifications. Mechanical Contractor is responsible for expenses that occur due to exceptions made.
- B. Fabricate draw-thru type air handling units with fan sections.
- C. Factory fabricate air handling units of sizes, capacities, and configurations as scheduled on drawings.
- D. Provide factory installed unit mounting legs to support all sections of units. If unit mounting legs are not provided, manufacturer shall provide a base rail for shipping and mounting purposes. Contractor will be responsible for providing a housekeeping pad when unit mounting device is not of sufficient height to properly trap unit. Unit mounting devices not constructed of galvanized steel shall be chemically cleaned, coated with rust inhibiting primer, and finished with rust inhibiting enamel.

**2.03 CASING**

- A. Unit shall be constructed of a complete structural frame with removable panels. Removal of side panels shall not affect the structural integrity of the unit. Contractor shall be responsible to provide connection flanges and all other framework that is needed on unit to ensure that removal of unit's panels shall not affect structural integrity.
- B. Panels shall be fully removable to allow for a proper way to thoroughly clean panels of microbial growth and to access internal parts. If panels are not removable, then manufacturer shall provide

access sections with doors between all internal components to ensure access and cleanability of the air handler.

C. Construct casing sections located upstream of supply fan for operation at 4 inches water gage negative static pressure and casing sections located downstream of supply fan for operation at 6 inches water gage positive static pressure.

D. All exterior panels and structural frames shall be constructed of galvanized steel. Casings not constructed of galvanized steel, casings with welds on exterior surfaces, or casings with welds on interior surfaces that have burned through to exterior surfaces shall be chemically cleaned, coated with rust inhibiting primer, and finished with rust inhibiting enamel in order to prevent premature corrosion and microbial growth. Seal joints between exterior panels and structural frames with closed-cell foam gasketing for air seal and thermal and acoustical break.

E. Casing shall have removable full size access panels or doors as scheduled on drawings. Access doors shall have double wall construction. Provide automotive style neoprene gasketing around full perimeter of access doors to prevent air leakage. Provide "ventlock" style non-corrosive alloy latches operable from the inside or outside of unit. If access doors open against unit operating pressure, provide safety latches that allow access doors to partially open after first handle movement and fully open after second handle movement.

F. Insulate all sections handling conditioned air with 1" thick 1-1/2 lb. per cubic ft. density matt faced fiberglass or equivalent. Install insulation with adhesive. If edges of fiberglass insulation are exposed, the contractor shall be responsible for sealing exposed edges with mastic sealer to prevent erosion into the airstream. Insulation, adhesive, and mastic sealer (if required) shall conform to NFPA 90A.

#### 2.04 DRAIN PAN CONSTRUCTION

Provide sealed double wall drain pans constructed of galvanized steel exterior panels and galvanized steel interior liner. Encase insulation between exterior and interior walls. Drain pans shall be sloped in 2 planes; cross break interior pans and pitch toward drain connections to ensure complete condensate drainage. Units with cooling coils shall have drain pans under complete cooling coil section. All drain pan connections will be to the side of the unit to enable proper trapping. Units without 2-way sloped drain pans shall coat drain pans with anti-microbial treatment.

#### 2.05 FANS

A. Provide supply fan section(s) with FC double width, double inlet centrifugal fan designed and suitable for class of service indicated in the unit schedule. Fan shaft to be properly sized and protectively coated with lubricating oil. Fan shafts shall be solid and properly designed so that fan shaft does not pass through first critical speed as unit comes up to rated RPM. Fans shall be statically and dynamically tested as an assembly at the required RPM to meet design specifications. Key fan wheels to fan shaft to prevent slipping.

Provide self-aligning, grease lubricated pillow-block ball bearings selected for L-50 200,000 hour average life per ANSI/AFBMA 9. Extend both grease lubrication fittings to drive side of unit with plastic tubes and zerk fittings rigidly attached to drive side bearing support.

B. Mount fans on isolation bases. Internally mount motors on same isolation bases and internally isolate fans and motors with 1 inch spring isolators. Install flexible canvas ducts between fan and casings to ensure complete isolation. Flexible canvas ducts shall comply with NFPA 90A. If no isolators or flexible canvas duct is provided, then the entire unit shall be externally isolated from the supply duct work and piping by contractor in order to avoid transmission of noise and vibration through the ductwork.

C. Fan sections shall have full height, double wall, hinged, removable access doors on drive side for inspection and maintenance of internal components. Construct doors in accordance with Article 2.03 Paragraph E.

D. Weigh fan and motor assembly at AHU manufacturer's factory for isolator selection. Statically and dynamically balance fan section assemblies. Fan section assemblies include fan wheels, shafts, bearings, drives, belts, isolation bases and isolators. Allow isolators to free float when performing fan balance. Measure vibration at each fan shaft bearing in horizontal, vertical and axial directions. Balance at design RPM's as scheduled on drawings.

## 2.06 MOTORS AND DRIVES

- A. Factory install all motors on slide base to permit adjustment of belt tension.
- B. Fan Motors shall be heavy duty, open drip-proof, operable at 460 Volts, 60 Hz, 3-phase.
- C. V-Belt Drive shall be variable pitch rated at 1.2 times the motor nameplate.
- D. Where called for on the plans or equipment schedule, provide unit with manufacturer's installed Variable Frequency Drive for Variable Air Volume applications.

## 2.07 COILS

A. Coils shall be manufactured by the same company as the supplier of the air handling unit. Install coils such that headers and return bends are enclosed by unit casings.

B. The wet section of the unit as defined as the entering air side of the dehumidification coil to the leaving edge of the drain pan, shall be insulated. The insulated surface shall meet UL 181 requirements. The airstream surface of the insulation shall be constructed or coated such that it is not biodegradable, repels water and it can be cleaned to prevent microbiable growth. The manufacturer's maintenance instructions shall describe the proper cleaning procedures for the unit.

C. Construct coils of configuration plate fins and seamless tubes. Fins shall have collars drawn, belled and firmly bonded to tubes by means of mechanical expansion of tubes. Do not use soldering or tinning in bonding process.

D. Construct coil casings of galvanized or stainless steel with formed end supports and top and bottom channels. If two or more coils are stacked in unit, install intermediate drain channels between coils to drain condensate to main drain pans without flooding lower coils or passing condensate through airstream.

### E. Water Cooling Coils

1. Clearly label supply and return headers on outside of units such that direction of coil water-flow is counter to direction of unit air-flow.
2. Coils shall be proof tested to 450 psig and leak tested to 300 psig air pressure under water.
3. Construct headers of round copper pipe or cast iron.
4. Construct tubes of 1/2 inch O.D. minimum .016 inch thick copper and construct fins of aluminum.

### F. Steam Heating Coils

1. Clearly label supply and return connections on outside of units.
2. Provide non-freeze steam distributing type coils. Pitch steam coils in units for proper drainage of steam condensate from coils.
3. Proof test coils to 300 psig air under water and leak test coils to 200 psig air pressure under water.
4. Construct headers of cast iron or round copper pipe.

5. Inner tubes shall have orifices that ensure even steam distribution across coil face. Direct orifices toward return connections to ensure steam condensate is discharged from coils.

**G. Refrigerant Cooling Coils**

1. Clearly label suction and liquid connections on outside of units.
2. Proof test coils to 450 psig air under water and leak test coils to 300 psig air pressure under water. Dry insides of coils after testing and seal all connections.
3. Construct suction headers of copper tubing. Suction connections shall penetrate unit casings to allow for sweat connections to refrigerant lines.
4. Coils shall have equalizing type vertical distributors sized in conjunction with capacities of coils.

**2.08 FILTERS**

A. Provide factory fabricated filter section of the same construction and finish as unit casings. Filter sections shall have filter guides and full height, double wall, hinged, removable access doors for filter removal. Construct doors in accordance with Article 2.03 Paragraph E. Filter sections shall flange to other unit components. Provide filter blockoffs as required to prevent air bypass around filters.

B. Provide 2 inch angled filter sections with pleated filters. Filters shall be removable from one side(s) of filter sections.

C. Coated filters shall be coated with an anti-microbial agent to prevent microbes from growing in the filters. The agent is comprised of a silane quaternary ammonium which exhibits permanent chemical bonding capability. The treatment will provide a minimum level of 90% bacterial reduction as compared with an untreated control when tested according to AATCC Test Method 100-1988 or equivalent anti-microbial test and a maximum of 20% fungal growth on the substrate as compared with an untreated control when tested according to AATCC Test Method 30. Anti-microbial materials must be registered with the Environmental Protection Agency under FIFRA and FEPCA and must be used in strict accordance with the registration.

**2.09 DAMPERS**

Provide dampers to modulate the volume of return air. Damper blades shall be galvanized steel, housed in a galvanized steel frame and mechanically fastened to an axle rod rotating on bearings. Blade seals are required to assure tight closure. All dampers shall be rated for a maximum leakage rate of less than 1 percent of nominal CFM at one-inch w.g..

**2.10 GENERAL MODULES**

**2.11 AIR HANDLING UNIT SCHEDULE:** see drawings

**PART 3 EXECUTION**

Install AHU in strict accordance with manufacturer's instructions and SMACNA and NFPA requirements.

*END OF SECTION*

**GENERAL:**

Furnish and install fan coil (FC or FCU) with type, size, and capacity as indicated on plans. Protect coil from construction dust and debris before project closeout with temporary disposable filters at unit and at return grille.

FC's shall be completely factory assembled including water coil, condensate drain pan, fan motor, filters and controls in an insulated casing in a vertical configuration. Units shall be rated and tested in accordance with ARI standard 210. Units shall be UL listed and labeled in accordance with UL 1995 for indoor blower coil units.

Vertical fan coil units shall have ducted side return air entry option as detailed on the drawings. Filters shall be accessible from side coil access panels. Provide 1 year supply of air filters as specified.

**CABINET/BLOWER:**

Unit casing shall be constructed of zinc coated, heavy gauge galvanized steel. Exterior surfaces shall be cleaned, and phosphatized, painted finish is optional. Casing is completely insulated with fire-retardant, permanent, odorless glass fiber material. Knockouts shall be provided for unit electrical power, water and/or refrigerant piping connections. Captive screws shall be standard on all access panels. Provide mounting subbase for vertical floor mount configurations. Subbase shall be constructed of heavy gauge, zinc coated galvanized steel with finish to match air handler unit.

Evaporator fan shall be a double inlet, double width, forward curved, centrifugal-type fan(s) with belt drive shall be standard. Thermal overload protection shall be standard on motor. Fan and motor bearings shall be permanently lubricated. Motor efficiency shall comply with NCSBC Volume X Energy Code.

**WATER COILS:**

Water coils shall be specifically designed and circuited for application. Provide 2-row heating coil and four or six row chilled water coil to meet design loads. Finned coil surface shall consist of aluminum plate fins securely bonded to seamless copper tubing. Coils shall be designed to allow drainage, designed for 150 psig working pressure, and tested at 350 psig.

Unit Drain pan shall be of corrosive resistant construction and have positive slope toward the drain. Provide and install a secondary overflow drain pan for each unit that is installed above a ceiling or on a mechanical platform. Install a float switch that will shut down the air handler and close the chilled water control valve upon activation. See control diagram and sequence of operation.

**MANUFACTURER:**

Units manufactured by Trane, First Co., or Magic\*Aire are acceptable provided all specifications are met or exceeded.



VIBRATION ISOLATION:

Provide all equipment with vibration isolation bases equal to Vibration Mounting and Controls, Inc. (VMC), and shall be installed in strict accordance with manufacturer's instructions. Provide neoprene-in-shear mounts, VMC no. R-2 or approved equal, rated for load. Arrangement shall be in accordance with applicable details on drawings.

WARRANTY:

Provide unit with 5-year parts warranty and 2-year factory labor warranty.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**SCOPE OF WORK:**

Furnish and install centrifugal exhaust fans, as specified herein, of sizes and capacities scheduled and in locations shown on drawings.

**GENERAL:**

Wall and roof exhaust fans shall be of the centrifugal, direct-drive type unless noted otherwise on plans. Construction of the fan housing shall be of heavy gauge aluminum. All spun parts shall have a rolled bead for added rigidity and shall be specially spun so as to seal the pores of the aluminum providing greater resistance against oxidation and deterioration.

The fan wheel shall be all-aluminum of the centrifugal blower type featuring backward inclined blades and a tapered inlet shroud. Wheels shall be statically and dynamically balanced. Inlet cone shall be aluminum and of the centrifugal blower type. Motor and drives shall be enclosed in weather-tight compartment, separate from the exhaust air stream. Air for cooling the motor shall be supplied to the motor compartment by way of an air passage, from an area free of contaminated exhaust fumes. Motor shall be of the heavy duty, permanently lubricated, sealed ball bearing type.

The entire drive assembly and wheel shall be removable, as a complete unit from the support structure without disassembling the external fan housing. The complete drive assembly shall be mounted on rubber vibration isolation. Units shall be of Type B construction and shall carry a one year warranty. Fans shall be licensed to bear the AMCA ratings seal for air sound performance.

Acceptable manufacturers are Greenheck, Penn, Cook, Carnes, and Acme.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**GENERAL:**

Furnish and install 1 year supply of 1" air filters disposable air filters in all fan coils and 2" for air handlers. One year supply consists of four (4) sets for 60 day replacement cycle and does not include first sets installed during start-up and replacement prior to Owner acceptance of building.

Provide an air filter replacement schedule indicating size and quantity for each HVAC unit with submittal for approval.

Air filters shall be medium efficiency, pleated, disposable type. Each filter shall consist of cotton and synthetic media, media support grid, and enclosing frame. The filter shall be listed and identified on the frame as Underwriters' Laboratories Class 2.

Filter shall have not less than 2.3 square feet of media per square foot of filter face area and not less than 16 pleats per linear foot of filter face area. A 96% open area media support grid of welded wire construction, coated with rust inhibitor shall be bonded to the air exiting side of the filter. The enclosing frame shall be of high wet-strength beverage board with diagonal support members bonded to the air entering and air exiting side of each pleat. The inside periphery of the enclosing frame shall be bonded to the filter pack.

Filter shall have an average efficiency of 25-30%, and an average arrestance of not less than 90% in accordance with ASHRAE Standard 52.1-1992. The minimum MERV when tested under ASHRAE 52.2 shall be no less than MERV 9. Initial resistance at 375 feet per minute approach velocity shall not exceed 0.28" iwc

A test report corresponding to each of the aforementioned ASHRAE Standards are required submittals.

**MANUFACTURER:**

Filters shall be Farr 30/30 Dual 9.

Units manufactured by Flanders and American Air Filter are acceptable provided all specifications are met or exceeded.

*END OF SECTION*

## 15900 BUILDING AUTOMATION SYSTEMS

### **PART 1 - GENERAL**

#### 1.1. APPLICABLE SECTIONS

- A. 15900 BAS Sensors and Devices

#### 1.2. RELATED DOCUMENTS

- A. The Contract Drawings are directly applicable to this Section, and this Section is directly applicable to them.
- B. The general provisions of the Contract, including General and Supplementary Conditions and/or Division 01 Specification Sections, are directly applicable to this Section, and this Section is directly applicable to them.
- C. Specifications throughout all Divisions of the Project Manual are directly applicable to this Section, and this Section is directly applicable to them.
- D. Collectively, these items will be referred to as the Contract Documents.

#### 1.3. DEFINITIONS AND ABBREVIATIONS

- A. Where definitions in Division 01 conflict with the definitions herein, Contractor will comply with the most stringent requirement.
- B. BAS Component: a generic reference to any hardware component which is provided by Contractor, including but not limited to controllers, power supplies, transformers, relays, actuators, sensors, or other devices.
- C. Building Automation System (BAS): Also referred to as Building Management System (BMS), Direct Digital Control (DDC).
- D. Building Controller: Controller, which is at, and controlling at, the building-level. Could also be a large portion of a building, such as a wing, depending on hardware capability. Generally, are the middle tier of the overall BAS network, and report up to a Building or Enterprise Supervisor. Also, generally what Device Controllers would be integrated with. See Section 2.5 System Architecture for full definition and specification.
- E. Building-Level Network (BLN): An ethernet, fiber, and/or wireless network dedicated to the BAS, which connects Building Controllers and Building Supervisors. The BLN may be a separate network from Owner's LAN, or as part of the LAN, which has been segmented to be used exclusively by the BAS. See Section 2.5 System Architecture for full definition and specification.
- F. Building Supervisor: Server, which is at, and controlling at, the building-level. Generally used when Building Controllers do not have sufficient hardware capability to support an entire building. Generally, are the middle tier of the overall BAS network, and installed on a Server in lieu of being a stand-alone piece of hardware. Also, generally what Building Controllers would be integrated with. Building Supervisors may be further integrated to an Enterprise Supervisor. See Section 2.5 System Architecture for full definition and specification.
- G. Controller: A generic reference to a BAS Controller, including but not limited to Device Controllers and Building Controllers.
- H. Contract Documents: All documents which compose the project, including but not limited to drawings, specifications, RFPs, scope of work, general conditions, and supplemental conditions.
- I. Control Panels: an assembly composed of an enclosure and one or more BAS Component(s).
- J. Critical: A special area or zone which receives specialized BAS Components.

- K. Device Controller: Also referred to as Field-Level Controller. Controller, which is at, and controlling at, at the device-level. Device in this instance is understood to reference MEP Equipment. Generally, are the lowest tier of the overall BAS network, and report up to a Building Controller. See Section 2.5 System Architecture for full definition and specification.
- L. Device-Level Network (DLN): A copper, ethernet, fiber, and/or wireless network dedicated to the BAS, which connects Device Controllers and Building Controllers. See Section 2.5 System Architecture for full definition and specification.
- M. Enterprise Supervisor: Server, which is at, and controlling at, the enterprise-level. Generally, are the highest tier of the overall BAS network, and installed on a server in lieu of being a stand-alone piece of hardware. Also, generally what Building Controllers and/or Supervisors would be integrated with. See Section 2.5 System Architecture for full definition and specification.
- N. Field-Level: See Device Controllers and Device-Level Network.
- O. Furnish: To supply and deliver to project site, ready for installation.
- P. Install: To place in position for service or use.
- Q. Local Area Network (LAN): Ethernet, fiber, and/or wireless network which connects computers and other networkable devices (printers, etc.), and has a connection to the WAN. See Section 2.5 System Architecture for full definition and specification.
- R. Manufacturer: The brand of the BAS being provided (ex: Distech, Honeywell, etc).
- S. MEP: Mechanical, electrical, and plumbing.
- T. MEP Equipment: Where MEP Equipment is used, it is understood to mean any piece of MEP Equipment which the BAS will in some way, shape, or form, interface with, via hardwired connection or integration. MEP Equipment includes, but is not limited to VAV, AHU, RTU, split systems, hot water heaters, heat exchangers, boilers, chillers, and pumps.
- U. MSI: Master Systems Integrator: see MSI section for full definition and specification.
- V. Owner: The financial provider and user of the BAS, as well as Owner Representatives.
- W. Owner Representatives: Representatives for the Owner which are on staff, contracted, or hired to protect the interests of the Owner, such as Engineers, Architects, Commissioning Agents, and other parties.
- X. Project: The facility/building as defined in the Contract Documents.
- Y. Server: A computer in which BAS software is installed on.
- Z. Sequence of Operation: The steps that MEP Equipment takes to achieve the desired operation to provide optimal comfort and/or ventilation for the Project.
- AA. Substantial Completion: Written authorization by the Owner that the project has reached a point of completion that it can be utilized.
- BB. Supervisor: A generic reference to a BAS Supervisor, including but not limited to Building Supervisors and Enterprise Supervisors.
- CC. Provide: To furnish and install, complete and ready for intended use.
- DD. Vendor: The installer, integrator, and/or contractor for the BAS being provided.
- EE. Wide Area Network (WAN): Ethernet and/or fiber-based network which connects multiple facilities via the internet. See Section 2.5 System Architecture for full definition and specification.
- FF. Warranty Period: The time between Substantial Completion and the duration of Warranty, as specified.

#### 1.4. GENERAL SPECIFICATIONS

- A. Contractor shall provide all hardware, software, configuration, programming, graphics (GUI), checkout, alarms, trending, functional testing, and commissioning necessary to provide a complete and fully functioning BAS. Contractor shall include all hardware, control wiring, wiring accessories, wiring connections, software, and programming not specifically itemized in these Specifications, which is necessary to implement, maintain, operate, and diagnose the system, now and in the future.
  - 1. Provide all necessary BAS Components on each piece of MEP Equipment to:
    - a. Perform the specified Sequence of Operation and meet the design/performance intent of the MEP Equipment.
    - b. Comply with BAS Components as shown on the control diagrams.
    - c. Comply with the point lists.
    - d. Comply with the Specifications herein.
    - e. Comply with the design intent of the BAS.
  - 2. Where the Sequence of Operation, control diagrams, points list, or specifications conflict with each other, Contractor will comply with the most stringent requirement.
- B. It is Contractor's responsibility to review all the Contract Documents and report any discrepancies to Owner.
- C. Substitutions
  - 1. Wherever the words "approved equal," "for review," or "for acceptance" are used in regard to manufactured specialties, or wherever it is desired to substitute a different make or type of BAS Component for that specified, submit all information pertinent to the adequacy and adaptability of the proposed BAS Component to Owner and secure their approval before the BAS Component is ordered.
- D. Warranty
  - 1. Warranty period shall be for 24 months after project construction closeout and owner's receipt of the Certificate of Occupancy. The entire BAS and all ancillary equipment required for its operation shall be free from defects in workmanship and material under normal use and service. If within the twenty-four months from the date of acceptance/occupancy the installed equipment is found to be defective in operation, workmanship or materials, Contractor shall replace, repair, or adjust the defect at no cost to Owner.
  - 2. Corrective software and/or hardware modifications made during warranty service periods shall be updated on all user documentation and on user and manufacturer archived software disks.
    - a. Modifications made which are corrective to one piece of MEP Equipment will be replicated to all MEP Equipment for consistency in programming.
    - b. User documentation will be updated in all locations, including but not limited to hard copies, Control Panel hard copies, O&Ms, and PDF copies accessible via download inside the BAS system.
    - c. Maintain revision control (i.e., v1\_05) to indicate which is the latest version of all documentation, software, and programming.
  - 3. Owner reserves the right to make changes to the BAS during the Warranty Period. Such changes do not constitute a waiver of warranty. Contractor shall warrant parts and installation work regardless of any changes made by Owner unless Contractor provides clear and convincing evidence that a specific problem is the result of such changes to the BAS.

4. At no cost to Owner, during the Warranty Period, Contractor shall provide maintenance services for software including all current software updates, firmware, and hardware. Prior to the closeout of the warranty period, Contractor shall meet with Owner to address any questions or concerns and offer ongoing services to Owner.
  5. Electronic Actuators: Parts and labor for 5 years from the date of substantial completion.
  6. Air and Water Flow Meters: Parts and labor for 3 years from the date of substantial completion.
- E. Extended Warranty
1. Contractor shall include a 3 year (36 Month) Extended Warranty agreement to oversee maintenance, adjustments and owner support for the controls system after expiration of the 24 month Basic Warranty period. This agreement shall include remote support for minor hardware, software or owner issues. Agreement shall also include additional on-site time to address major Control System (Hardware or Software) issues that have one or more pieces of equipment off-line. Contractor shall be on-site to address the major issue within 36 hours on normal work days or the following Monday if 36 hour time limit falls after regular business hours on Friday afternoon or over the weekend.
- F. Training
1. Provide eight hours of training for Owner personnel, and/or maintenance contractor, on the operation and maintenance of the BAS. Owner may wish to video tape the training session.

#### 1.5. CODES AND REFERENCE STANDARDS

- A. Comply with all current federal, state, and local codes, requirements, ordinances, and regulations, in accordance with the authority(ies) having jurisdiction (AHJ).
- B. Comply with the National Electric Code (NEC).
- C. Comply with all manufacturer guidelines and requirements.
- D. Comply with all Owner rules, guidelines, procedures and requirements, including Owner IT.
- E. The latest published edition of a reference shall be applicable to the Project unless identified by a specific edition date.
- F. All materials, installation, and workmanship shall comply with the applicable requirements and standards addressed within the following references:
  1. American Society of Heating, Refrigeration and Air Conditioning Engineers (ASHRAE)
  2. American National Standards Institute (ANSI)
  3. UL 916: Energy Management Systems
  4. LonMark International
  5. BACnet Testing Lab

#### 1.6. COORDINATION OF WORK AND INTEGRATION

- A. Certain LonMark, BACnet, Modbus, and other products, systems, and interface devices, may be provided by other trades via MEP Equipment. Examine the Contract Documents to ascertain the requirements to install, wire, program, commission, and/or interface to these systems. Particular attention must be paid towards the interface boards submitted by the various MEP Equipment providers. It is this Contractor's responsibility to verify the submitted interfaces will integrate properly into the BAS. Report any discrepancies to Owner. Discrepancies brought to Owner's attention after the procurement of that piece of MEP Equipment will be integrated at no additional cost to Owner. Contractor will provide additional interface(s) needed to integrate piece of MEP Equipment.
- B. Controls contractor is responsible for reviewing the equipment submittals for ALL equipment to be integrated into the BAS system prior to equipment being ordered to verify proper power

voltages, control voltages, control signals, control points, etc. for proper seamless integration and control of the equipment provided by the other contractor.

- C. Contractor shall review MEP Equipment for compliance with control diagrams, Sequence of Operation, and points lists. Report any discrepancies to Owner.
- D. Wherever work interconnects with work of other trades, coordinate with other trades and with Owner to ensure that all trades have the information necessary so that they may properly install all the necessary connections and equipment.
- E. Coordinate location of thermostats, humidistats, and other exposed control sensors with plans and room details before installation. Verify all locations with Owner and/or General Contractor prior to installation.
- F. Coordinate sources of 120V power with the Electrical Contractor and Owner. Extend power from source(s) as needed.
- G. Coordinate location of data ports/drops to the LAN/WAN with the Electrical Contractor and Owner.
- H. Coordinate shipping of BAS Components to another Contractor or manufacturer for factory-installation.

#### 1.7. SPARE PARTS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
- B. Provide one replacement for each unique actuator, Controller, thermostat, wall module, or any other BAS Component provided.

#### 1.8. QUALITY ASSURANCE

- A. The BAS and BAS Components shall be listed by Underwriters Laboratories (UL 916) as an Energy Management System.
- B. Control Panels, both new and modified, shall comply with UL 508A.
- C. Electrical Components, Devices, and Accessories: UL listed and labeled as defined in NFPA 70.

#### 1.9. CONTRACTOR QUALIFICATIONS

- A. Qualifications may be requested from Contractor prior to the bidding process. Owner reserves the right to not allow Contractors to bid if they do not meet the qualifications or provide them in a timely manner. Qualifications will be provided for all items below in an orderly format for review by Owner.
- B. Contractor shall have a successful history in the design and installation of the BAS being provided that consists of web-browser monitoring and control of LonWorks, BACnet, and/or Modbus Device Controllers. These projects must be on-line and functional such that Owner can observe the BAS in full operation. Include proper references, contact names, emails, and phone numbers of these reference projects, with a minimum of five projects similar to this Project.
- C. Contractor shall demonstrate experience in BAS installations for not less than five years, in BAS installation projects with point counts equal to this Project, and systems of the same character as this Project.
- D. Contractor shall have specialized in and be experienced with the installation of the proposed product line for not less than five years, on at least ten projects of similar size and complexity.
- E. Contractor shall be factory authorized by manufacturer of product line and be in good standing with the manufacturer.
- F. Contractor shall be located within 50 miles of Project.
- G. Contractor shall be a Certified Tridium Systems Integrator.



- H. Contractor shall have a minimum of three, Niagara Technical Certification Program (TCP) certified personnel.
- I. Contractor shall have a minimum of three personnel who are certified in LonWorks, BACnet, and/or Modbus line(s) of controls to be installed as part of this project.
- J. Be of sufficient size to provide service, including both routine maintenance and emergency support within 24 hours upon receipt of request.

#### 1.10. ACTION SUBMITTALS

##### A. Product Data Submittal

1. Submit manufacturer's technical product data for each BAS Component, including but not limited to Controller, sensor, actuator, relay and panel, indicating dimensions, capacities, performance, electrical characteristics, and material finishes. Also include installation and start-up instructions.
  - a. When manufacturer's product datasheets apply to a product series rather than a specific product model, clearly indicate, mark-through, and highlight only applicable information.
  - b. Generic submittals will be automatically rejected.
2. Submit documentation indicating LonMark, NICs, and/or BTL compliance and include Protocol Implementation Conformance (PIC) Statements.

##### B. Shop Drawings Submittal

1. Submit shop drawings. Shop drawings will include:
2. Bill of Materials (BOM): indicating equipment served, quantity, manufacturer, point range (i.e. 0-10 in. w.c.), sensor range (i.e. 0-10V), and model number for all BAS Components being provided.
  - a. Disconnect Schedule: additionally, indicating MCA, MOP, voltage, # of phases, size, NEMA rating, # of poles, and neutral (Y/N).
  - b. Starter Schedule: additionally, indicating horsepower, voltage, # of phases, size, NEMA rating, and bypass.
  - c. VFD Schedule: additionally, indicating horsepower, voltage, # of phases, size and NEMA rating, bypass (Y/N), number of contactors (if bypass), disconnect (Y/N), and disconnect type (fused/non-fused).
  - d. Hydronic Valves (Pressure-Dependent): additionally, indicating gpm, line size, calculated Cv and design pressure drop, actual Cv and actual pressure drop, close-off pressure, type (ball/globe/butterfly), connection, valve size, 2/3-way, mixing/diverting (if 3 way), service (2-position/modulating), and fail position.
    - A) Actual pressure drop will correct for any line-size to valve-size restrictions per the manufacturer's data.
    - B) Actuator will be scheduled with the valve per the standard BOM.
  - e. Hydronic Valves (Pressure-Independent): additionally, indicating gpm, line size, selected valve gpm, maximum valve gpm, min/max pressure drops, close-off pressure, type (ball/globe/butterfly), connection, valve size, 2/3-way, mixing/diverting (if 3 way), service (2-position/modulating), and fail position.
    - A) Actual pressure drop will correct for any line-size to valve-size restrictions per the manufacturer's data.
    - B) Actuator will be scheduled with the valve per the standard BOM.
  - f. Steam Valves: additionally, indicating lb/hr, inlet pressure, outlet pressure, line size, calculated Cv and design pressure drop, actual Cv and actual pressure drop, close-

- off pressure, type (ball/globe/butterfly), connection, valve size, 2/3-way, mixing or diverting (if 3 way), service (2-position/modulating), and fail position.
- A) Actual pressure drop will correct for any line-size to valve-size restrictions per the manufacturer's data.
  - B) Provide sizing methodology/calculations for manufacturer selected.
  - C) Actuator will be scheduled with the valve per the standard BOM.
- g. Air Flow Metering Stations (AMFS): additionally, indicating duct size, output, network capable (LonWorks/BACnet), and number of probes/sensors.
  - h. Water/Steam Flow Meters: additionally, indicating line size, output, network capable (LonWorks/BACnet), and flow meter style/type.
  - i. Damper Schedule: additionally indicating, duct size, blade type, leakage, and construction.
  - j. VAV schedule: indicating VAV type, K factor, and max/min/reheat flows.
3. Schematic Flow Diagram: schematic representation of MEP Equipment. Diagram will show all BAS Components on schematic, point name, and point number (i.e. UI-1). Where MEP Equipment varies slightly, schematic will be clearly diagramed to indicate any differences between each piece of MEP Equipment. Stating the schematic as "typical" is not acceptable.
  4. Wiring Diagram: indicating power, signal, and control wiring. Where terminal blocks are provided, provide indication where wiring terminates to terminal block.
  5. Sequence of Operation: Any modifications proposed to the Sequence of Operation will be clearly marked up as part of the shop drawings or submitted as an annotated Microsoft Word document in addition to the shop drawings. A default Contractor Sequence of Operation, included without regard to the Contract Document's Sequence of Operation, will result in a rejected submittal.
  6. Control Panel Diagrams: indicating panel faces, with layouts of any BAS Components to be installed in the panel face, BAS Component locations inside panel, and labeling of BAS Components.
  7. One-line diagram for all controllers showing the network layout. Where Project is to connect with an existing BAS, indicate how the new network will integrate with the new and/or existing BAS Components.
  8. Indicate anticipated device ID, Network number, MAC Addressing, and Max Masters for all BACnet devices. Provide logical schema for BACnet addressing.
  9. Individual floor plans with device (controllers, routers, sensors, etc.) locations with all interconnecting wiring routing including space sensors, Device and Building-Level Network wiring, power wiring, and low voltage power wiring.
  10. Additional Requirements:
    - a. Point names will be consistent between the schematics and wiring diagrams.
    - b. Misc. Points List: where controllers being provided for other purposes are also used to control a miscellaneous point, such as an exhaust fan or lighting contactor, provide a list of those miscellaneous points in a concise format for quick identification of their location and associated Controller.
    - c. Provide a complete list of any deviations of submitted products to the specification in this document.
    - d. Where existing BAS Components are being reused, such as controllers or sensors, clearly indicate (via coloring, line type, etc) the BAS Components being reused as "existing" and new components as "new."

C. Graphics Submittal

1. Provide screen captures of graphical user interfaces developed by Contractor on previous projects. These screen shots shall represent actual work performed by Contractor and not generic work from the line of controls which Contractor represents. Screenshots will be applicable to the MEP systems as part of this project. "Generic" screenshots of MEP systems will not be accepted. Provide client contact information for Owner to validate. Any comments from the submittal process will be incorporated into the actual graphics for the project.
2. Follow Owner's graphics standards.
3. Zoning Map
  - a. Provide submittal of graphic floorplans for markup by Owner to identify required zoning to use for scheduling. Floorplan markup will be used by Contractor to segment equipment that satisfies the identified zones.

D. Point-Naming Submittal

1. Points shall be named consistently. Provide list of point names and point conventions.
2. Point naming shall be consistent with an existing standard, such as Project Haystack.

E. IP Drop Request Submittal

1. Provide list of BAS Component(s) which need an IP drop to the LAN/WAN.
2. Provide location, quantity (if multiple per Control Panel/location), and IP address requirements (DHCP, fixed, etc), and total number of IP address reservations, including room for future growth.
3. Provide list to a minimum of ten business days' notice prior to needing the drop.

F. Schedule/Sequence of Construction Submittal

1. Provide schedule and sequence of construction, as it pertains to the installation of the BAS, for review.

G. Functional Performance Testing (FPT) Submittal

1. Provide FPT agendas and testing procedures for review.
2. FPT should include at a minimum Sequence of Operation, point-to-point verification to graphical interface, historical data logging, and alarms testing procedures.

1.11. START-UP AND ASSOCIATED TESTING SUBMITTALS

A. Point-to-Point Testing/Checkout Sheets Submittal

1. Prior to startup of MEP Equipment, Contractor will provide checkout sheets for each piece of MEP Equipment.
2. Checkout sheets will contain at a minimum:
  - a. Equipment name and location.
  - b. Associated Controller address (MAC or Node ID), name, type, and instance number.
  - c. Point name, type (resistance, amperage, voltage, etc), and range (i.e., -5 to +5 in w.g.).

B. Start-Up Testing Submittal

1. As part of the startup of MEP Equipment, Contractor will provide start-up testing sheets for each piece of MEP Equipment.
2. Start-up testing sheets will contain at a minimum:
  - a. Equipment name and location.
  - b. Sequence of Operation and step-by-step procedure used to check programming and configuration.

- c. Any modifications required to Sequence of Operation for MEP Equipment performance.
  - d. Final graphical screens.
  - e. PID tuning parameters for each loop.
- C. Adjusting and Calibration Submittal
1. As part of the startup of MEP Equipment, Contractor will provide a calibration submittal for each piece of MEP Equipment.
  2. Calibration submittal will contain at a minimum:
    - a. Equipment name and location.
    - b. Point name, type, and range.
    - c. Sensor type and manufacturer's stated accuracy.
    - d. Calibration type (single point, two point, etc).
    - e. Checking, adjusting, and calibration data.
    - f. Sensor installed accuracy.
    - g. Sensor pass, fail, replaced, etc.
    - h. Calibration equipment used and associated certificates of calibration, including expiration dates.

#### 1.12. CLOSE-OUT SUBMITTALS

- A. Operating and Maintenance Manuals
1. Provide all documentation as required in the submittal processes to-date, updated to as-built conditions.
  2. In addition, provide the following:
    - a. Include control response, settings, set points, throttling ranges, gains, reset schedules, adjustable parameters, and limits.
    - b. A table (or similar) of all Testing, Adjusting and Balancing (TAB) values for each piece of MEP Equipment and BAS-calibrated equipment, such as airflow metering stations (AFMS).
    - c. Any O&Ms for equipment not originally included in the submittal, in addition to product data.
    - d. Accurately record actual set points, calibrations/offsets, and settings of controls, final Sequence of Operation, including changes to programs made after submission and approval of shop drawings and including changes to programs made during specified testing.
    - e. Database of all point names.
- B. As-Built Shop Drawings
1. Provide PDF of shop drawings which have been corrected to reflect the as-built state.
    - a. Incorporate any redlines made in field during installation.
    - b. Update Sequence of Operation to reflect MEP Equipment operation as changed during installation, commissioning, and/or functional performance testing.
    - c. Provide reference to being "as-built" version on each sheet of the shop drawings.
  2. Provide hard copy of appropriate shop drawing page(s) inside each Control Panel.
- C. Software Closeout
1. Provide all usernames, passwords, software, GUI, databases, licenses, and application programming tool(s) to Owner.

2. Provide software backup of entire BAS and associated components on digital media for Owner record. Coordinate file location of automatic backup of software with Owner.

D. Reference 3.11 Closeout for additional requirements.

#### 1.13. MATERIALS AND EQUIPMENT

- A. All materials shall meet or exceed all applicable referenced standards, federal, state, and local requirements, referenced standards, and conform to codes and ordinances of the AHJ.
- B. Materials shall be new, the best of their respective kinds without imperfections or blemishes and shall not be damaged in any way. Used equipment shall not be used in any way for the permanent installation except where Contract Documents specifically allow existing materials to remain in place.
- C. To the extent practical, all equipment of the same type serving the same function shall be identical and from the same manufacturer.

#### 1.14. COLORS AND LABELING

- A. Where requirements in 15190 conflict with the requirements below, Contractor will comply with the most stringent requirement.
- B. Provide BAS Components consistent with the following color requirements.
  1. Control Panels Blue
  2. Conduit Blue
  3. Input/Output Wiring Yellow
  4. BACnet Copper Wiring Orange
  5. LonWorks Copper Wiring Purple
  6. Modbus Copper Wiring Blue
  7. Ethernet/Fiber Cable Consistent with color of primary communication protocol.
  8. Tubing Black with White Stripe
- C. Provided BAS Components with the following labeling requirements.
  1. Controllers
    - a. Vinyl or nylon label, 1/2 inch or greater in height, black text on white background, adhesive backed, printed with MEP Equipment served by Controller, permanently mounted.
  2. Control Panels
    - a. Two-layer engraved phenolic or engraver's plastic tag, 1 inch or greater in height, adhesive backed, engraved with MEP Equipment served by panel, permanently mounted.
  3. Input/Output Wiring
    - a. Nylon or self-laminated wire-wrap label, 1/2 inch or greater in height, black text on white background, adhesive backed, printed with BAS Component connected to cable and cable number, permanently mounted at termination to terminal block in Control Panel on cable jacket.
    - b. Premade labels or wire marker tape is not allowed.
  4. BAS Component
    - a. Vinyl or nylon label, 1/2 inch or greater in height, black text on white background, adhesive backed, printed with MEP Equipment served and BAS Component purpose (ex. AHU-1 SF Start/Stop), permanently mounted.

## **PART 2 - PRODUCTS**

### **2.1. MANUFACTURERS AND VENDORS**

- A. Subject to the Specifications and requirements herein, the BAS will be provided by (listed in alphabetical order):

#### **NEW CONSTRUCTION**

1. Siemens
  2. Reliable Controls
  3. Distech
  4. Lynxspring
- B. Products by the manufacturer listed shall be used for Device and Building Controllers. Sensors, actuators, valves, dampers, and other BAS Components may be manufactured by others as indicated.

### **2.2. GENERAL**

- A. Owner shall receive ownership of all job-specific configuration documentation, data files, software and/or code developed for the Project. This shall include all custom, job-specific software code, databases, and documentation for all configuration and programming that is generated for the Project and/or configured for use with the Device and Building Controllers or Building and Enterprise Supervisors, and any related LAN, WAN, Intranet, and Internet connected routers and devices.
- B. Any and all required IDs and passwords for admin and programming-level access to any BAS Component or software program shall be provided to Owner.
- C. It is Owner's intent to purchase an open system capable of being serviced and expanded by any acceptable system integrator that has and maintains certification to work on Niagara Framework systems. The Niagara Compatibility Statement (NICS) for all Niagara Software shall allow open access and be set as follows: `accept.station.in="" accept.station.out="" accept.wb.out="" accept.wb.in=""`. In any case, Owner shall maintain the right to direct Contractor to modify any software license, regardless of supplier, as desired by Owner.
- D. Contractor shall not install any "brand-specific" software, proprietary JAR files, applications, or utilities on Niagara Framework based devices, unless otherwise permitted. Provide exceptions to Owner for review.
- E. All Device and Building Controllers installed for the project shall not be limited in their ability to communicate with a specific brand/Manufacturer or Vendor of the BAS. They shall also be constructed in a modular fashion to permit the next generation and support components to be installed in replacement of, or in parallel with, existing components.
- F. Device and Building Controllers shall have the ability to perform energy management routines via preprogrammed function blocks or template programs.
- G. Browser-based access: A remote/local user using a standard browser will be able access all BAS facilities and graphics via the LAN or direct connection, with proper username and password. Only HTML5 browser-based graphical user interfaces (GUI) is acceptable. The system shall be capable of supporting an unlimited number of clients using a standard Web browser such as Internet Explorer, Edge, Firefox, or Chrome.
1. Graphics shall be Niagara "virtuals" which allow graphics to be present on both the JACE and Supervisor, allowing for an update in one location to be automatically applied to the other.
- H. Remote data access: The system shall support browser-based remote access over the Internet to the building data.

1. The Contractor shall coordinate with Owner IT to ensure all remote browser access is protected with the latest BAS software updates.
  2. The Contractor shall coordinate with Owner IT to ensure a VPN (Virtual Private Network) is installed to protect Owner from cyber-attacks.
- I. Systems Configuration Database: The system architecture shall support maintaining the systems configuration database on a Supervisor server on the LAN. User tools for BLN and/or DLN management shall be provided and licensed to Owner and shall allow unrestricted configuring, updating, maintaining, and expanding of all current devices, configurations and settings.
  - J. Database Schema shall be published and provided to Owner to facilitate easy access to BLN and DLN data.
  - K. Owner shall be the named license holder of all software associated with any and all incremental work on the project. Contractor will coordinate with Owner IT for any requirements regarding software/hardware licensing.
  - L. Where multiple pieces of Niagara equipment exist, use single-JACE sign-on. Coordinate with Owner on requirements.
- 2.3. DEVICE COUNT AND SOFTWARE MAINTENANCE AGREEMENTS
- A. All Device Controllers, Building Controllers, and Supervisors which have a license structure to where only a certain quantity of BAS Components or devices can connect to it shall be selected such that there is a minimum 25% capacity for future BAS Component or device connections. (i.e. if there are 80 connected devices, the license shall allow for  $80 \times 1.25 = 100$  potential device connections (20 extra device connections possible).
  - B. All Building Controllers and Supervisors which have a license structure requiring a Software Maintenance Agreement (SMA) shall be for a period of five years.
- 2.4. SYSTEM PERFORMANCE
- A. Description: The BAS shall comply with the following minimum performance requirements. Performance requirements are based on a fully functioning BAS with all trends and alarms enabled:
    1. Graphic Display: Display graphic with minimum 20 dynamic points with current data within 10 seconds.
    2. Graphic Refresh: Update graphic with minimum 20 dynamic points with current data within 8 seconds.
    3. Object Command: Reaction time of less than 2 seconds between operator command of a binary object and device reaction.
    4. Object Scan: Transmit change of state and change of analog values to control units or workstation within 6 seconds.
    5. Alarm Response Time: Annunciate alarm at workstation within 45 seconds. Multiple workstations must receive alarms within five seconds of each other.
- 2.5. SYSTEM ARCHITECTURE
- A. The system architecture provided shall incorporate hardware and software resources sufficient to meet the functional requirements of these Specifications. The Building and Device-Level Network shall be based on industry standard open platforms as specified herein, and utilize commonly available operation, management, and application software. All software packages and databases shall be licensed to Owner to allow unrestricted maintenance and operation of the BAS. Contractor shall include all items not specifically itemized in these Specifications that are necessary to implement, maintain, and operate the system in compliance with the functional intent of these Specifications.

- B. Reference 4.1 Network Diagram for diagram of System Architecture layout.
- C. The system architecture shall consist of a Wide Area Network (WAN), a Local Area Network (LAN), a Building-Level Network (BLN), and one or more Device-Level Network(s) (DLN), as well as an Enterprise Supervisor, a Building Supervisor, Building Controller(s), and Device Controller(s), as applicable.
  - 1. Wide Area Network (WAN): WAN infrastructure provided by Owner. Contractor will coordinate with Owner IT for configuration (ports, firewall, etc) for a successful BAS installation.
    - a. The WAN infrastructure shall be used to connect the Enterprise Supervisor to the Building Supervisor and/or Building Controller(s).
  - 2. Local Area Network (LAN): LAN infrastructure provided by Owner. Contractor will coordinate with Owner IT for configuration (ports, firewall, etc) for a successful BAS installation.
    - a. The LAN infrastructure shall be the connection point to the WAN for the BAS, and also serve as the BLN.
  - 3. Building-Level Network (BLN): BLN shall be a segmented network on the Owner's LAN.
    - a. The BLN shall be used for connection of Building Controller(s) and/or Building Supervisor only. No Device Controller(s) shall be connected to the BLN.
  - 4. Device Level Network (DLN): DLN infrastructure provided by Contractor.
    - a. DLN will be BACnet TCP/IP (Ethernet).
    - b. Contractor will provide one or more DLNs to maintain network speeds as specified herein.
    - c. Additional DLNs of a different protocol than listed may be added to integrate unique pieces of equipment not provided by Contractor, however all Contractor-provided equipment shall be consistent with the DLN above.
  - 5. The LAN will be under construction and not necessarily complete prior to work commencing. As such, a temporary BLN will be provided by Contractor for functionality of the BAS. This may include wireless access points, switches, or other temporary hardware for full functionality. Upon completion of the LAN, which will also serve as the BLN, Contractor shall remove the temporary equipment and provide final installation of devices to the permanent BLN. Testing of the system will be provided to ensure functionality is the same as on the temporary system.
  - 6. The LAN is existing and segmented for the BLN.

## 2.6. SYSTEM ARCHITECTURE, ADDITIONAL REQUIREMENTS

- A. Niagara Framework will be Niagara 4 (N4), with the latest stable released installed (as identified by Contractor) and will be compatible with any existing Niagara systems. Where the incorrect software version is installed, it shall be corrected at no additional cost to Owner.
- B. Prior to bid, where a modification to the System Architecture is desired, Contractor will obtain permission for the proposed System Architecture. Contractor will provide documentation with proposed modifications and how they will improve the System Architecture as specified. If not approved, Contractor will provide the System Architecture as specified.
- C. Prior to the bid, Contractor may request for additional connections to the WAN/LAN beyond the ones specified herein. Should those connections be disallowed, Contractor shall provide additional BLN(s) or DLN(s) at no additional cost to Owner.
- D. Capacity of any BLN or DLN shall be limited to 70% of the allowable device count to allow for future minor modifications or expansions to the network. Provide calculations on request.
- E. Device Controllers shall communicate on a hardwired network.



- F. Twisted-Pair Based Device Level and/or Building Level Networks (DLN/BLN):
1. BACnet MS/TP networks where the baud rate for equipment is “fixed” and cannot be changed shall be segmented from the main DLN(s). The main DLN(s) will not be slowed to accept Device Controllers with slower baud rates than the majority of the Device Controllers can achieve.
  2. ARCnet and/or Token-Ring based DLNs shall not be acceptable.
  3. The communication speed between Device Controllers shall be sufficient to ensure fast system response time under any loading condition. At a minimum, network speed shall be minimally 78K bits per second (LonWorks FTT-10A), 19.2K bits per second (Modbus RTU), 76,800 baud (BACnet MS/TP).
    - a. Where speeds must be reduced, provide justification to Owner for approval.
  4. Provide a maximum of 40 LonWorks FTT-10A controllers per segment. Provide a maximum of 25 BACnet MS/TP controllers per segment. Provide a maximum of 25 Modbus RTU controllers per segment.
    - a. Controller counts may be increased where specifically recommended/approved by the Manufacturer and system performance will be achieved as specified. If network performance suffers due to excessive controllers, Contractor shall provide additional BLN(s) or DLN(s) at no additional cost to Owner.

G. Ethernet Based Device Level and/or Building Level Networks (DLN/BLN):

1. Where DLN is an ethernet-based network (vs traditional copper twisted-pair network), the requirements of the BLN shall also apply to the DLN.
2. Ethernet-based BLN or DLN shall be consistent with Owner IT standards and requirements, and at a minimum IEEE 802.3 Ethernet over Fiber or Category 6 cable with switches and routers that support 1000base-T gigabit Ethernet throughput. Provide all routers, switches, and other hardware for functionality.

2.7. DEVICE CONTROLLERS

- A. Provide a Device Controller for each piece of MEP Equipment, or as specifically identified.
- B. General
1. Device Controllers shall fundamentally communicate with the protocol as specified in the System Architecture for the DLN. Device Controllers which communicate over a different protocol and then convert to the specified protocol via a protocol converter, router, or gateway are not acceptable.
  2. All Device Controllers shall be able to communicate peer-to-peer without the need for a Building Controller and shall be capable of assuming all responsibilities typically assumed by a Building Controller.
  3. Any Device Controller shall be able to act as a Master to allow for the exchange and sharing of data variables and messages with any other Controller connected on the same communication cabling. So called “Slave Controllers” are not acceptable.
  4. A dedicated Device Controller will be provided for each piece of MEP Equipment. Controller “sharing,” where one Controller does one or more pieces of MEP Equipment, is not allowed, unless specifically approved by Owner.
  5. Each Device Controller shall have a minimum of 10% spare capacity for each point type for future point connection, rounded up to the nearest whole number.
  6. Performance
    - a. Each Device Controller shall have a minimum of 64KB of RAM and 384KB of non-volatile flash memory.

- b. Each Device Controller shall have a 32-bit microprocessor operating at a minimum of 68 MHz.
    - c. Real time clock with rechargeable battery and 20 days power backup.
  - 7. The control program shall be resident within the same enclosure as the input/output circuitry, which translates the sensor signals. The control program shall be stored in non-volatile memory, which is not dependent upon the presence of a battery, to be retained.
  - 8. Provide single Device Controllers with the physical and software resource count for standalone operation of each piece of MEP Equipment. The Sequence of Operation and required points for control shall reside on a single Device Controller.
    - a. Remote I/O modules (via a field-wired communications bus designed for remote I/O purposes) are acceptable for points required to achieve the Sequence of Operation.
      - A) BACnet, LonWorks, Modbus, and any other communication protocol designed for Device Controller to Building Controller communication is not acceptable for remote I/O communication.
      - B) Expansion I/O modules plugged directly into the Controller are acceptable for points required to achieve the Sequence of Operation.
      - C) Additional Device Controllers connected via the DLN are not acceptable for points required to achieve the Sequence of Operation.
  - 9. Device Controllers with integral sensors or devices (i.e., a VAV terminal unit controller with integral damper actuator and pressure sensor), shall comply with the specification requirements for those sensors if they were submitted separately. If the Controller's sensors or devices do not comply, the sensors or devices will be provided separately.
  - 10. BACnet Device Controller Specific Requirements:
    - a. Each BACnet Controller on the BACnet MS/TP communications trunk shall provide a loading characteristic of 1/8th load.
    - b. Provide BACnet Controllers that are BACnet Testing Laboratory (BTL) listed (v14 or later). Controllers will be marked with the BTL certified logos. Controllers must be within the following categories:
      - A) BACnet Building Controller (B-BC)
      - B) BACnet Advanced Application Controller (B-AAC)
      - C) BACnet Application Specific Controller (B-ASC)
  - 11. LonWorks Device Controller Specific Requirements:
    - a. Provide LonWorks Device Controllers that conform to LonMark Certified Interoperability Standards. Components will be marked with the LonMark certified logos.
  - 12. Modbus Device Controller Specific Requirements:
    - a. Provide Modbus Device Controllers that conform to the Modbus Conformance Testing Program and be independently verified by an approved third-party for conformance.
- C. Configurable Device Controllers
  - 1. Shall contain an application-specific control program which can be configured to meet the Sequence of Operation.
  - 2. Where a configurable Controller cannot be configured to meet the Sequence of Operation, a Programmable Controller will be used. Alternatively, Contractor may submit a request to modify the Sequence of Operation so that a Configurable Controller may be used in lieu of a Programmable Controller.

- D. Programable Device Controllers
  - 1. Shall be fully programmable and the programming software shall have a library of pre-built, tested, and user re-definable control sequences for a wide range of typical HVAC applications.
- E. Ethernet Device Controllers
  - 1. Provide with a 2-port or greater integrated switch.
  - 2. Controllers should be able to be “daisy chained” to eliminate multiple dedicated ethernet drops for each Controller.

## 2.8. BUILDING CONTROLLERS

- A. Provide Building Controller(s) with sufficient expansions to integrate DLNs while maintaining network speed, point count requirements, spare capacity, and other requirements as specified.
- B. Building Controller(s) shall be JACE 8000 series.
  - 1. Provide with embedded workbench.
  - 2. Provide with all required expansions for LonWorks FTT-10A, RS485, etc. to achieve the necessary quantity of DLN(s).
- C. Provide sufficient quantity of Building Controllers to maintain average processing power at 70% or less. Where Building Controllers are running above 70% consistently, additional Building Controllers will be provided and DLNs rewired at no cost to the Owner.

## 2.9. CONTROL PANELS AND ENCLOSURES

- A. Control Panels are an assembly composed of an enclosure and one or more BAS Component(s). Control Panels will be provided for:
  - 1. All MEP Equipment which requires a Device Controller(s) and does not have an Enclosure for a Device Controller(s) included as part of the MEP Equipment.
  - 2. All Building Controller(s).
- B. Reference 1.9 Quality Assurance for Control Panel rating requirements.
  - 1. All Control Panels provided for MEP Equipment shall be assembled and installed in accordance with UL508A. Field wiring to the Control Panel shall be terminated to a field wiring terminal as indicated on the required drawings provided with the Control Panel. Control Panels which are modified after UL508A listing by adding BAS Component(s) not shown on the UL508A panel drawings are 1) not allowed, or 2) require UL508A recertification from an authorized UL508A inspector. In short, ‘generic’ UL508A Control Panels which have power prewired but contain no BAS Component(s) as listed are not allowed.
- C. Controller(s) installed inside of MEP Equipment shall only be done so in spaces/enclosures designed for a Controller to be installed (i.e. a VAV controls enclosure). The fact a Controller fits inside the space does not constitute being designed for a Controller to be installed. Controller shall not be installed on the outside of any MEP Equipment or in a plenum, even if Controller is plenum rated.
- D. Enclosures shall have continuously welded and ground smooth seams, have doors that open 180 degrees, concealed and continuous hinge, and ground studs on door and body.
- E. Indoor/inside enclosures shall be NEMA/UL Listed Type 1. Enclosure shall be powder-coated steel, consistent with color chart herein. Outdoor/outside Enclosures shall be NEMA/UL Listed 3R or 4X. Enclosure shall be power-coated steel consistent with color chart herein or stainless steel.
- F. All enclosures will be provided with a removable backplate to which BAS Components will be fastened. No BAS Components will be fastened to the enclosure body. BAS Components,

such as pilot lights and switches, displays, and operator interfaces may be mounted to the enclosure door, so long as they are designed to do so. No component will sacrifice or downgrade the NEMA rating of the enclosure.

- G. Control Panels will be sized (width, height, and depth) so that all BAS Components, including but not limited to Controllers, relays, power supplies and transformers, fit inside neatly and in an organized fashion. Provide cable tray for all wire to rest in and fasten to backplate. Cable tray shall be sufficiently sized for future expansion and/or service loop for field-wiring.
- H. Control Panels which have more than one BAS Component are required to be provided prewired to numbered terminal blocks. All BAS Components and terminal blocks will be fastened to the removable backplate and wired between the BAS Components and terminal block at Contractor's panel shop. The terminal block will serve as the demarcation point between factory/shop wiring and field wiring. At no point shall field wiring cross the terminal block and be wired directly to a factory/shop-installed BAS Component. Any BAS Component that was intended to be in the field, such as a relay, will not be installed inside the Enclosure in the field.
  - 1. Exception: Enclosures which house only one BAS Component, such as a Controller, are not required to have numbered terminal blocks, and may have field wiring terminated directly to the BAS Component.
- I. Maintain separation between Class 2 wiring and other wiring, such as power, for both field and factory connections.
- J. The design intent of the Control Panels is to have the ability to, in the future, disconnect all field wiring from the terminal blocks, remove the backplate with old control components, install new backplate with new control components and reconnect wire to the terminal blocks. Contractor will maintain design intent with their panel design and installation.
- K. Where the Specification conflicts with Control Panel requirements in Division 16, Contractor will comply with the most stringent requirement.

## 2.10. CABLE, WIRING, TUBING, AND ACCESSORIES

- A. Comply with Division 16.
- B. BAS cable for input and outputs shall comply to the color chart herein and have "BAS CABLE" (or equivalent) physically written on the cable from the cable manufacturer at regular intervals.
- C. BAS cable for LonWorks shall comply to the color chart herein and have "LONMARK" physically written on the cable from the cable manufacturer at regular intervals. BAS cable for BACnet shall comply with the color chart herein and have "BACNET" physically written on the cable from the cable manufacturer at regular intervals. BAS cable for other protocols will have the appropriate protocol written on the cable.
- D. All control wiring and tubing shall be plenum rated, no riser cable or tubing is allowed. Conform with NFPA 262 Flame Test for approved plenum use without conduit.
- E. Provide with integral ripcord.
- F. Treat cable with a lubricant to increase cable pulling productivity and efficiency and to decrease the risk of cable damage due to excessive pulling strengths. A non-staining lubricant shall be applied to coat the full length of the cable during the manufacturing process. The lubricant shall produce a low coefficient of friction on the cable jacket material that reduces pulling friction by up to 70%. The lubricant shall continue to reduce friction after it has dried; remaining as a slippery film that retains lubricity for months after use. The cable lubricant shall comply with the physical and performance requirements of Telcordia Standard, TR-NWT-002811, and Generic Requirements for Cable Placing Lubricants. The lubricant shall not contain solvents nor have a flash point.

- G. BACnet and Modbus cable will be continuously shielded. LonWorks cable must be shielded into and out of VFDs, or any other noise-generating piece of equipment. Input/output (I/O) cable need not be shielded.
- H. Ethernet cable shall comply with the color chart herein and be consistent with Owner IT standards and requirements, and at a minimum IEEE 802.3 Category 6 cable.
- I. Tubing for air pressure sensors shall be polyethylene, approved for plenum installations, have high stress-crack resistance and be resistant to ultraviolet light.

#### 2.11. TRANSFORMERS AND DC POWER SUPPLIES

##### A. Control Transformers

- 1. Class 2, sized and rated for application. Circuit breaker overcurrent protection; fused or internal overcurrent protection is not allowed. Transformers shall be sized so that connected load does not exceed 75 percent of rating. Functional Devices TR series or approved equal.

##### B. DC Power Supplies

- 1. Class 2, sized and rated for application. Overcurrent protection with auto-reset; fused or internal overcurrent protection is not allowed. Transformers shall be sized so that connected load does not exceed 75 percent of rating. IDEC PS5R-V Series or approved equal.

#### 2.12. SURGE PROTECTION

- A. Provide any power supply surge protection, filters, etc. as necessary for proper operation and protection of all BAS Components.
- B. All BAS Components shall be capable of handling voltage variations 10% above or below measured nominal value, with no effect on hardware, software, communications, and data storage.
- C. Provide Control Panel surge protection for:
  - 1. Building Controllers and/or their associated Control Panels
  - 2. Control Panels with 11 or more hardwired input/output points entering/exiting the panel.
  - 3. Control Panels with network routers, switches, and/or other network/interface devices.
  - 4. Location(s) required by Owner based on submitted controls architecture.
  - 5. Manufactured by Ditech DTK-120HW or approved equal.
- D. Provide surge protection for DLN and/or BLN at every point network enters or leaves the building enclosure.
  - 1. Manufactured by Ditech DTK-2MHLP series or approved equal for copper twisted-pair networks.
  - 2. Manufactured by Ditech DTK-110C6A series or approved equal for ethernet networks.

#### 2.13. SOFTWARE

- A. Provide one copy of Tridium Niagara Workbench software.
- B. Provide one copy of ALL programming tools for all Device Controllers. Provide multiple versions of Software as required. Software will be fully licensed and not a "partial" or "light/lite" software version. Any functionality the Manufacturer and/or Vendor has available to them will also be provided to the Owner.
- C. Install software on Owner-chosen computer. Coordinate with Owner on processing, memory, operating system, and other computer requirements.

## **PART 3 - EXECUTION**

### **3.1. PREPARATION**

- A. Examine areas and conditions under which BAS is to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Owner and Contractor. Report any issues to Owner and/or General Contractor.
- B. These Specifications call out certain duties of Contractor and any subcontractor(s). They are not intended as a material list of all items required by the Project.

### **3.2. INSTALLATION**

- A. Provide related items and work indicated in the Contract Documents, as specified or not specified, necessary to provide a complete and fully functioning BAS, including but not limited to:
  - 1. All incidentals, equipment, appliances, services, hoisting, scaffolding, supports, tools, supervision, labor, consumable items, fees, licenses, etc.
  - 2. All BAS Components, devices, power supplies, transformers, fittings, sensors, controllers, wiring, accessories, etc.
  - 3. All wiring, including communication network, analog points, digital points, low voltage power, line voltage power, emergency power, etc.
  - 4. All associated power and low voltage connections.
  - 5. All conduit, junction boxes, fittings, panels, enclosures, hardware, etc.
- B. Utilize licensed electricians for all electrical distribution systems.
- C. The Contract Documents show the general arrangement of the respective systems. Follow as closely as actual building construction and the work of other trades will permit.
- D. Maintain redlines of shop drawings throughout installation process. Redlines will be used to generate O&Ms, and any other closeout documentation as specified herein. Shop drawings for O&Ms which are submitted unchanged from the Action Submittal phase will be required to be as-built to actual constructed conditions at no cost to Owner.

### **3.3. PRODUCT DELIVERY, STORAGE, HANDLING, PROTECTION, AND CLEANING**

- A. All products and materials shall be new, clean, and free of defects, damage, and corrosion.
- B. Ship and store products and materials in a manner which will protect them from damage, weather, and entry of debris until final acceptance.
- C. Where BAS Components are required to be factory-mounted on MEP Equipment by others, arrange for shipping of BAS Components to MEP Equipment manufacturer.

### **3.4. SITE CLEAN-UP**

- A. At conclusion of each day's work, and at the request of Owner, clean up and remove from the site all rubbish, debris, and trash accumulated during the day as a result of work of Contractor.
- B. Marks on walls and/or ceiling tiles caused by Contractor shall be cleaned by Contractor.
- C. Ceiling tiles, drywall, carpet, paint, and all architectural finishes damaged by Contractor shall be replaced by Contractor.

### **3.5. POWER WIRING, CONTROL WIRING, AND CONTROL TUBING**

- A. Comply with Division 16.
- B. Extend 120V power circuits from points provided to control voltage transformers. Where dedicated junction boxes have been provided, coordinate the exact locations with the Electrical Contractor. Where they have not, coordinate the spare circuit breakers to be used with the Electrical Contractor and/or Owner.
- C. Install all wiring and cabling in conduit.

- D. Install wire, cable, and accessories with sufficient slack and flexible connections to allow for vibration of piping and equipment.
- E. Wire safeties and limit controls to prevent operation of MEP Equipment in any selector position (off-hand-auto).
- F. Provide sleeves and conduit for passage of wiring through structural masonry, concrete walls and floors, and elsewhere for the proper protection of the BAS. Seal as required.
- G. Splices are not permitted within the BLN or DLN communication cables. Only continuous network topologies or continuous homeruns are allowed for these networks. Splices identified, including damage to cable, will result in cable being re-pulled at no additional cost to Owner.
- H. Limit DLN and BLN cable lengths to no longer than 70% of the longest dimension published by the manufacturer of the cable or Controller, between the most remote network nodes/Controllers.
- I. Shielded wiring will have shields twisted together and taped against jacket of cable. No exposed shields will be allowed. Ground shield at one end of cable.
- J. LonWorks communication network shall transition from unshielded to shielded at device prior to VFD(s), be shielded into and out of the VFD(s), and transition back to unshielded at device after VFD(s).
- K. Power wiring, control wiring, and wiring accessories (i.e. conduit) shall be consistent with color chart herein.
- L. Power wiring, control wiring, and wiring accessories shall comply with Division 16. Where the Specification conflicts with Division 16, Contractor will comply with the most stringent requirement.
- M. Install control transformers and DC power supplies inside Control Panels. Transformers randomly installed in plenum, or connected to junction box via nipple mount, is not allowed.
- N. Install surge protection for wiring as required. Surge protection for 120V shall be installed exterior to Control Panel. Surge protection for communication network will be installed in close proximity to grounding locations and bars. Route communication network such that surge protection can be installed in accordance with manufacturer's instructions. Excessive grounding wiring runs and/or grounding to structural steel for surge protection is not permitted.
- O. Maintain all bend radius requirements with control tubing. Do not kink tubing. Do not use tees, elbows, or other fittings in tubing.
- P. I/O wiring shall be labeled in accordance with 1.15 Colors and Labeling. Wire number shall correspond to wire number shown on Closeout Documentation.
- Q. I/O cabling will be sized in accordance with the load and distance traveled. Input wiring will be minimally 22AWG. Output wiring will be minimally 18AWG.

### 3.6. NETWORK MANAGEMENT FUNCTIONAL REQUIREMENTS

- A. Contractor shall thoroughly and completely program and configure BAS Components, software, supplemental software, application programming, network communications, operator workstations, computers, printer, and network communications to permit the functional requirements of the BAS herein specified. The setup shall include as a minimum the following network management procedures:
  1. Automatic backup of the BAS database to appropriate media.
  2. Program, load, and debug all software installations, including integration of third-party applications (i.e., analytics and energy management).
  3. Network user auditing routine.

### 3.7. POINT-TO-POINT TESTING/CHECKOUT

- A. As a part of installation, provide checkout (also called point-to-point testing) of all BAS Components.
- B. Prior to start-up of any MEP Equipment, ensure all points have been properly set up, including but not limited to sensor type and range.
- C. Ensure BAS Component is accessible for maintenance.
- D. Ensure sensors and devices have been installed in the correct location in accordance with actual field conditions and modifications made to the flow diagram in the Contract Documents. Ensure sensors and devices have the proper flow direction, orientation, insertion depth, and any other applicable requirements.
- E. Provide means to increase or decrease sensed value and ensure the BAS responds accordingly.
- F. Checkout will be performed via Owner's final graphic screens. If checkout is performed within the programming function of the BAS, it shall be repeated when the final graphic screens are complete and available for use.
- G. Check operation of valve/damper-actuator combination to confirm that actuator modulates valve/damper smoothly throughout stroke to both open and closed positions. Check valve for proper close off.
- H. Provide documentation of the checkout process for each piece of MEP Equipment.

### 3.8. START-UP TESTING

- A. At the conclusion of point-to-point testing/checkout, provide start-up testing of all BAS Components.
- B. Provide start-up of all MEP Equipment. Perform start-up in conjunction with any applicable trades.
- C. Provide start-up testing to ensure all configuration and programming conforms with Sequence of Operation.
- D. Start-up testing will be performed via Owner's final graphic screens. If start-up testing is performed within the programming function of the BAS, it shall be repeated when the final graphic screens are complete and available for use.
- E. Tune PIDs to provide reasonable speed response to change in variables while having stable operation.
- F. Provide documentation of the start-up testing process, including any modifications made to the Sequence of Operation, for each piece of MEP Equipment.

### 3.9. ADJUSTING AND CALIBRATION

- A. Adjust and calibrate all points on the BAS as follows.
- B. Prior to calibration, complete all point-to-point testing/checkout and start-up testing to ensure the BAS is fully functioning.
- C. Calibrations shall be made inside the Niagara wire sheet. Do not calibrate sensors inside the device controller.
- D. Calibrated instrument shall be minimally twice as accurate as the sensor's installed accuracy.
- E. Using calibrated instruments, document actual value (per calibrated instrument) and indicated sensor reading (per the BAS). Adjust using a single point offset or a double-point calibration. Document calibration value(s).
- F. If sensor reading is within the manufacturer's stated accuracy, do not calibrate the sensor. Document actual value and sensor reading.



- G. If sensor is greater than manufacturer's stated accuracy, investigate installation of sensor (i.e., 5-10 pipe/duct diameters downstream, etc), programming of sensor (i.e., SVNTs, range, voltage instead of mA and resistance causing high voltage drop, etc.), transient issues (i.e., turbulence, diffuser blowing on sensor). If investigation uncovers potential source of error, correct sensor installation.
- H. If no errors are found and sensor's accuracy is between 100 and 200% of manufacturer's stated accuracy, provide:
  - 1. Single-point offset for sensors whose readings will vary less than 20% (ex., room temperature).
  - 2. Two-point calibration for sensors whose readings will vary greater than 20%.
  - 3. Document actual value, sensor reading, and offset/calibration values.
- I. If no errors are found and sensor's accuracy is greater than 200% of manufacturer's stated accuracy, replace sensor. Alternatively, provide documentation for approval as to why sensor's error is more than 200% of manufacturer's stated accuracy.
- J. Work with Testing and Balance (TAB) Contractor to input calibrations performed within TAB Contractor's scope of work. Provide dedicated personnel to assist TAB Contractor during their work, provide a fully functioning TAB graphical screen on the BAS for TAB Contractor use, or provide means to adjust TAB via wall module. Assist TAB Contractor with questions regarding TAB graphical screen.
- K. Do not calibrate any sensor which has a guaranteed installed accuracy, such as airflow monitoring stations (AFMS) or water flow sensors.

### 3.10. FUNCTIONAL PERFORMANCE TESTING (FPT) PROCEDURE

- A. Perform point-to-point testing/checkout, start-up testing, adjusting/calibration testing, configuration, and programming on all MEP Equipment and the BAS as a whole to provide a complete and fully functioning BAS.
- B. BAS shall be complete and fully functioning prior to any Functional Performance Testing (FPT). Assist Owner and/or Owner Representatives, which may include but is not limited to the Engineer, Architect, Commissioning Agent (CxA), and/or Testing and Balance (TAB) Firm, with FPT, which may include but is not limited to verification, commissioning, and/or Graphical User Interface (GUI) acceptance testing. Provide dedicated personnel to those activities as specified herein or as requested by Owner.
- C. Provide documentation as specified to prove the BAS is complete and fully functional prior to FPT activities.
- D. At a minimum, perform the following FPT procedures. The following may be achieved within a Commissioning Plan or another FPT as required within the Contract Documents.
  - 1. Provide Owner an agenda and schedule of FPT activities for approval and coordination as part of Action Submittals.
  - 2. Complete all necessary installation to have a complete and fully functional BAS. Provide written notice that BAS is ready for FPT.
  - 3. Demonstrate BAS systems to Owner. Perform FPT including but not limited to Sequence of Operation, point-to-point verification to graphical interface, historical data logging, and alarms.
  - 4. Owner to provide detailed punch list to Contractor.
  - 5. Contractor to repair issues on Owner punch list within five business days.

### 3.11. CLOSEOUT

- A. Upon completion of Functional Performance Testing (FPT), Contractor provides all requirements as specified in 1.13 Close-Out Submittals to Owner.

- B. Contractor trains Owner on all aspects of the BAS including architecture, devices, software, and final Sequences of Operation.
- C. Owner issues letter to Contractor declaring that system is Substantially Complete. Date of this letter starts the Warranty Period.
- D. Final Acceptance. Owner issues letter to Contractor accepting system. Final pay app can be issued for release of any remaining contingency funds.

### 3.12. CONTROL PANELS

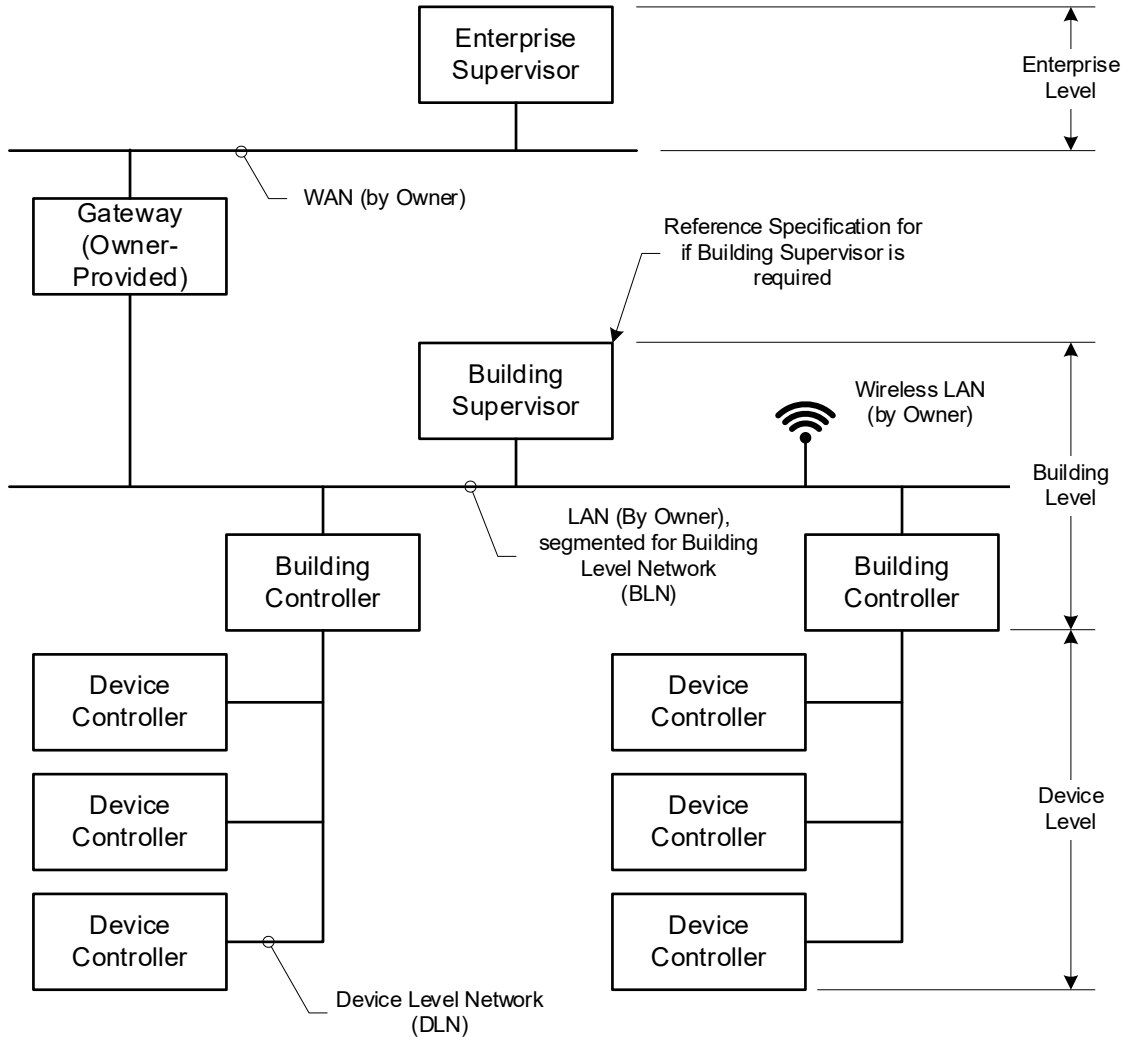
- A. Install Control Panels at locations in accordance with the Contract Documents and/or Owner. Ensure proper service clearances will be achieved at the end of construction. Control Panels without proper service clearances will be relocated at no cost to Owner.
- B. For any Control Panel that exceeds 16 inches in any dimension, provide a trough above/below Control Panel. Trough shall be separated into high and low voltage. Provide a high and low voltage conduit or nipple between trough and Control Panel, sized appropriately for the high and low voltage wiring. All other conduit that serves the Control Panel shall enter/exit the trough. Do not terminate any other conduit(s) to the Control Panel outside of two conduits/nipples identified.
- C. Provide a service loop for all controls wiring. Service loop will be installed in trough (where provided) or inside Control Panel cable tray (where allowed).
- D. Contractor shall extend power to the Control Panel from a junction box or an acceptable location.

### 3.13. GRAPHICS/OPERATOR INTERFACE

- A. The graphics shall comply with the Owner's standards and requirements.

**PART 4 - FIGURES**

**4.1. NETWORK DIAGRAM**



END OF 15900 – BUILDING AUTOMATION SYSTEMS

## 15910 BAS SENSORS AND DEVICES

### **PART 1 - GENERAL**

#### 1.1. APPLICABLE SECTIONS

- A. 15900 Building Automation Systems

### **PART 2 - PRODUCTS**

#### 2.1. GENERAL

- A. Provide BAS Components as indicated in the Contract Documents, Sequence of Operation, control diagrams, points lists, Specifications, or as needed to perform the intended operations consistent with the design intent of the BAS and design/performance intent of the MEP Equipment.
- B. Provide with metal enclosure for all plenum applications. Any sensor mounted in plenum that has a plastic enclosure will be rated for plenum installation or installed in a plenum-rated enclosure.
- C. All sensors shall be vibration and corrosion resistant.
- D. Accuracy statements are written for the specific sensor. Installation shall not degrade accuracy more than double what accuracy statement for sensor requires.
- E. Enclosures:
  - 1. Provide suitable enclosure for BAS Component for ambient conditions encountered by application.
  - 2. NEMA Type 1 or 2 for indoor and protected applications.
  - 3. NEMA Type 3R, 4 or 4X for outdoor and unprotected applications.

#### 2.2. TEMPERATURE SENSORS, STANDARD ACCURACY

- A. Manufacturers:
  - 1. ABB
  - 2. ACI
  - 3. BAPI
  - 4. Distech
  - 5. Honeywell
- B. General Requirements:
  - 1. Sensor shall be thermistor or RTD inherently compatible with BMS.
  - 2. Accuracy:  $\pm 0.5$  deg F over 32 to 158 deg F range.
  - 3. Operating Temperature Range: -40 to 300 deg F.
- C. Outside Air Temperature (OAT) Sensor: Sensor installed in wall-mounted weatherproof enclosure with conduit entrance, with PVC sun and windscreen as required.
- D. Duct-Mounted Single-Point Temperature Sensor: Rigid sensor sealed in 0.25-inch stainless steel probe of length between one-third and two-thirds of the duct width in duct-mounted metal housing with conduit entrance.
- E. Duct-Mounted Averaging Element Temperature Sensor: Multi-point sensor, contained in a flexible copper or woven continuous metallic sheath, with length sized for duct.
  - 1. Provide a minimum of 1 foot of sensing element for every three square feet of duct/coil area. Multiple averaging elements may be required.

2. Averaging elements shall be used where ducts are prone to stratification, and downstream of heating/cooling coils.
  3. Where multiple sensors are provided, sensors may be wired in a series-series, parallel-parallel pattern (requires four or nine sensors) in lieu of multiple inputs.
  4. Plenum rated sheaths are not acceptable.
- F. Wall-Mounted Flat-Plate Temperature Sensor: Stainless steel, flat plate sensor that fits in a standard 2-inch by 4-inch junction box with tamperproof screws. Provide with insulated back.
- G. Thermowell-Mounted Immersion Temperature Sensor: Rigid sensor sealed in 0.25-inch stainless steel probe, with three-part moisture protection system, that has minimum length of 20% of the pipe width. Provide machined, single-piece brass or stainless steel thermowell compatible with sensor housing.
- H. Strap-On Piping Temperature Sensor: Sensor with metal clamps to fasten to piping. Strap-on sensors are only acceptable where specifically called for in Contract Documents. Thermowell and insertion sensor shall be installed where strap-on temperature sensor not specifically called for.
- I. Cooler/Freezer Temperature Sensor: Use bullet probe style sensor.

### 2.3. TEMPERATURE SENSORS, MATCHED PAIR

- A. Where two temperature sensors will be used together to calculate a BTU measurement, provide a matched pair.
- B. General Requirements
1. All requirements for Standard Accuracy Temperature Sensors are applicable, except where more stringent below.
  2. Sensor shall be thermistor or RTD with matched transmitter, bath calibrated, 4-20mA output proportional to temperature range and compatible with BAS and 24 Vac/dc power supply.
  3. Differential Accuracy:  $\pm 0.15$  deg F at 70 deg F.
  4. Measurement Range: 32 to 200 deg F.
  5. Range of sensor output shall be appropriate for the application the sensor is installed in. Range of the output shall be set at the factory and shown on the provided documentation.

### 2.4. HUMIDITY SENSORS, STANDARD ACCURACY

- A. Manufacturers
1. ABB
  2. ACI
  3. BAPI
  4. Distech
  5. Honeywell
- B. General Requirements:
1. Laser-trimmed thermoset polymer-based capacitive-type sensor, 4-20mA or 0-10Vdc output proportional to relative humidity range of 0% to 100% and 24 Vac/dc power supply.
  2. Accuracy:  $\pm 2$  percent over 10 to 90 percent range.
  3. Measurement Range: 0-100%.
  4. Operating Temperature Range: -40 to 140 deg F.
- C. Outside Air Relative Humidity (OAH) Sensor: Sensor installed in wall-mounted weatherproof enclosure with conduit entrance, with PVC sun and windscreen as required.

- D. Duct-Mounted Relative Humidity Sensor: Sensor in duct-mounted plenum-rated housing with conduit entrance.
- E. Wall-Mounted Relative Humidity Sensor: Sensor in white plastic enclosure with insulated back.

#### 2.5. COMBINATION RELATIVE HUMIDITY AND TEMPERATURE SENSORS

- A. Where there is a requirement for the monitoring of both relative humidity and temperature at the same location, provide combination relative humidity and temperature sensors. The individual sensors must each meet the specifications details herein.
- B. Where required in the drawings, combination relative and humidity sensors shall have the ability to output additional parameters, including dew point, enthalpy, and wet bulb temperature.

#### 2.6. WALL MODULES AND ROOM SENSORS, STANDARD ACCURACY

- A. General
  - 1. Wall modules and room sensors cover devices which mount on a wall and provide an interface between the MEP Equipment and the occupant.
- B. Manufacturers: Provide a wall module consistent with the manufacturer providing the overall controls.
- C. General Requirements:
  - 1. Wall modules which measure including but not limited to temperature, relative humidity, and/or carbon dioxide must each meet the specifications details herein.
  - 2. Provide with plastic enclosure with display, override switch, override indicator, and setpoint adjustment.

#### 2.7. DRY (AIR) PRESSURE SWITCH

- A. Manufacturers
  - 1. Dwyer
  - 2. Cleveland Controls
- B. General Requirements
  - 1. Diaphragm pressure switch with SPDT contacts.
  - 2. Sensor shall be uni-directional.
  - 3. Manual or automatic reset, in accordance with Contract Documents.
  - 4. Setpoint adjustment knob.
  - 5. Accuracy:  $\pm 2$  percent of full scale output.
  - 6. Measurement Range: 0 to 12 in wg.
  - 7. Operating Temperature Range: -4 to 185 deg F.
- C. "Paddle-style" air flow switches are not allowed. Use dry pressure switch in lieu of paddle.

#### 2.8. DRY (AIR) PRESSURE SENSOR, STANDARD ACCURACY

- A. Manufacturers
  - 1. ACI
  - 2. Honeywell
  - 3. Setra
  - 4. Veris
  - 5. ABB
- B. General Requirements

1. Diaphragm pressure transducer and amplifier type sensor, 4-20mA or 0-10Vdc output proportional to pressure range and compatible with BMS system and 24 Vac/dc power supply.
  2. Sensor shall be uni- or bi-directional for application as stated below.
  3. Sensor shall have local display.
  4. Accuracy:  $\pm 1$  percent of full-scale output/selected range.
  5. Measurement Range: See applications below.
  6. Operating Temperature Range: -4 to 140 deg F.
  7. Burst pressure: 5 psid.
- C. Duct-Mounted Static Pressure Sensors:
1. Uni-directional.
  2. Measurement Range: 0 to 5 in wg. for low and medium pressure applications and higher as required for high pressure applications.
- D. Room Pressure Sensors:
1. Bi-directional.
  2. Measurement Range: -0.2 to 0.2 in wg.
  3. Provide with surge damper (Amphenol SD-01 or equivalent) and room static pressure pickup with fine stainless steel mesh filter.
- E. Building Pressure Sensors:
1. Bi-directional.
  2. Measurement Range: -0.2 to 0.2 in wg.
  3. Provide outside air reference kit, (Dwyer A-306 or equivalent), with tubing, mounting bracket and required hardware.
  4. Provide with surge damper (Amphenol SD-01 or equivalent) and room static pressure pickup with fine stainless steel mesh filter.
- F. Air Filter/Coil Differential Pressure Sensors:
1. Uni-directional.
  2. Measurement Range: 0 to 2 in wg and higher as required.
  3. Provide with static pressure probe(s).
- 2.9. WET (WATER) PRESSURE SWITCH
- A. Manufacturers
1. Ashcroft
- B. General Requirements
1. Diaphragm pressure switch with SPDT contacts.
  2. Sensor shall have stainless steel wetted components in a weatherproof wiring housing.
  3. Sensor shall be uni-directional.
  4. Manual or automatic reset, in accordance with drawings.
  5. Setpoint adjustment knob.
  6. Accuracy:  $\pm 2$  percent of full scale output.
  7. Measurement Range: 0 to two times the setpoint or anticipated pressure.
  8. Operating Temperature Range: -20 to 150 deg F.
- C. "Paddle-style" water flow switches are not allowed. Use wet pressure switch in lieu of paddle.

## 2.10. WET (WATER) PRESSURE SENSOR

### A. Manufacturers

1. Senva
2. Setra
3. Veris
4. ABB

### B. General Requirements

1. Diaphragm pressure transducer and amplifier type sensor, 4-20mA or 0-10Vdc output proportional to pressure range and 24 Vac/dc power supply.
2. Sensor shall have stainless steel wetted components in a weatherproof wiring housing.
3. Sensor shall be uni-directional, unless bi-directional required for reversing flow.
4. Sensor shall have local display.
5. Accuracy:  $\pm 0.25$  percent of full-scale output/selected range.
6. Measurement Range: See applications below.
7. Operating Temperature Range: See applications below.
8. Proof Pressure: two times rated input pressure, or greater.
9. Burst Pressure: five times rated input pressure, or greater.

### C. Water "Gauge" Pressure Sensors:

1. Measurement Range: 0 to two times the setpoint or anticipated pressure.
2. Operating Temperature Range: 0 to 175 deg F.

### D. Water Differential Pressure Sensors:

1. Measurement Range: 0 to two times the setpoint or anticipated pressure.
2. Operating Temperature Range: 0 to 175 deg F.

### E. Provide with four or five valve manifold. Sensor to be connected to manifold at factory.

## 2.11. CURRENT SWITCHES/TRANSDUCERS

### A. Manufacturers

1. ACI
2. Setra
3. Veris
4. ABB

### B. General Requirements

1. Sensor shall be rated for their associated motor load and voltage, have input and output isolation, and have LED indication of status.
2. Sensor shall be selected based on application, including but not limited to standard 60 hertz motors, variable speed drive, or ECM.
3. Accuracy:  $\pm 2$  percent of full-scale output.
4. Measurement Range: 0 to two times the anticipated current.
5. Operating Temperature Range: 5 to 140 deg F.

### C. Current Switch (CS):

1. Self-powered current switch with N.O. contacts.
2. Provide with adjustable trip point where indicated in Contract Documents, or as required for proper operation for application.

### D. Current Transducer (CT):



1. Sensor with 4-20mA or 0-10Vdc output proportional to current draw and 24Vac/dc power supply.

## 2.12. CARBON DIOXIDE SENSORS

### A. Manufacturers

1. Honeywell
2. Vaisala
3. Veris
4. ABB

### B. General Requirements

1. Non-dispersion infrared (NDIR) type sensor, 4-20mA or 0-10Vdc output proportional to carbon dioxide (CO<sub>2</sub>) range and 24 Vac/dc power supply.
2. Sensor shall have local display.
3. Accuracy:  $\pm 2$  percent of reading, or 30 ppm, whichever higher.
4. Measurement Range: 0 to 2000 ppm.
5. Operating Temperature Range: 32 to 122 deg F.
6. Standard Calibration: No maintenance or periodic sensor replacement needed. The sensor shall have a 5-year calibration interval, utilizing an automatic unoccupied period calibration.

C. Wall-Mount Carbon Dioxide Sensors: Sensor with plastic enclosure that fits on a standard 2-inch by 4-inch junction box.

D. Duct-Mount Carbon Dioxide Sensors: Sensor with sampling tube, duct-mounted metal housing with conduit entrance.

E. Where CO<sub>2</sub> is provided beside temperature and/or humidity sensors, it shall be provided separately and not combined into a single sensor.

## 2.13. AIRFLOW MEASUREMENT STATION (AFMS)

### A. Manufacturers

1. Ebtron

### B. General Requirements

1. Thermal dispersion type flow sensor, composed of one or more sensor probes (multiple sensors per probe) and transmitter, 4-20mA or 0-10Vdc output proportional to flow range and 24 Vac/dc power supply.
2. Measurement will be made using the principle of thermal dispersion. Provide one self-heated bead-in-glass thermistor and one zero power bead-in-glass thermistor at each sensing node. Thermal dispersion devices that indirectly heat a thermistor are not acceptable. Other measurement technologies are not acceptable.
3. Sensor probe tubes and mounting brackets shall be constructed of gold anodized, 6063 aluminum alloy, 304 stainless steel, or 316 stainless steel.
4. Internal wiring in probes shall be resilient to exposure of moisture and not effect sensor operation.
5. Sensor probe shall be comprised of multiple sensors, with calibration data stored in the cable connecting plug, such that switching transmitters will automatically read corresponding calibration and sensor data. Quantity of sensors per probe and quantity of probes shall vary based on duct/fan configuration to provide the required accuracy.
6. Accuracy:  $\pm 3$  percent of reading over full scale, when installed in accordance with manufacturer guidelines.  $\pm 5$  percent of reading over full scale for outdoor air intakes,

when installed in accordance with manufacturer guidelines. Accuracy is for installed air flow monitoring sensor, not for individual sensors in each probe.

7. Measurement Range: 0 to 5,000 feet per minute (fpm).
8. Operating Temperature Range: Probes: -20 to 160 deg F. Transmitter: -20 to 120 deg F.
9. Sensing elements will be NIST traceable.
10. Transmitter:
  - a. Heavy-duty construction with LED display with 4-20mA air flow and temperature output signals. Outputs may be field configured for additional signals.
  - b. Capable of communicating with BAS on communication protocol as specified in 15900
  - c. Transmitter shall generate alarms for individual sensor errors and transmit over the BMS network.
  - d. Transmitter will be provided with Bluetooth low-energy interface card, capable of transmitting information to Android or iOS devices.
- C. Duct Air Flow Measuring Stations: Probes will be ordered specific to duct as installed in field.
- D. Fan Inlet Air Flow Measuring Stations: The sensing element shall be specifically designed to measure air flow of a centrifugal fan at the inlet cone. Coordinate mounting style with fan selection and manufacturer recommendations. For double-inlet fans, provide one set of elements for each inlet.

#### 2.14. INSERTION TURBINE WATER FLOW METERS

- A. Manufacturers
  1. Onicon F-1000 series
- B. General
  1. Provide with NIST traceable, wet calibrated flow-measuring element, integral transmitter (4-20mA or 0-10Vdc output proportional to flow range), installation valves, depth gage, calibration certificate, and attached tag indicating calibration information.
  2. Flow meter shall be wet tappable, allowing insertion and removal from the flow stream without system shutdown.
  3. Provide power from 24 Vac/dc power supply.
  4. Contractor shall be responsible for selecting flow meter options submitted based on application. Flow meter shall be constructed, calibrated, and scaled for the intended application in terms of pipe size, pipe material, installation requirements, expected flow rate, ambient conditions, and fluid characteristics which include but are not limited to pressure, temperature, conductivity, and viscosity.
  5. Single or dual axial insertion turbine design with electronic impedance-based sensing circuit. Dual insertion turbine shall incorporate two contra rotating turbines and an averaging circuit to reduce measurement errors due to flow distortions, such as swirl, when installed in piping configurations with reduced straight run.
    - a. Coordinate single or dual turbine requirements with as-built conditions to ensure accuracy is achieved as specified.
  6. 316L stainless steel construction.
  7. Maximum pressure rating: 400 psig or greater.
  8. Maximum temperature rating: 280°F or greater.
  9. Accuracy:  $\pm 2$  percent of reading from 0.4 to 20 fps, when installed in accordance with manufacturer guidelines.
  10. Flow range: 0 to 20 fps

11. Provide with installation kit appropriate for application.

C. Application

1. Chilled water, chilled glycol, hot water, or any other media which contains minimal particulate.

2.15. INSERTION ELECTROMAGNETIC WATER FLOW METERS

A. Manufacturers

1. Onicon F-3500 Series

B. General

1. Provide with NIST traceable, wet calibrated flow-measuring element, integral transmitter (4-20mA or 0-10Vdc output proportional to flow range), installation valves, depth gage, calibration certificate, and attached tag indicating calibration information.
2. Flow meter shall be wet tappable, allowing insertion and removal from the flow stream without system shutdown.
3. Provide power from 24 Vac/dc power supply.
4. Contractor shall be responsible for selecting flow meter options submitted based on application. Flow meter shall be constructed, calibrated, and scaled for the intended application in terms of pipe size, pipe material, installation requirements, expected flow rate, ambient conditions, and fluid characteristics which include but are not limited to pressure, temperature, conductivity, and viscosity.
5. Electromagnetic sensing element shall utilize two sets of diametrically opposed electrodes to measure the average flow rate velocity.
6. 316L stainless steel construction.
7. Maximum pressure rating: 400 psig or greater.
8. Maximum temperature rating: 200°F or greater.
9. Accuracy:  $\pm 1$  percent of reading from 2 to 20 fps, when installed in accordance with manufacturer guidelines.
10. Flow range: 0 to 20 fps
11. Provide with installation kit appropriate for application.

C. Application

1. Condenser water or any other media which contains particulate.

2.16. BTU (ENERGY) METERS

A. Manufacturers

1. Onicon System 10

B. General

1. Water flow meter, dual temperature sensors, and transmitter, 4-20mA or 0-10Vdc output proportional to flow range and each temperature (3 analog outputs total), and 24 Vac/dc power supply.
2. Provide water flow meter in accordance with the specification herein.
3. Provide matched temperature sensors in accordance with the specification herein.
4. Transmitter
  - a. Provide with local display and operator interface. Display shall visually indicate instantaneous flow rate, supply temperature, return temperature, thermal energy flow rate (MBH).
  - b. Capable of communicating with BAS on communication protocol as specified in 15900

## 2.17. THERMOSTATS

### A. Manufacturers

1. ACI
2. Honeywell
3. ABB
4. Schneider Electric

### B. General

1. Label switches "FAN ON-OFF", "FAN HIGH-LOW-OFF", "FAN HIGH-MED-LOW-OFF", or as applicable.
2. Mount on standard junction box.
3. Thermostat portion must meet the specifications details herein as required for application.

### C. Digital Stand-Alone Thermostat

1. Electronic, solid-state, microcomputer-based room thermostat.
2. Automatic switching from heating to cooling.
3. PID control to minimize overshoot and deviation from setpoint.
4. Set up for four separate temperatures/periods per day, with individual programming for each day of the week (4 programs per day, 7 days per week, 28 potential programs).
5. Instant override of setpoint for continuous or timed period from 1 hour to 31 days.
6. Short-cycle protection.
7. Selection features include degree F or degree C display, 12- or 24-hour clock, keypad disable, and fan on-auto-circulate.
8. Powered off unit 24Vac transformer, with solid-state memory in which programming is retained on power failure. Battery acceptable only for time and date upkeep during power failure.
9. Thermostat display features include the following: time of day, actual room temperature, programmed temperature, programmed time, duration of timed override, day of week, and system mode indications include "heating," "cooling," "off," "fan auto," "fan circulate," and "fan on."
10. Combination Thermostat, Humidistat, Carbon Dioxide, and/or Occupancy Sensor: Where there is a requirement for a thermostat with humidistat, carbon dioxide, and/or occupancy sensing functions at the same location, provide combination unit. The individual sensors must each meet the specifications details herein.
11. Provide remote sensing element (electronic sensor) as required for application.

### D. Low-Voltage, On-Off Thermostats

1. 24Vac, bimetal-operated, mercury-free, heat anticipator, concealed set-point adjustment, space temperature indicator, 55 to 85 deg F setpoint range, and 2 deg F maximum differential.
2. Selector Switch: Integral, manual on-off-auto.

### E. Line-Voltage, On-Off Thermostats

1. Line voltage listed for electrical rating, bimetal-operated, mercury-free, open contact or bellows-actuated, snap-switch or equivalent solid-state type, heat anticipator, concealed set-point adjustment, space temperature indicator, 55 to 85 deg F setpoint range, and 2 deg F maximum differential.
2. Electric Heating Thermostats: Equip with off position on dial wired to break ungrounded conductors.

3. Selector Switch: Integral, manual on-off-auto.
  4. Combination Thermostat and Fan Switches: Push-button or lever-operated fan switch.
- F. Freezestat/Low-Limit Duct Thermostat (LTD)
1. Manual reset switch.
  2. Snap-acting SPDT with gas/refrigerant filled copper capillary that trips if temperature sensed across any 12 inches of bulb length is equal to or below setpoint. Sensing range 15 to 55 deg F.
  3. Bulb Length: Sized for duct/coil with minimum 5 feet.
  4. Quantity: Provide a minimum of 1 foot of sensing element for each square foot of duct/coil area. Multiple Low-Limit Thermostats may be required.
- G. High-Limit Humidistat
1. Snap acting SPDT, duct or room mount, automatic reset switch that trips if humidity sensed is equal to or above setpoint. Sensing range 15 to 95% relative humidity.
- H. Strap-On Piping Aquastat Temperature Sensor
1. Snap acting SPDT, pipe mount, automatic or manual reset switch (as indicated in Contract Documents) that trips if temperature sensed is equal to or above setpoint. Sensing range appropriate for application.

## 2.18. RELAYS

- A. Manufacturers
1. IDEC
  2. Functional Devices
  3. Veris
  4. ABB
- B. General Requirements
1. Electrically rated for application, minimally SPDT with 10A (resistive) contacts.
  2. Provide with LED indicator light.
  3. Provide with hand-off-auto (HOA) unless otherwise specified. HOA not required if controller has internal HOA or output being controlled has HOA (i.e. VFD).
  4. Plenum rated where required.
- C. BAS Panel-Mounted Relays: "ice-cube" / socket style with mounting base and replaceable relay. Relays in panel will be screw terminal terminations; relays with wiring whip from factory are not allowed for panel mounting.
- D. Nipple-Mounted Relays: enclosed relay compatible with conduit knockout. Acceptable for field use. With or without factory-provided wiring whip.
- E. Track-Mounted Relays: acceptable for use in terminal unit control panels. Screw terminal terminations. Track-mounted relays are not to be installed in field unless inside an equipment control panel (i.e., no track-mounted relays in electrical boxes).
- F. Combination Motor Starter / Current Switch Relays: allowed only for single-phase equipment and must be mounted such that pilot light is exposed (i.e., combination motor starter / current switch relays which install inside of motor starter/VFDs are not allowed). The individual sensors must each meet the specifications details herein.

## 2.19. ADDITIONAL SENSORS AND DEVICES

- A. Shaft-Mounted Limit Switches: SPDT/DPDT mercury-free, gravity-actuated mechanical switch with adjustable shaft connection.
- B. Whisker Limit Switches: SPDT/DPDT mechanical whisker switch with adjustable trim arm.

- C. Condensate Drain Pan Overflow Safety Switch: Low-voltage, float-type safety switch designed for condensate drain pan high-level alarm for unit shutdown and alarming. Little Giant Pump/Franklin Electric (ACS series) or equal. Whisker switch with foam float is not acceptable.
- D. Water Leak Detection Alarm: Adjustable-height multi-point water detection sensor constructed to be corrosion and abrasion resistant and configured for normally open or normally closed as required by the application with 24Vac/dc power supply. Provide remote-mounted sensing probe and cable as needed for each application. Operating Temperature Range: -40 to +185 deg F.
- E. Emergency Stop Buttons: ADA-compliant, red emergency pushbutton in yellow polycarbonate plastic enclosure with clear flip-up cover and stainless steel backplate. Button shall be reset by twisting or pulling out the button; a procedure that requires disassembly or a key is not acceptable. 120V or 24 V as needed. Provide label with indication of operation (ex. "Boiler E-Stop"). Safety Technology International (STI) Stopper Station series or equal.

## 2.20. ELECTRONIC ACTUATORS

- A. Manufacturers: All valve actuators shall be supplied from a single manufacturer. All damper actuators shall be supplied from a single manufacturer. Provide actuators manufactured by one of the following:
  1. Belimo
  2. Honeywell
  3. ABB
  4. Schneider Electric (TAC Dura-Drive)
- B. General
  1. Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
  2. Actuators shall operate related valve(s)/damper(s) with sufficient reserve power to provide smooth modulating action or two-position action and proper speed of response at velocity and pressure conditions to which the valve/damper is subjected.
  3. Actuators shall produce sufficient power and torque to close off against the maximum system pressures encountered. Actuators shall be sized to close off against the designed pump/fan shutoff pressure as a minimum requirement.
  4. Select actuators to fail in desired position in the event of a power failure. See Contract Documents for power failure modes.
  5. Provide a position indicator and graduated scale on each actuator indicating open and closed travel limits.
  6. Type: Motor operated, with gears, electric and electronic.
  7. Voltage: 24Vac unless otherwise specified. 120V actuators may be allowed if coordinated by BAS Contractor with Electrical Contractor to provide local disconnect and power. Circuit must be fed from the same power panel as the MEP Equipment or Control Panel and a spare circuit must be available.
  8. Power: Contractor is responsible for sizing control transformers based on the VA of the actuator(s) selected.
  9. Provide electronic overload protection throughout the entire operating range in both directions.
  10. Coupling: V-bolt and V-shaped, toothed cradle. Bolt and set screw method of attachment is unacceptable.
  11. Actuators shall be capable of being mechanically and electrically paralleled to increase torque if required.

12. Two-Position Actuators: Single direction, spring return or non-spring return type.
13. Modulating Actuators:
  - a. Capable of stopping at all points across full range and starting in either direction from any point in range.
  - b. Control Input Signal:
    - A) Three Point, Tristate, or Floating Point: Clockwise and counter-clockwise inputs. One input drives actuator to open position, and other input drives actuator to close position. No signal of either input, the actuator remains in the last position.
    - B) Proportional: Actuator drives proportional to input signal and modulates throughout its angle of rotation. Suitable for 0-5Vdc, 0-10Vdc, 1-5Vdc, 2-10Vdc, and 4-20mA signals.
  - c. Floating control actuators shall be allowed only for damper and valve control for room terminal units where there is not a room pressurization requirement. See General Requirements for definition of those spaces. Use of floating controls must be specifically requested by Contractor for specific spaces and reviewed by Owner. Submission of floating control actuators without specific comment by Contractor for spaces and the resulting review by Owner does not constitute approval for use.
  - d. Pulse width modulation (PWM), or any other analog signal that is not specified above is not allowed.
14. Position Feedback: Where indicated, equip two-position actuators with auxiliary switches (SPDT) for remote monitoring of open and/or closed position. Point of open and/or closed position can be adjusted over the actuators range of operation (0-100%). Where indicated, equip modulating actuators with a position feedback through current and/or voltage signal for remote monitoring.
15. Fail-Safe: Where indicated, provide actuator to fail via a mechanical spring return mechanism, to drive controlled device to an end position (open or close) on loss of power. Electronic fail-safe is not allowed, unless specifically reviewed and accepted by Owner. Provide external, manual gear release on non-spring return actuators.
16. Temperature Rating:
  - a. Standard Dampers and Valves: -22 to +122 deg F.
  - b. Smoke Dampers: -22 to +250 deg F.
17. Provide actuator enclosure with a heater and thermostat where required by application.
18. Stroke Time:
  - a. Normal: 120 seconds or less from fully closed to fully open, or fully open to fully closed.
  - b. Fast-Acting: 12 seconds open, 5 seconds closed unless otherwise noted.
- C. Damper Actuators
  1. The total damper area operated by an actuator shall not exceed 80 percent of damper manufacturer's maximum area rating.
  2. Provide one actuator for each damper assembly where possible. Multiple actuators required to drive a single damper assembly shall operate in unison off a single control signal.
  3. Avoid the use of excessively oversized actuators which could overdrive and cause linkage failure when the damper blade has reached either its full open or closed position.
  4. Use shaft couplings in lieu of blade-to-blade linkages when driving axially aligned damper sections.

5. Actuator will mount directly to damper with coupler as described above. No foot mount kits, jackshafts, or linkages shall be used.
  6. Sizing: Size for running torque calculated as follows:
    - a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sqft. of damper.
    - b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sqft. of damper.
    - c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sqft. of damper.
    - d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sqft. of damper.
    - e. Dampers with 2- to 3-Inch wg of Pressure Drop or Face Velocities of 1,000 to 2,500 fpm: Increase running torque by 1.5.
    - f. Dampers with 3- to 4-Inch wg of Pressure Drop or Face Velocities of 2,500 to 3,000 fpm: Increase running torque by 2.0.
- D. Smoke and Combination Fire/Smoke Damper Actuators
1. Actuator shall come connected to damper as a rated assembly, sized per the damper manufacturer's requirements, and meet the specifications herein.
  2. Actuators operating in smoke control systems shall comply with governing code and NFPA requirements.
- E. Valve Actuators
1. Valve actuators will be direct coupled "rotary-style" unless otherwise specified. Where required, direct coupled "linear-style" actuators may be used.
  2. Sizing
    - a. Hydronic: Size for torque required to achieve valve close off at 150% of maximum pump differential pressure.
    - b. Steam: Size for torque required to achieve valve close off at 150% of steam design pressure.

## 2.21. CONTROL VALVES

### A. General

1. Factory fabricated, of type, body material, and pressure class based on maximum pressure and temperature rating of piping system, unless otherwise indicated.
2. Control valves assemblies shall be provided and delivered from a single manufacturer as a complete assembly, with the actuator installed at the factory.
3. Control valves shall be two- or three-way as specified in Contract Documents.
4. Provide with extended neck as required to accommodate insulation thicknesses.
5. Refer to Division 15 for general information about valve construction and installation.

### B. Hydronic Ball-Style Control Valves

1. Manufacturers
  - a. Belimo (CCV Series)
  - b. Honeywell (VB Series)
2. Construction
  - a. 2-Inch NPS and Smaller: 350 psi at 250 deg F brass/bronze body, stainless steel ball with matching blow-out proof stem, full port with stainless steel or composite characterizing insert, Teflon seats, dual EPDM O-ring seals, solder or threaded ends.
  - b. 2 1/2-Inch NPS and Larger: 175 psi at 250 deg F iron body, stainless steel ball and matching blow-out proof stem, full port with stainless steel or composite characterizing insert, Teflon seats, dual EPDM O-ring seals, ANSI Class 125/150 flanged ends.



- c. ANSI class IV seat leakage for two-way, ANSI class IV seal leakage for three-way A-Port and class III for B-Port.
  - 3. Flow Characteristics
    - a. Two-way two-position valves shall be full port.
    - b. Two-way modulating valves shall have equal percentage characteristics.
    - c. Three-way valves shall have equal percentage characteristics on A-Port and linear characteristics for B-Port. Bypass applications shall have linear percentage characteristics.
  - 4. Sizing
    - a. Two Position: Line size or size using a 1 psig pressure differential.
    - b. Two-Way Modulating: Size using 4 psig or equal to the load pressure drop, whichever is greater.
    - c. Three-Way Modulating: Size using 4 psig or equal to the load pressure drop, whichever is smaller.
    - d. Effective Cv: for any valve smaller than line size, the pressure drop due to the reduction in pipe size shall be taken into effect. Provide effective Cv on submittal.
- C. Hydronic Butterfly-Style Control Valves
  - 1. Manufacturers
    - a. Belimo (HD Series)
    - b. Honeywell (VFF Series)
  - 2. Construction
    - a. 2 to 12-Inch NPS: Class 125/150 cast-iron full-lugged body, stainless steel disc, EPDM seat and extended neck. Disc-to-stem connection shall utilize an internal spline.
    - b. 14-Inch NPS and Larger: Class 125/150 cast-iron full-lugged body, stainless steel disc, EPDM seat and extended neck. Disc-to-stem connection shall utilize a dual-pin method.
    - c. Leakage: 200 psid zero leakage for 2 to 12-inch NPS and 150 psid zero leakage for 14-inch NPS and larger.
  - 3. Sizing
    - a. Two Position: Line size or size using a 1 psig pressure differential.
    - b. Two-Way Modulating: Size using 3 psig or equal to the load pressure drop, whichever is greater. Size for the design flow with the disc at 60-degree open position and the design velocity less than 12 FPS.
    - c. Effective Cv: for any valve smaller than line size, the pressure drop due to the reduction in pipe size shall be taken into effect.
- D. Pressure-Independent Hydronic Ball-Style Control Valves
  - 1. Manufacturers
    - a. Belimo (PIQCV up to 3/4"; ePIV for 1" and up)
  - 2. General
    - a. Valve shall meet all the requirements set forth in the Hydronic Ball-Style Control Valve section, in addition to the requirements below.
    - b. Operating Differential Pressure Range: 5 to 50 psid or better.

- c. The flow through the valve shall not vary more than +/- 5% due to system pressure fluctuations across the valve in the selected operating range. The control valves shall accurately control the flow from 0 to 100% full rated flow.
- 3. Construction
  - a. Mechanical pressure regulation style PIC valves shall have factory installed pressure/temperature test ports (Pete's Plugs) across the pressure regulator at the factory.
  - b. Pressure independent control valves 1" NPT or larger may use ultrasonic flow measurement. The ultrasonic flow meter will meet the specifications herein.
- 4. Flow Characteristics: see Hydronic Ball-Style Control Valves.
- 5. Sizing
  - a. Valve shall be sized at line size for the GPM specified of MEP Equipment.
  - b. Provide minimum and maximum full-open pressure drop of valves.

### **PART 3 - EXECUTION**

#### **3.1. GENERAL INSTALLATION**

- A. Install aspirating guards on wall-mounted devices in the following locations:
  - 1. Building entrances.
  - 2. Public areas.
  - 3. Where indicated on construction documents.
- B. Exposed wire nuts, including in plenum, will not be acceptable. All connections will be made inside a rated enclosure.
- C. Install labels and nameplates to identify control components according 15190.
- D. Install hydronic instrument wells, valves, and other accessories according to Division 15.
- E. Install refrigerant instrument wells, valves, and other accessories according to Division 15.
- F. Smoke detectors, high and low limit thermostats, high-pressure cut-offs, and other safety switches shall be hard-wired to de-energize equipment as described in the sequence of operation. Switches shall require manual reset. Provide contacts that allow DDC software to monitor safety switch status.
- G. Coordinate fire alarm relay connections to the fire alarm system with the fire alarm installer.
- H. Where sensors have a display, mount such that display can be read from ground.
- I. Install sensors in visible and accessible areas. Do not hide sensors on top of ductwork or insulate over sensors.
- J. For sensors on rigid insulation for duct or piping, install sensor prior to insulation. Sensors installed after insulation will be required to cut and seal insulation around sensor.
- K. Sensors requiring an external power source shall use DC power from switching DC power supply. Do not use alternating current for sensors unless specifically required by the manufacturer. Do not use on-board DC power for sensors unless specifically required by the manufacturer.

#### **3.2. TEMPERATURE/HUMIDITY/WALL MODULE AND ROOM SENSORS INSTALLATION**

- A. Verify location of thermostats, humidistats, and other exposed control sensors with Contract Documents and room details before installation. Install devices 48 inches above the floor per ADA requirements. The location(s) to be selected by Owner. No sensor shall be mounted until the Owner and/or Owner Representatives give specific location instructions. Do not

install sensor(s) on the inside of exterior building walls (including column fur outs) unless explicitly approved by Owner.

- B. Air seal wires attached to sensors in their raceways or in the wall to prevent sensor readings from being affected by air transmitted from other areas.
- C. Install outdoor air temperature and humidity sensors on north-facing wall at designated location. If sensor cannot be placed on north wall, submit RFI for approved location and provide with PVC sun shield and windscreen.
- D. Single-point temperature sensors may be used in ducts where there is no air stratification possibilities. Sensor shall be mounted sufficiently downstream to allow for sufficient mixing, five to ten duct diameters at a minimum.
- E. Install mixing plenum sensors in a serpentine manner horizontally (not vertically) across duct. Support each bend with a capillary clip.
- F. Thermowells to be installed in piping. Contractor to “stub-up” any thermowell which is too long to install directly into piping. Install heat-conducting fluid in thermowell prior to installing sensor.
- G. Install heat-conducting fluid where strap-on temperature sensors contact piping. Sand and clean piping prior to installation. Insulate around sensor.
- H. Install cooler/freezer sensors in rubber clamp to isolate sensor from surrounding metal. Run conduit inside cooler/freezer for sensor away from door and storage racks. After sensor has been checked out, seal all penetrations with low expansion insulating foam. Coordinate installation with cooler/freezer vendor.
- I. Install humidity sensor in areas where relative humidity will not rise above 90% RH. If area will have high humidity consistently, relocate to different area and use dewpoint/psychrometric calculations to calculate relative humidity of the area required.
- J. Wall Modules
  - 1. Limit setpoint adjustment to  $\pm 3$  deg F unless otherwise specified on the Drawings.

### 3.3. PRESSURE SENSOR INSTALLATION

- A. Supply (Positive) Duct Static Pressure. Pipe high-pressure tap to duct using a pitot tube/probe. Make pressure tap connections according to manufacturer's recommendations.
- B. Return (Negative) Duct Static Pressure. Pipe low-pressure tap to duct using a pitot tube/probe. Make pressure tap connections according to manufacturer's recommendations.
- C. Room Pressure: Pipe appropriate pressure sensor port (positive space: high pressure, negative space: low pressure) to room. Pipe opposite pressure point to reference outside of room. Connect to stainless steel mesh snubber mounted to white 2 in by 4 in plate at locations on drawings.
- D. Building Static Pressure. Pipe pressure sensor's low-pressure port to the static pressure port located on the outside of the building through outside air reference kit. Mount kit per manufacturer's instructions. Pipe high-pressure port to stainless steel mesh snubber mounted to white 2 in by 4 in plate at locations on drawings.
- E. Pressure transducers, except those controlling VAV boxes, shall be located in Control Panels, not on MEP Equipment or on ducts. Mount transducers in a vibration-free location accessible for service without use of ladders or special equipment.
- F. Do not install tees for TAB purposes in air pressure tubing. Remove tees where found.
- G. Install differential pressure sensor valve manifold at eye level. Provide hard copper tubing from water mains to valve manifold; soft copper not allowed. Provide isolation valves in tubing prior to valve manifold.

#### 3.4. CURRENT SWITCHES/TRANSDUCER INSTALLATION

- A. Wire may be “wrapped” around CS/CT to obtain better status indication.
- B. CS/CTs requiring commissioning/startup will be done per manufacturer installation instructions.

#### 3.5. AIR FLOW MEASUREMENT STATIONS (AFMS) INSTALLATION

- A. Install AFMS in locations indicated and required to perform the Sequences of Operation. Install AFMS in accordance with the manufacturer’s recommendations.
- B. Do not install AFMS sensors and probes until all sanding and grinding activities are complete to protect them from accumulating dust and debris.
- C. Prior to ordering, measure actual duct size as installed in field and provide to vendor.
- D. Mount transmitter at eye level. Measure distance from probe to transmitter and order wire whip of sufficient length to reach. Install probe wire whip in conduit of sufficient size for connector to pass through.

#### 3.6. THERMOSTATS

- A. Install Freezestat/Low-Limit Duct Thermostat (LTD) in ducts and plenums in a serpentine manner horizontally (not vertically) across duct. Support each bend with a capillary clip. Provide rows at 12 inch spacing; the element covers a maximum of 6 inches above and below sensing element. At the bottom of the duct or plenum, the row with the tail end of the sensing element shall be a maximum of 6 inches from the bottom.

#### 3.7. WATER FLOW AND BTU METER INSTALLATION

- A. Install water flow meters in locations indicated to perform the Sequences of Operation. Install water flow meter in accordance with the manufacturer’s recommendations.
- B. Do not install AFMS sensors and probes until all sanding and grinding activities are complete to protect them from accumulating dust and debris.
- C. Prior to ordering, measure actual pipe size and verify furnished material as installed in field and provide to vendor.
- D. Mount transmitter at eye level. Measure distance from probe to transmitter and order wire whip of sufficient length to reach. Install probe wire whip in conduit of sufficient size for connector to pass through.
- E. Provide installation kit (i.e., threadolet, nipple/standoff, pipe tee, isolation valve, etc) to Mechanical Contractor for installation. Kit will be specific to the application. Installation accessories which are not provided by the vendor will not be acceptable.

#### 3.8. RELAYS

- A. Nipple-mount relays will be mounted at a location where pilot light is visible from floor.

#### 3.9. VALVES, DAMPERS, AND ELECTRONIC ACTUATORS INSTALLATION

- A. Wire parallel actuators according to manufacturer's recommendations.
- B. Dampers and Damper Actuators
  - 1. Install automatic dampers according to Division 15.
  - 2. Mount actuators directly on damper shaft or jackshaft unless shown as a linkage installation.
  - 3. To compress seals when spring-return actuators are used on normally closed dampers, power actuator to approximately the 5° open position, manually close the damper, and then tighten linkage.
  - 4. Provide necessary mounting hardware and linkages for actuator installation.

5. Install damper motors on outside of duct in climate controlled areas, including mechanical rooms. Provide sufficient standoff/offset of damper actuator from ductwork to allow for insulation behind actuator.
  6. Where clearance cannot be maintained, locations exposed to outdoor temperatures, or actuator is inside ductwork, provide 12 inch by 12 inch access door per specifications for any actuator inside of ductwork.
- C. Control Valves and Valve Actuators
1. Provide sufficient standoff/offset of valve actuator from piping to allow for insulation of valve.
  2. PIC Valves
    - a. Where not provided from the factory, install pressure/temperature test ports (Pete's Plugs) for testing of pressure differential across the PIC valve.
    - b. For PIC valves with electronic flow metering, coordinate with mechanical contractor to ensure 5 pipe diameters of straight pipe entering valve.
  3. Steam Valves
    - a. Mount actuators at a minimum 30 degree angle compared to vertical. Do not mount actuator directly above steam valve or piping.

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**PART I: GENERAL**

Control system contractor shall be responsible for selection of the proper control valves including line size, pressure rating, flow-coefficient, shutoff rating and allowable leakage factor. Valves will be turned over to the Division 15 Contractor for installation.

Modulating water valves shall be sized for nominal 5 psi pressure drop and close off. All 2-way valves shall have contoured or characterized throttling plugs with linear (for steam applications) or equal percentage characteristics.

The controls contractor shall calculate the required Cv for each valve. Valve Cv shall be within 100 percent to 125 percent of the Cv calculated.

Fan coil valves and AHU central station actuators shall operate from either a 0-10Vdc or a 4-20ma signal.

**PART 2 - PRODUCTS**

**2.1 MANUFACTURERS**

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

1. Belimo
2. Delta
3. Approved equal

**2.2 CONTROL VALVES**

- A. Valves 1/2 inch through 2 inches shall be ball valve type assemblies industrial quality with bronze bodies and NPT screw type and shall be rated for 600 psig (40 bar) working pressure - or two-way and 400 psig (27 bar) for three-way. The operating fluid temperature range shall be 20' F to 2500 F (-70C to 1200C).
- B. The actuator and its mounting plate shall be capable of being repositioned on the square mounting bracket in 90 degree increments parallel or perpendicular to the pipe. Non-metallic thermal isolation standoffs shall separate mounting plate from actuator with high temperature materials rated for continual use at greater than the application temperature. Valve assemblies without thermal isolation as described above are not acceptable.
- C. The mounting bracket shall be of rigid structural metal incorporating a shaft of stainless steel positioned parallel and perpendicular to the packing and stem to prevent lateral or rotational forces from affecting the stem and its packing. The mounting bracket shall be positioned so as to allow the insulation of the valve body and bracket to allow removal of the actuator without disturbing the insulation. Valves shall have either ISO-5211 style mounting pads or machined mounting surfaces. The shaft shall be supported by an upper bearing.
- D. All control ball valves shall be furnished with a 316 stainless steel ball & stem and carbon and graphite reinforced Teflon O seats and seals.
- E. Ball valves for low pressure steam applications shall have 316 stainless steel ball, stem, and drive shaft and rated at a maximum of 600 psi working pressure. Valves shall be installed in the piping at 45 degree angle from vertical. Valve and actuator mounting bracket shall be fully insulated.
- F. The valves shall have a blow out proof stem design.

- G. Each valve shall be functionally tested by the valve manufacturer.
- H. Flow type for modulation shall have equal percentage and linear flow characteristics for two-way and three-way valves, respectively.
- I. Two-way stem packing shall consist of stacked 'V' ring and spring (live) loaded packing requiring no maintenance. Three-way stem packing shall consist of EPDM O-ring requiring no maintenance and no adjustment to meet complete operating life. Valves requiring packing adjustment throughout the life of the valve are unacceptable.
- J. Valves 3 inches and larger shall be butterfly valves.
- K. Butterfly valves shall be threaded lug type suitable for dead-end service and for modulation to the fully-closed position, with carbon-steel bodies and noncorrosive discs, stainless steel shafts supported by bearings, have flanged-end connections, and EPDM seats suitable for temperatures from minus 20 degrees to plus 250 degrees F. All valves shall have a manual means of operation independent of the actuator. Provide valve manufacturer's insulation casing.
- L. Manufacturer shall provide a two year "no hassle" unconditional warranty from date of installation.

### 2.3 CONTROL VALVE ACTUATORS

- A. The actuator manufacturer shall have ISO 9001 quality certification.
- B. Actuators shall be Underwriters Laboratories Listed under Standard 873 and Canadian Standards Association Class 4813 02. Actuators shall have European Community (CE) certification.
- C. Actuators used near outdoor air streams shall have NEMA type 2 (IP54) housings for water and moisture resistance.
- D. Actuators shall be mounted on the valve by the manufacturer.
- E. Actuators shall be applied according to the manufacturer's specifications.
- F. Actuators shall be fully modulating or 2-position (with fail-safe mechanical spring return) as indicated on drawings.
- G. The valve actuator shall be capable of providing the minimum torque required for proper valve close-off for the required application.
- H. Each actuator shall have current limiting circuitry or microprocessor overload protection incorporated in its design to prevent damage to the actuator. End of travel switches are not acceptable.
- I. Actuators shall have mechanical spring return for fail safe mode where specified. Battery backup units or storage capacitor type units contained within the individual actuators are not acceptable.
- J. Powering shall be 24VAC, 24VDC, 120VAC, or 230VAC. Feedback signal shall be available to provide a DDC input signal or to drive a second slave or tandem actuator. The actuator shall have the capability of adding auxiliary switches or feedback potentiometer if required.
- K. A release button and optional handle on the actuator shall be provided to allow for manual override on non-spring return assemblies.

**PART 3 - EXECUTION**

**3.1 INSTALLATION:**

- A. Install control valves in strict accordance with manufacturer's published instruction manual.
- B. Install control valves with necessary clearance around ball valve assembly.
- C. Install control valves to provide access for periodic maintenance, including removal.
- D. Insulate valve body, not actuator.
- E. Install control valves to prevent condensate forming on valve body to travel into actuator.
- F. Piping installation requirements are specified in other Division 15 Sections.
- G. Electrical power and control wiring and connections are specified in other Division 15 & 16 Sections

**PART 4: COMMISSIONING**

Schedule service of factory trained representative to inspect installation and provide instruction on maintenance to Owner.

**PART V: WARRANTY**

Manufacturer shall guarantee the system as installed to be free from manufacturing defects for a period of 2 years from startup not to exceed 30 months from shipping to job site under normal use.

*END OF SECTION*



**PART I: GENERAL**

SCOPE:

Furnish and install at locations shown on the plans or as specified in schedules, variable frequency drives meeting or exceeding the following specifications.

RELATED WORK:

- a. Section 15750 Pumps
- b. Section 15966 Pump Control
- c. Section 15850 Air Handler Equipment
- d. Division 16

REFERENCES:

- a. UL 508
- b. NEC

**PART II: PRODUCTS**

GENERAL:

- a. Furnish complete variable frequency drives as specified herein for the fans and/or pumps designated on the drawing schedules to be variable speed. All standard and optional features shall be included within the VFD enclosure, unless otherwise specified. VFD shall be housed in a metal NEMA 1 enclosure.
- b. The VFD shall convert incoming fixed frequency three-phase AC power into a variable frequency and voltage for controlling the speed of three phase AC motors. The motor current shall closely approximate a sine wave. Motor voltage shall be varied with frequency to maintain desired motor magnetization current suitable for centrifugal pump and fan control.
- c. An advanced sine wave approximation and voltage vector control shall be used to allow operation at rated motor shaft output at nominal speed without being de-rated. This voltage vector control shall minimize harmonics to the motor to increase motor efficiency and life.
- d. The VFD shall include a full-wave diode bridge rectifier and maintain a fundamental power factor near unity regardless of speed or load.
- e. The VFD and options shall be tested to ANSI/UL Standard 508. The complete VFD, including all specified options, shall be Listed by a nationally recognized testing agency such as UL, CUL, ETL, or CSA
- f. The FDA shall have a DC link reactor to minimize power line harmonics. VFD's without a DC link reactor shall provide a 3% impedance line reactor.
- g. The VFD's full load amp rating shall meet or exceed NEC Table 430-150. The VFD shall be able to provide full rated output current continuously, 110% of rated current for 60 seconds and 220% of rated current for up to 1 second while starting.
- h. An automatic energy optimization selection feature shall be provided standard in the drive. This feature shall reduce voltages when lightly loaded and provide a 3% to 10% additional energy savings.
- i. Input and output power circuit switching can be done without interlocks or damage to the VFD.
- j. VFD shall have a Bacnet interface card.

PROTECTIVE FEATURES:

- a. Class 20 I<sup>2</sup>t electronic motor overload protection for single motor applications and thermal-mechanical overloads for multiple motor applications.

- b. Protection against input transients, loss of AC line phase, short circuit, ground fault, over voltage, under voltage, drive over temperature and motor over temperature. The VFD shall display all faults in plain English. Codes are not acceptable.
- c. Protect VFD from sustained power or phase loss. The VFD shall incorporate a 5 second control power loss ride through to eliminate nuisance tripping.
- d. Drive shall catch a rotating motor operating forward or reverse up to full speed.
- e. VFD shall be rated for 100,000 amp interrupting capacity (AIC).

**INTERFACE FEATURES:**

- a. Local/Hand, Stop/Reset and Remote/Auto selector switches shall be provided to start and stop the drive and determine the speed reference.
- b. Digital manual speed control. Potentiometers are not acceptable.
- c. Lockable, alphanumeric backlit display keypad can be remotely mounted up to 10 feet away.
- d. VFD's up to 300 HP shall use the same control panel.
- e. Displays shall be available in 6 languages including English, Spanish and French.
- f. A quick setup menu with preset parameters shall be provided on the drive.
- g. The drive shall be fitted with an RS 485 serial communications port and be supplied with software to display all monitoring, fault, alarm and status signals The software shall allow parameter changes to be made to the drive settings as well as storage of each controller's operating setup parameters.
- h. Set point control interface (PID control) shall be standard in the unit.
- i. Floating point control interface shall be provided to increase/decrease speed in response to switch closures.
- j. An elapsed time meter and kWh meter shall be provided.
- k. The following displays shall be accessible from the control panel in actual units: Reference Signal Percent, Output Frequency, Output Amps, Motor HP, Motor kW, kW/hr, Output Voltage, No Load Warning, DC Bus Voltage, Drive Temperature (%until trip) and Motor Speed in Engineering units per application (in percent speed, GPM, CFM, ).
- l. Drive will sense the loss of load and signal a no load/broken belt warning or fault.
- m. The VFD shall store in memory the last 8 faults and record all operational data.
- n. Six programmable digital inputs shall be provided for interfacing with the systems control and safety interlock circuitry.
- o. Two programmable relay outputs shall be provided for remote indication of drive status.
- p. Two programmable relay analog inputs shall be provided and shall accept a direct-or-reverse acting signal. Analog reference inputs accepted shall include 0-10 V dc, 0-10 mA and 4-20 mA.
- q. One programmable analog outputs shall be provided for indication of drive status. These outputs shall be programmable for output speed, voltage, frequency, amps and input Kw.
- r. Under fire mode conditions the VFD shall automatically default to a preset speed.
- s. VFD shall receive an Enable/Disable signal from the building Energy Management System as well as an analog speed control signal.

**ADJUSTMENTS:**

- a. VFD shall have an adjustable carrier frequency of 2 of 14 kHz through 60 HP and 2 to 4.5 kHz above 60 HP.
- b. Three variable-torque V/Hz patterns shall be provided with the ability to select a constant torque start pattern for each of them.
- c. Twenty preset speeds shall be provided.
- d. Eight acceleration and eight deceleration ramps shall be provided. The shape of these curves shall be adjustable.
- e. Four current limit settings shall be provided.
- f. If VFD trips on one of the following conditions, the VFD shall be programmable for automatic or manual reset: under voltage, over voltage, current limit, inverter overload and motor overload.

- g. The number of restart attempts shall be selectable from 0 through 10 and the time between attempts shall be adjustable from 0 through 10 seconds.

**BYPASS:**

Provide a manual bypass consisting of a door interlocked main fused disconnect pad lockable in the off position, a built-in motor starter and a four position DRIVE/OFF/LINE/TEST switch controlling three contactors. In the DRIVE position, the motor is operated at an adjustable speed from the drive. In the OFF position, the motor and drive are disconnected. In the LINE position, the motor is operated at full speed from the AC power line and power is disconnected from the drive, so that service can be performed. In the TEST position, the motor is operated at full speed from the AC line power. This allows the drive to be given an operational test while continuing to run the motor at full speed in bypass. Customer supplied normally closed dry contact shall be interlocked with the drives safety trip circuitry to stop the motor whether in DRIVE or BYPASS mode in case of an external safety fault.

**SERVICE CONDITIONS:**

- a. Ambient temperature, -10 to 40°C (14 to 104°F).
- b. 0 to 95% relative humidity, non-condensing.
- c. Elevation to 3,300 feet without derating.
- d. AC line voltage variation, -10 to +10% of nominal with full output.
- e. No side clearance shall be required for cooling of wall mount units and all power and control wiring shall be done from the bottom.
- f. Drive shall be capable of operating motor up to 1,000 feet away without derating or field modification.

**QUALITY ASSURANCE:**

- a. To ensure quality and minimize infantile failures at the jobsite, the complete VFD shall be tested by the manufacturer. The VFD shall operate a dynamometer at full load and the load and speed shall be cycled during the test.
- b. All optional features shall be functionally tested at the factory for proper operation.

**SUBMITTALS:**

- a. Submit manufacturer's performance data including dimensional drawings, power circuit diagrams, installation and maintenance manuals, warranty description, VFD's FLA rating, certification agency file numbers and catalog information.
- b. The specification lists the minimum VFD performance requirements for this project. Each supplier shall list any exceptions to the specification are identified; the supplier shall be bound by the specification.

**MANUFACTURERS:**

Variable frequency drives shall be manufactured by Danfoss, ABB, Sq. D, Graham Company, ITT, or other equal approved by Owner. Provide HVAC Series Model VLT or equal.

**PART III: EXECUTION**

**START-UP SERVICE:**

The manufacturer shall provide start-up commissioning of the variable frequency drive and its optional circuits by a factory certified service technician who is experienced in start-up and repair services. The commissioning personnel shall be the same personnel that will provide the factory service and warranty

repairs at the customer's site. Sales personnel and other agents who are not factory certified technicians for VFD field repair shall not be acceptable as commissioning agents. Start-up services shall include checking for verification of proper operation and installation for the VFD, its options and its interface wiring to the building automation system. Start-up shall include customer operator training at the time of the equipment commissioning.

**WARRANTY:**

The VFD shall be warranted by the manufacturer for a period of 36 months from date of shipment. The warranty shall include parts, labor, travel costs and living expenses incurred by the manufacturer to provide factory authorized on-site service.

**EXAMINATION:**

- a. Contractor to verify that job site conditions for installation meet factory recommended and code-required conditions for VFD installation prior to start-up, including clearance spacing, temperature, contamination, dust, and moisture of the environment. Separate conduit installation of the motor wiring, power wiring, and control wiring, and installation per the manufacturer's recommendation shall be verified.
- b. The VFD is to be covered and protected from installation dust and contamination until the environment is cleaned and ready for operation. The VFD shall not be operated while the unit is covered.

*END OF SECTION*

**GENERAL:**

Electrical Contractor shall provide rough-in, junction box, or wiring trough as indicated. All external disconnect switches, motor starters, and any fuses required for equipment furnished under Division 15 shall be provided by the Mechanical contractor and shall be installed by the Electrical Contractor. Coordinate all equipment locations with all other contractors prior to installation of equipment. Consult all Contract drawings which may affect location of equipment or apparatus and make any minor adjustments as required. Electrical Contractor is responsible for all line side and load side wiring for all equipment requiring electrical power. Line side wiring is defined as the wiring from the distribution panel circuit to the point of disconnect (internal or external) for the equipment, whether provided by the contractor or factory installed by the equipment manufacturer. Load side wiring is defined as the wiring from the point of disconnect to all equipment requiring electrical power. All final electrical terminations to the piece of equipment shall be done by the Mechanical contractor.

All control switches for remote equipment shall be provided with on/off indicator lights at the switch.

Ensure that all rotating equipment has a power disconnect available within sight of the equipment, regardless of whether required by the NEC. Coordinate exact locations with Electrical Contractor prior to rough-ins.

The HVAC Contractor shall also provide all control wiring, conduit, equipment interlocks, low voltage device or motor power connections, and similar in accordance with this section or Division 16 of these specifications. Provide all necessary cabinets, panels, junction boxes, interconnecting signal cabling & associated hardware, transformers, relays, engineering support, etc. for a complete and operational system that executes the specified control sequence of operation.

**MOTOR STARTERS, CONTROLLERS AND CONTACTORS:**

Motor controllers and contactors shall be as indicated or specified and shall be furnished under each Section of this Division requiring such controllers unless otherwise indicated to be provided in a Motor Control Center under Division 16. Motor Starters, Controllers, and Contactors shall be furnished by the HVAC Contractor and installed by Electrical Contractor.

Motor controllers shall, unless otherwise specifically noted, be combination magnetic type, with thermal overload relays and heaters in each phase conductor, with operating coils for 120 volts as noted on the drawings or as required. Maximum trip rating of starters for hermetic motors shall be at least 105% of the nameplate full load current of the motor.

Starters shall be provided with build-in selector switches (H-O-A) or pushbutton stations where required. Combination starters shall be provided with sufficient auxiliary contacts or control relays for control sequence as specified, indicated or as required, and with sufficient auxiliary contacts on its circuit breaker or with control relays so that opening the circuit breaker ahead of the starter unit opens all hot control lines within the starters. All starters furnished under this Section shall be mounted in individual NEMA I enclosures, unless otherwise specified or indicated on drawings. Special requirements are specified in the separate Sections of this Division or indicated on the drawings.

Equipment shall be manufactured by Square D to match equipment furnished under Division 16

**ROOM-INSTRUMENT MOUNTING:**

Room instruments shall be mounted so that their switching devices are 54" maximum above the finished floor unless a clear space of 30" wide by 48" long for wheelchair access is not available, mount at 48" AFF to comply with the American Disability Act (ADA).

**CONTROL WIRING:**

Run control wiring in metallic raceway in masonry walls, boiler room and exposed conditions. All other signal cables shall be run on utility platform on wire management bridle hooks provided by this contract. Do not run inside raceway with power conductors. Use copper wire or control cable, #18 minimum (except that digital signaling can be NEC class 2). The contractor shall connect to junction box(s) or other termination points provided by the Electrical Contractor for control power. See Electrical Section of these specifications for materials and installation requirements. All wiring shall be color and number coded.

**RELAYS:**

Indexing relays shall be 24 VAC coils "relay in a box" with pilot light & off/on switch, IDEC or equal. All line side relay wiring shall be 12 AWG and in metallic raceway. Relays shall be installed in NEMA 1 enclosures.

**CONTROL CABINETS:**

Control cabinets shall be provided for mounting of control devices in utility platform and/or boiler room. Cabinet shall be UL listed lockable, code gauge gray painted steel, with knockouts, and hinged door. Enclosure shall be equal to Austin Co. CT series

Provide boiler room cabinet enclosure with swing-down table shelf for use with laptop computer.

**CORRDINATION OF ELECTRICAL POWER REQUIREMENTS:**

Mechanical contractor shall coordinate voltage and amperage requirements for all HVAC equipment with the Electrical Contractor prior to ordering equipment submittals. Make adjustments to equipment voltage or phase requirements as necessary to match electrical power being provided. Make engineer/architect aware of any conflicts or issues.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**ADJUSTMENT AND TRIAL RUNS:**

Upon completion of all work, the Contractor shall operate the plant in the presence of the engineer for the purpose of demonstrating quiet and satisfactory operation, the proper setting of controls, safety and relief valves, and cleanliness of system. Heating and cooling shall be tested separately during periods approaching the design conditions and shall fully demonstrate fulfillment of capacity requirements. Test procedures shall be in accordance with applicable portions of ASME, ASHRAE and other generally recognized test codes as far as field conditions will permit.

**AIR BALANCING & TESTING:**

Air Balancing and System Testing includes (1) balancing air distribution, (2) adjustment of total system to provide design quantities, (3) electrical measurement, (4) verification of performance of all equipment and controls, and (5) sound and vibration measurement. Contractor shall provide all required instrumentation and equipment required to obtain proper measurements. Contractor shall perform final test and balance of selected areas in presence of Engineer. The following procedure is adapted from the 1995 ASHRAE Applications Handbook, Ch. 34: Testing, Adjusting and Balancing, and Associated Air Balance Council:

- (1) All supply and return air-duct dampers are set at full open position. All diffuser and side-wall grilles are set at full open position. Outside-air damper is set at minimum position. All Controls are checked and set for full cooling cycle. Branch liner splitter dampers are set to open position. All extractors and distribution grids are set in wide-open positions.
- (2) Drill all probe holes for static-pressure readings, pitot tube traverse readings, and temperature readings. Check motor electric current supply and rated running amperage of fan motors. Check fan and motor speeds. Check available adjustment tolerance.
- (3) Make first complete air-distribution run throughout entire system, recording first-run statistics. Using pitot tube traverse in all main ducts, branch ducts, and supply and return, proportion all air in required amounts to the various main-duct runs and branch runs. Make second complete air-distribution run throughout entire system for check on proper proportion of air.
- (4) Using pitot tube traverse, set all main-line dampers to deliver proper amount of cfm to all areas. Using pitot tube traverse, set all branch-line dampers to deliver proper amount of cfm to diffusers amount of cfm to diffusers and side-wall supply grilles in each zone. Read cfm at each outlet and adjust to meet requirements. Test and record all items as listed on attached form.

Final air balancing form (3 copies) submitted to Engineer shall be on attached form adapted from the Associated Air Balance Council (AABC) and the National Environmental Balancing Bureau (NEBB).

**HYDRONIC BALANCING & TESTING:**

Hydronic Balancing and System Testing includes (1) bleeding air at all system high points, (2) adjustment of total system to provide design flows, (3) pressure drop measurements & head loss calculations, (4) verification of performance of all pumps, automatic control valves and system controls, and (5) sound and vibration reduction. Contractor shall provide all required instrumentation and equipment required to obtain proper measurements. Contractor shall perform final test and balance of selected equipment in presence of Engineer. The following procedure is adapted from 1995 ASHRAE Applications Handbook, Ch. 34: Testing, Adjusting and Balancing, and the Bell & Gossett Engineering Design Manual:

- (1) Perform air test & balance as specified above.
- (2) Flush & clean system as specified Section 15745. Remove & clean all strainers. Verify correct pump rotation. Pumps shall operate air-free without cavitation. Set automatic fill valves to required pressure.
- (3) Check expansion tanks to verify if system is not water-logged or air-locked. Check all manual air-vents installed at all system high points - bleed all air out of system completely.
- (4) Set all valves at full open position. Close coil bypass valves. Set temperature controls for full flow through all coils.
- (5) Verify correct operation of all automatic control valves. Set operating temperature of chillers to design leaving water temperature.
- (6) Take differential pressure measurements across all pumps & coils. Take power measurements of pump motors in watts (power factor calculated). Use pump manufacturer's published pump curves to determine flow rate.

*END OF SECTION*



**AIR BALANCE REPORT**

Project: \_\_\_\_\_  
 Contractor: \_\_\_\_\_  
 Date: \_\_\_\_\_  
 Air Balanced by: \_\_\_\_\_  
 Instrument Mfr #: \_\_\_\_\_  
 Date Calibrated: \_\_\_\_\_

System No. \_\_\_\_\_  
 CFM: \_\_\_\_\_  
 S.P.: \_\_\_\_\_  
 Fan RPM: \_\_\_\_\_  
 Motor Voltage: \_\_\_\_\_  
 Motor Amperage: \_\_\_\_\_

Location	No.	Model/Size	Effective	Design Values		Field Test		Final Test		% DEV.
			Area	FPM	CFM	FPM	CFM	FPM	CFM	
	1									
	2									
	3									
	4									
	5									
	6									
	7									
	8									
	9									
	10									
	11									
	12									
	13									
	14									
	15									
	16									
	17									
	18									
	19									
	20									
	21									
	22									
	23									
	24									
	25									

**PROCEDURE/NOTES:**

- (1) Review Specification Section 15980 prior to air test & balance.
- (2) Ensure fan is providing specified air volume within 5%.
- (3) Set all dampers to full open position prior to first field test.
- (4) Identify air distribution device nos. on HVAC as-built drawing.
- (5) Adjust dampers accordingly and recheck entire system as required.
- (6) Acceptable % deviation is +/-10%.

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**EVALUATION:**

Upon completion of all work, the Contractor shall operate the plant in the presence of the engineer for the purpose of demonstrating quiet and satisfactory operation, the proper setting of controls, safety and relief valves, and cleanliness of system. Heating and cooling shall be tested separately during periods approaching the design conditions and shall fully demonstrate fulfillment of capacity requirements. Weather-dependent test procedures that cannot be performed by simulation shall be performed in the appropriate climatic season. When simulation is used, the Contractor shall verify the actual results in the appropriate season.

The Contractor shall make the observations, adjustments, calibrations, measurements, and tests of the control systems, tune the controllers, set the timeclock schedule, and make any necessary control-system corrections to ensure that the systems function as described in the sequence of operation. The Contractor shall permanently record, on system equipment schedule, the final setting of controller proportional, integral and derivative constant settings, setpoint, manual reset setting, maximum and minimum controller output, and ratio and bias settings, in units and terminology specific to the controller.

Test procedures shall be in accordance with applicable portions of ASME, ASHRAE, NEBB and other generally recognized test codes as far as field conditions will permit.

**CLEANING:**

All surfaces on metal, pipe, insulation covered surfaces, and other equipment furnished and installed under this section of the specifications shall be thoroughly cleaned of grease, scale, dirt, and other foreign materials. Prior to final inspection, all equipment having factory finishes shall be thoroughly cleaned inside and outside. All damaged surfaces shall be replaced or refinished by Contractor, with paint same as original manufacturer. Engineer shall determine whether the damaged surface is to be replaced or painted.

**EQUIPMENT IDENTIFICATION:**

Provide black-on-white laminated plastic name plates for each AHU & FC equipment unless indicated otherwise on the drawings. The name plate shall be engraved to indicate the equipment controlled or identified. Name plates shall be securely fastened to equipment using two screws.

**MAINTENANCE AND OPERATING MANUALS:**

Upon completion, the MC shall turn over to the Architect three (3) sets of complete Operation and Maintenance Manual and parts list for all mechanical equipment used on the job. Manuals shall include submittal data, manufacturer's recommended maintenance, warranties, and name, address, and phone numbers, both Contractor and of suppliers of equipment.

The Operation and Maintenance Manual shall include in addition to manufacturer's operation and maintenance guides and parts list, a maintenance schedule indicating recommended frequency of service, a blank service repair log for recording date, description of maintenance, and parts purchased, and an air filter replacement schedule indicating size and quantity for each HVAC unit.

**INSTRUCTION & TRAINING:**

Upon completion of the work, and at a time designated by the Architect, with no less than 10 days prior notice, a competent employee of the Contractor shall be provided for a period of not less than one (1) day

to instruct a representative of the Owner in the operation and maintenance of the equipment. Systems requiring manufacturer's representative as specified elsewhere shall be scheduled in same manner. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**SCOPE OF WORK:**

The scope of work consists of the furnishing and installing of complete electrical systems including miscellaneous systems. The Electrical Contractor (hereafter referred to as "the Contractor", or Electrical Contractor) shall provide all supervision, labor, materials, equipment, machinery, and any and all other items necessary to complete the systems. The Contractor shall note that all items of equipment are specified in the singular; however, the Contractor shall provide and install the number of items of equipment as indicated on the drawings and as required for complete systems.

It is the intention of the Specifications and Drawings to call for finished work, tested and ready for operation.

Any apparatus, appliance, material, or work not shown on the drawings but mentioned in the specifications, or vice versa, or any incidental accessories necessary to make the work complete and perfect in all respects and ready for operation, even if not particularly specified, shall be furnished, delivered, and installed by the Contractor without additional expenses to the Owner.

Minor details not usually shown or specified, but necessary for proper installation and operation, shall be included in the Contractor's estimate, the same as if herein specified or shown.

With submission of bid, the Contractor shall give written notice to the Architect of any materials or apparatus believed inadequate or unsuitable, in violation of laws, ordinances, rules, and any necessary items or work omitted. In the absence of such written notice, it is mutually agreed that the Contractor has included the cost of all required items in his proposal, and that he will be responsible for the approved satisfactory functioning of the entire system without extra compensation.

NOTICE TO BIDDERS, INSTRUCTIONS TO BIDDERS, SUPPLEMENTARY INSTRUCTIONS, GENERAL CONDITIONS, SUPPLEMENTARY GENERAL CONDITIONS, SPECIAL CONDITIONS, GENERAL REQUIREMENTS bound in the front of this document are included as a part of the specifications for this work.

**ELECTRICAL DRAWINGS AND SPECIFICATIONS:**

The electrical drawings are diagrammatic and indicate the general arrangement of fixtures, equipment, and work included in the contract. Consult the architectural, structural, plumbing, fire alarm, integrated communications, and mechanical drawings and details for exact locations and dimensions of fixtures and equipment; where same are not definitely located, obtain this information from the Architect.

The Contractor shall follow drawings in laying out work and check drawings of other trades to verify spaces in which work will be installed. Maintain maximum headroom and space conditions at all points. Where headroom or space conditions appear inadequate, the Architect shall be notified before proceeding with installation. If directed by the Architect, the Contractor shall, without extra charge, make reasonable modifications in the layout as needed to prevent conflict with work of other trades or for proper execution of the work.

The plans and these specifications are intended to describe, imply and convey the materials and equipment as well as necessary labor, required for the installation as outlined in the paragraph entitled "Scope of Work". Any omissions from either the drawings or these specifications are unintentional, and it shall be the responsibility of this Contractor to call to the attention of the Architect or Engineer any pertinent omissions before submission of a bid. The drawings which accompany these specifications are not intended to show in complete detail every fitting which may be required; however wherever reasonable implied by the nature

of the work, any such material or equipment shall be installed by this Contractor as a part of his contract price. In no case will any extra charge be allowed unless authorized in writing by the Architect or Engineer.

The Contractor shall arrange with the General Contractor for required concrete and masonry chases, openings, and sub-bases so as not to delay progress of work. Work shall be installed sufficiently in advance of other construction to conceal piping and to permit work to be built in where required.

It shall be understood and agreed by all parties that where the words "Furnish", "Install", and / or "Provide" appear, the following definitions apply:

Furnish - to supply or give.

Install - to place, establish or fix in position.

Provide - to furnish and install as defined above.

#### CODES, PERMITS, AND FEES:

The Contractor shall give all necessary notices, including electric and telephone utilities, obtain all permits, and pay all government taxes, fees, and other costs, including utility connections or extensions in connection with his work file all necessary plans, prepare all documents, and obtain all necessary approvals of all governmental departments having jurisdiction at each phase of construction as required; obtain all required certificates of inspection for his work and deliver same to the Architect before request for acceptance and final payment for the work.

The Contractor shall include in the work, without extra cost to the Owner, any labor, materials, services, apparatus, drawings (in addition to contract drawing and documents) in order to comply with all applicable laws, ordinances, rules, and regulations, whether or not shown on drawings and / or specified.

All work and materials under this section shall be in strict compliance with more stringent requirements of the North Carolina State Building Code, including the National Electrical Code, NFPA 101-Life Safety Code, Regulations of the State Fire Marshall, UL Directory of Electrical Construction Materials, and requirements of the local utility company.

#### VERIFICATION OF DIMENSIONS, DETAILS, EXISTING FIELD CONDITIONS:

The Contractor shall visit the premises prior to bidding, and thoroughly familiarize himself with all details of the work, working conditions, verify dimensions in the field, provide advice of any discrepancy, and submit shop drawings of any changes he proposes to make in quadruplicate for approval before starting any work. The Contractor shall install all equipment in a manner to avoid building interference.

#### COORDINATION WITH EQUIPMENT PROVIDED BY OTHERS:

Electrical contractor shall coordinate voltage, phase and amperage requirements for all Plumbing, HVAC, and Kitchen equipment with the sub-contractor providing the equipment prior to ordering electrical gear submittals. Make adjustments to panels, feeders, and breakers as necessary to feed actual equipment being provided. Make engineer/architect aware of any conflicts or issues.

#### ACCEPTABLE MANUFACTURERS:

Acceptable manufacturers, as specified in the Contract Documents, implies that the specified manufacturer may produce acceptable products equal in quality of materials and performance to such item specified. The Contractor will be required to provide products meeting or exceeding the "Standard of Quality and Performance" as dictated by the product selection noted. However, any changes which result (from substitution of other manufacturers) in the electrical work or work of other Contractors, shall be paid for by the Contractor.

**SHOP DRAWINGS:**

The Contractor shall submit five (5) copies of the shop drawings to the Architect for approval within thirty (30) days after the award of the general contract. If such a schedule cannot be met, the Contractor may request in writing for an extension of time to the Architect. If the Contractor does not submit shop drawings in the prescribed time, the Architect has the right to select the equipment.

Provide manufacturer's cuts of items to be provided under this Contract. Included, but not limited to these items, are any of the following which may be required in this Contract: Fixtures, switches, outlet boxes, device plates, panelboards, transformers, conductors, pull boxes, wiring troughs, circuit breakers, disconnect switches, emergency fixtures, receptacles, etc.

The shop drawings shall be neatly bound in five (5) sets and submitted to the Architect with a letter of transmittal. The letter of transmittal shall list each item submitted along with the manufacturer's name.

Approval rendered on shop drawings shall not be considered as a guarantee of measurements or building conditions. Where drawings are approved, said approval does not mean that drawings have been checked in detail; said approval does not in any way relieve the Contractor from his responsibility or necessity of furnishing material or performing work as required by the contract drawings and specifications.

**COORDINATION WITH OTHER TRADES:**

Coordinate all work required under this section with work of other sections of the specifications to avoid interference. Bidders are cautioned to check their equipment against space available as indicated on drawings and shall make sure that proposed equipment can be accommodated. If interferences occur, Contractor shall bring them to attention in writing, prior to signing of contract; or, Contractor shall at his own expense provide proper materials, equipment, and labor to correct any damage due to defects in his work caused by such interference.

**INSPECTION AND CERTIFICATES:**

On the completion of the entire installation, the approval of the Architect and Owner shall be secured, covering the installation throughout. The Contractor shall obtain and pay for Certificate of Approval from the public authorities having jurisdiction. A final inspection certificate shall be submitted to the Architect prior to final payment. Any and all costs incurred for fees shall be paid by the Contractor.

**EQUIVALENTS:**

When material or equipment is mentioned by name, it shall form the basis of the Contract. When approved by the Architect in writing, other material and equipment may be used in place of those specified, but written application for such substitutions shall be made to the Architect as described in the Bidding Documents. The difference in cost of substitute material or equipment shall be given when making such request. Approval of substitute is, of course, contingent on same meeting specified requirements and being of such design and dimensions as to comply with space requirements.

**EXCAVATING AND BACKFILLING FOR ELECTRICAL WORK:** Refer to Sections 02202 & 02220.

**CUTTING AND PATCHING:**

On new work, the Electrical Contractor shall furnish sketches to the General Contractor showing the locations and sizes of all openings and chases, and furnish and locate all sleeves and inserts required for the installation of the electrical work before the walls, floors, and roof are built. The Electrical Contractor shall be responsible for the cost of cutting and patching where any electrical items were not installed or where incorrectly sized or located. The Contractor shall do all drilling required for the installation of his hangers. See also Section 01050.

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**CONDUIT SYSTEM:**

Furnish and install all conduits, or other raceways, fittings, boxes, and other component parts specified or required for completion and proper operation of the power distribution, fire alarm, data, security and other low voltage systems shown on the drawings. See also Fire Alarm, IC and Security drawings and coordinate closely with all of the Low Voltage System Sub-Contractors for their requirements during construction. All Fire Alarm conduit with associated junction boxes and covers shall be red in color.

Other than as noted above, conduit shall be sized in accordance with the current NEC. All conduit shall be neatly installed parallel to, or at right angles to beams, walls and floors of the building in a neat and workmanlike manner. All bends shall be made with standard conduit elbows or conduit bent to not less than the same radius as that of a standard conduit elbow. Conduits shall be supported at intervals not greater than 8' and within 3' of any bend, cabinet, outlet or junction box. Conduits shall be supported by approved pipe straps or clamps, secured by means of toggle bolts on hollow masonry, expansion shields and machine screws or standard pre-set inserts on concrete or solid masonry, machine screws or bolts on metal surfaces, and wood screws on wood construction.

Conduit 3/4" (minimum) and larger shall be electrical metallic tubing (EMT). EMT shall be cold-rolled steel tubing with a coating on the outside and protected on the inside by a zinc, enamel, or equivalent corrosion-resistant coating and conforming to the requirements of ANSI C 80.3-1966 or later edition. EMT may be installed in dry construction in furred spaces, in partitions other than concrete and solid plaster, or for exposed work except on mechanical structures or supports, or in refrigerated areas. EMT shall not be installed where: it will be subject to physical damage; where it will be installed nearer than 4' from finished floor in exposed areas; where it will be subject to severe corrosive influence; where the trade size is larger than 2"; where it will be installed in masonry walls; or where tubing, elbows, couplings, and fittings would be in concrete or in direct contact with the earth. Electric metallic tubing fittings shall be all plated steel hexagonal threaded compression type, with insulated throats. No pot metal, set screw, or indenter fittings shall be used. PVC conduit shall be used in masonry wall construction. Contractor shall transition to EMT or rigid conduit at the top of masonry walls. PVC conduit shall not be used in stud walls.

Connections to lighting fixtures will be permitted with flexible steel conduit strapped every 6'-0", with UL listed AC type cables, used in strict accordance with current NEC Article 333. Armored Cable assembly shall encase conductors in a continuous length of galvanized cold rolled steel strip, spirally wound with adjacent strips locked to turn all edges inward. The ends shall be terminated with fiber bushings to protect conductors from sharp edges. Fittings shall be the insulated throat type, T & B 3100 series or equivalent.

All underground conduit shall be UL Listed Schedule 40 PVC conforming to Article 347 of the current NEC, or rigid galvanized steel. At the Contractor's option, this installation may consist of rigid steel conduit with PVC coating, minimum of 15 mils of PVC. Where schedule 40 PVC is installed under floor slabs, the elbows required to turn the raceway up into cabinets, equipment, etc., shall be of rigid steel. A copper ground wire shall be installed in all PVC conduits. PVC conduit shall not be used above the floor slab, unless roughed-in masonry.

All exposed conduit to 5'- 0" above finish floor shall be rigid galvanized steel or IMC conduit. Liquid-tight flexible steel conduit with an extruded PVC jacket shall be used for connections to exterior motors and compressors. Liquid-tight flexible conduit fittings shall be insulated throat type, Appleton STB type or equal.

All permanent conduit stub-outs shall be sealed with galvanized standard water pipe caps immediately after installation. All conduits crossing expansion joints shall have approved type expansion fittings as manufactured by Crouse Hinds, Killark or Appleton. Fittings shall be of type to ensure ground continuity. Provide a 240 lb. tensile strength poly pull-wire in all empty conduits.

**SURFACE MOUNTED RACEWAY:**

Two piece metal surface mounted raceway shall be used in all cases where it is not possible or desirable to run conduit concealed in the wall unless specifically noted otherwise on the plans. Provide Wiremold 3000 Series or equal. Provide large divided two channel raceway (4000 Series) in locations where power and low voltage wiring are to be routed in the same raceway.

**CABLE TRAY:**

Cable trays shall be aluminum ladder style trays suspended from structural elements above. Locate in the platforms, IDF, MDF and other areas as indicated on plans. Changes in direction shall be accomplished by utilizing standard radiused 90 degree and 45 degree fittings from the same manufacturer. Ladder tray system shall be 18" wide minimum. Provide B-line or equal by Monosystems or TRG.

**OUTLETS AND PULL BOXES:**

All boxes shall be UL labeled or listed by an approved agency. At each location where required, an outlet box of a type to suit the intended use shall be installed. Boxes shall be fastened to building structure in an approved manner. Flush outlet, junction and pull boxes shall be pressed galvanized or sheradized steel, either square or octagonal with knockouts on tops and sides, and fitted with plaster covers where necessary to set flush with the finished surface. For use in hollow-core masonry walls, switch boxes shall be of sufficient depth to permit conduit to rise in the core with minimum cutting of block. Provide plaster rings or box extensions for flush devices with finish surface. Boxes for unplastered masonry walls shall be masonry type with device mounting ears on the interior of the box.

Convenience outlet boxes shall be generally mounted approximately 18" above floor, 48" above floor in mechanical equipment rooms and shop type areas, and 4" above counter backsplash, unless otherwise noted. Convenience outlets for drinking fountains shall be installed behind fountain enclosure so as not to be visible; coordinate with Plumbing Contractor.

Lighting switch outlet boxes shall be 4' above floor, unless noted or required otherwise. Where switches occur in 4' high tile walls, they shall be lowered by 6 inches.

Pull boxes shall be used as required in long runs of conduit to facilitate pulling of wires. All interior pull boxes shall be constructed of code gauge galvanized sheet metal, and not less than the minimum size recommended by the NEC. Boxes shall be furnished with screw-fastened covers. When several feeders pass through a common pull box they shall be tagged to indicate clearly their electrical characteristics, circuit number, and panel designation. Wire markers shall be as manufactured by W. H. Brady Co., or equal. In no case shall a pull box be installed in an inaccessible location. Boxes shall be provided with fixed or removable steel barriers for each circuit where two or more feeders pass through the box. In case of banked conduit runs consisting of more than two horizontal rows of conduits, where barriers would be impracticable, the cables for each conduit shall be tied together with heavy waxed twine and wrapped with one wrap of heavy grade tape.

Where two or more outlets are to be installed in one location, they shall be installed in gang boxes suitable for the intended purpose.

Outlet boxes for outdoor use, and for exposed use where not covered by fixture canopies, shall be cast metal suitable for the intended purpose, having integral threaded hubs, and of the weatherproof type with gasket. Provide special outlet boxes where indicated.

All junction boxes shall be marked with panel and circuit number which it contains.

*END OF SECTION*



**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**CONDUCTORS FOR 600 VOLTS OR LESS:**

All conductors shall be copper with a minimum conductivity of 98% and shall be delivered to the job site in their original packages, marked or tagged as follows : UL label , size, type, and insulation of the wire; name of manufacturer and trade name of the conductor: and date of manufacture. All conductors shall be insulated for 600 volts unless otherwise indicated. Furnish and install all conductors specified or required for completion and proper operation of the various systems shown on the drawings.

Conductors shall be 600 volt type THW or THWN. Branch circuit conductor shall not be smaller than No. 12 AWG, except where specifically noted otherwise. Home runs originating more than 80' at 120 volts from panel location shall be No. 10 AWG minimum size. Wires No. 10 AWG and smaller shall be solid; wires No. 8 AWG and larger shall be stranded. Where branch circuits are fed through fluorescent fixture channels, use code grade type THHN or XHHW. All MC cables where permitted shall include a separate copper ground conductor sized per phase conductors.

Provisions of Section 210-5, Color Code, NEC, shall be strictly complied with. Color coding shall include feeders and mains and be consistent throughout entire system. For 120/208 volt systems, use black, red, and blue for phases A, B, & C respectively. For 277/480 volt systems, use brown, orange, and yellow for phases A, B, & C respectively.

All conductors in vertical raceways shall be properly supported at intervals not greater than those specified in Section 300-19 of NEC.

All wire and cable except as specifically stated otherwise, shall be of one of the following makes: Anaconda Wire and Cable Co., General Cable Corp., General Electric Co., or Okonite Co.

**LOW VOLTAGE DATA & TWISTED PAIR CABLES:**

Data – See Division 17 Specifications for data cable requirements.

Twisted Pair (Shielded or Unshielded) – Conductors shall be insulated copper. Coordinate requirements for type, size and quantity of conductors in the shielded or unshielded cables with the equipment being served by the twisted cables (Fire Alarm Equipment/Devices, Intercom Devices, Speakers, Amps, phones, etc.).

Any low voltage cable that is not installed in a conduit or raceway shall be run concealed above ceilings or in the mechanical platforms. They must be properly supported with j-hooks or cable management devices that clip onto ACT support wires that are specifically designed for the purpose of supporting the cables. Zip ties are NOT acceptable as a method of securing/supporting cables. Zip ties may be used to bundle cables for easier management and neatness of installation.

**JOINTS AND CONNECTIONS:**

The Engineer reserves the right to inspect any and all joints made in wiring. If they are taped prior to being inspected, the tape shall be removed as ordered from any joint or joints for inspection. After inspection and correction of any fault found, the Contractor shall properly retape the joints.

Conductors shall be continuous without joints or splices in runs between outlet boxes. All splices shall be made at boxes only. Where stranded conductors are to be connected to any apparatus, bus work, switches or fuse blocks, they shall be connected by suitable mechanical solderless type lugs or spades. All lugs shall be

permanently bolted in such position as to give maximum contact surface available. Where multiple circuits are run from same switch or panel, individual lugs for each conductor shall be used. Feeder taps in junction boxes or panel gutter shall be made with insulated cover panel gutters. Feeder conductors shall not be spliced, feeder conductors shall be continuous for the length of run.

Solid conductors, namely those sized #10 and #12 AWG copper, shall be spliced by using Ideal "wire-nuts", 3M Co. "Scotchlok", or T & B "Piggy" connectors for branch circuit splices in junction boxes and light fixtures, except recessed fixtures as noted above. "Sta-Kon" or other other permanent type crimp connectors shall not be used.

Stranded conductors, namely #8 AWG copper and larger, shall be spliced by approved mechanical connectors plus gum tape, plus friction or plastic tape. Solderless mechanical connectors, for splices and taps, provided with UL approved insulating covers, may be used instead of mechanical connectors plus tape.

#### DEVICE PLATES:

A device plate shall be provided for each outlet to suit the device installed. All plates shall be no. 302 stainless steel construction. All plates shall be "jumbo" size.

Device plates shall be of the one piece type, of suitable shape for the devices to be covered. The use of sectional device plates will not be permitted. Plates having a .375" bushed hole in the center shall be installed on all wall mounted outlets for telephones.

Devices and/or plates installed prior to painting shall be properly taped and shall be cleaned after painting, if necessary. Blank plates shall be installed on all unused outlets.

Plates shall be manufactured by Pass & Seymour, Bryant, or Hubbell. Provide sample of plates to Architect for approval.

#### RECEPTACLES:

Duplex convenience outlets for general use shall be rated 20 amperes, 125 volts, duplex, for standard parallel blade three-wire grounded type caps, Hubbell No. 5362-I (ivory), Leviton, Pass & Seymour or Arrow-Hart or approved equal. Color to be selected by Architect. Where outlets are installed vertically, ground plug position shall be on top and on right side where outlets are installed horizontally.

#### SPECIAL USE RECEPTACLES:

Provide special receptacles including receptacles with ground fault circuit interrupter protection, where needed, as required by equipment. Provide MOV-based transient voltage surge suppression devices (SS), where shown on plan. Tamper-resistant receptacles (TP) shall prevent insertion of objects other than a properly rated 2 or 3 wire plug using "floating" shutters. Equal devices by Hubbell, Leviton, Pass & Seymour or Arrow-Hart are considered acceptable.

#### WALL SWITCHES:

Wall switches shall be installed as shown on the drawings and shall be connected to provide control of the outlets indicated. Switches shall be rated at 20 amperes for 120 volts or 277 volts lighting circuits. Hubbell No. 1221 (or 1221-1), for single pole; Hubbell Catalog No. 1223 (or 1223-1) for 3-way; Hubbell Catalog No. 1224 (or 1224-1) for 4-way. Weather-proof switches shall be Hubbell No. 1781 single pole or Hubbell No. 1783 3-way. Provide sample of switches to Engineer for approval. Color of switches to be selected by Architect.

Automatic light switches shall have passive infra-red occupancy switch with light sensor to prevent light from switching on when daylight is above pre-set level. Switch shall be UL listed, have adjustable time delay of 30

seconds to 30 minutes, auto/off control, and minimum coverage of 900 square feet, Automatic light switch shall be UNENCO model no. D-IS.

Provide special purpose switches where noted on the drawings, or elsewhere. Equal devices by Pass & Seymour or Arrow-Hart are considered acceptable.

For wall switches indicated as dimmers on LED lighting, coordinate the exact 0-10 volt dimmer that is compatible with LED driver at 277V for the specific fixtures provided. Install the correct size wall box to accommodate the specific dimmer to be installed.

*END OF SECTION*

**SERVICE EQUIPMENT AND POWER DISTRIBUTION:**

Furnish, install and completely connect the circuit breaker type service, panelboard and distribution equipment as indicated. All construction shall meet applicable standards of ANSI, IEEE, and NEMA, and all equipment shall bear UL label insofar as it is available. Equipment shall be Square D QED, I-Line or QMB; equipment manufactured by Cutler-Hammer (Eaton) , General Electric, or ITE Siemens will be considered equal.

Provide a copper bus interior with an insulated neutral in the Main Distribution Panel. This neutral bus shall be the source for all insulated neutral conductors of the system. Jumpers shall be installed to connect the insulated neutral bus to the uninsulated grounding bus. The uninsulated grounding bus shall be the source of grounds for all grounding and bonding (not neutrals) of equipment. Equipment UL listed for use as a Service Entrance shall have the Neutral and Ground bars bonded together per Current NEC requirements.

Electrical contractor is responsible for providing all transformer and equipment data to gear supplier as necessary for the supplier to evaluate and coordinate any circuit breaker settings to ensure that downstream breakers trip prior to any upstream breakers.

**LIGHTING AND POWER PANELBOARDS:**

Panelboards shall be of the thermal-magnetic circuit-breaker type and shall consist of an assembly of single, double, and triple-pole breakers. Each circuit-breaker shall be bolted-in, removable without disturbing the adjacent units and shall have trip ratings as indicated. All multipole breakers shall be common trip. Ground fault circuit breakers shall be used as indicated on the drawings.

Each panelboard shall be installed in an appropriate cabinet of sufficient size with top 6'- 0" above finish floor and shall conform to the requirements of UL standard for cabinets and boxes. Standard cabinets with surface or flush type trim and door shall be used, as required. Cabinets shall have a minimum width of 20" unless noted otherwise. A neutral bar shall be provided in each panel with a terminal for each breaker. Grounding lugs shall be provided.

Cabinet shall be made of spot welded galvanized sheet steel not less than N.E.C. gauge with hinged door and trim of the same material. When closed, the door shall fit accurately in the opening provided and present a flush finish with the trim. The door shall be equipped with a key operated lock. Furnish one key with each lock. All door locks shall be keyed alike. Knockouts in cabinets are not acceptable. Cabinets shall be finished with manufacturer's standard painted finish.

On the inside of each door, a typewritten directory identifying each circuit shall be mounted in a suitable protective enclosure. Panelboards shall have laminated plastic designations on inside corresponding to feeder and drawing identifications.

Panelboards shall be Square D I-Line or NQOD Series or equal by Cutler-Hammer, General Electric, or Siemens.

**SHUNT TRIP PROTECTION:**

All electrical equipment located under a kitchen hood with a fire suppression system shall be protected by a shunt trip device that is interlocked with the suppression system. Upon activation of the suppression system the shunt device shall trip and disconnect power for the equipment under the hood. This may be done via individual shunt trip breakers or a single main breaker that is shunted upon activation of the suppression system. If a main shunt breaker is utilized no circuits should be fed from the respective distribution panel other than the circuits for the equipment under the hood. Elevator feeder circuits shall also be protected by a shut trip device if the elevator shaft and/or the elevator equipment room are protected by a fire suppression system. Coordinate with the General Contractor for final plans from the Sprinkler Design-Build Contractor.

**SURGE PROTECTION:**

Furnish and install transient voltage surge suppressor (TVSS) units where indicated on the drawing risers as 'SP' to protect AC electrical circuits from the detrimental effects of lightning, utility switching transients, AC motor transients, and other internal generated transients. TVSS shall comply with UL 1449, have a Category C pulse life for all protection modes (L-N, L-G or L-L where applicable), shall operate bio-directionally, and shall have a maximum single pulse current capacity of 50 KA per mode in accordance with NEMA LS1-1992. Acceptable manufacturers include Leibert, Current Technology, LEA, and United Power. Provide complete shop drawing submittal including installation instructions, dimensional drawings, clamp voltage data, and 3rd party data confirming single pulse current capacity rating. Provide on-site manufacturer's testing and start-up.

**SAFETY DISCONNECT SWITCHES:**

Disconnect switches shall be horsepower rated, installed where indicated and / or required by the NEC. Switches, except where shown as beined by other sections shall be furnished under this Section. Switches shall be heavy duty, fused unless otherwise noted, sized as shown, quick-make, quick-break, NEMA type "ND" with NEMA 1 enclosure, type HD, Square D. Switches to be installed outdoors shall be NEMA type 3R, with raintight conduit hubs. All switches shall be capable of being locked in the "off" position. Fuses shall be one-time, non-renewable types, dual-element, time-delay, Bussman or equal as required for application.

**MOTOR STARTERS:**

Motor controllers shall, unless otherwise specifically noted, be combination magnetic type, with thermal overload relays and heaters in each phase conductor, with operating coils for 120 volts as noted on the drawings or as required. Maximum trip rating of starters for hermetic motors shall be at least 105% of the nameplate full load current of the motor.

Starters shall be provided with build-in selector switches (H-O-A) or pushbutton stations where required. Combination starters shall be provided with sufficient auxiliary contacts or control relays for control sequence as specified, indicated or as required, and with sufficient auxiliary contacts on its circuit breaker or with control relays so that opening the circuit breaker ahead of the starter unit opens all hot control lines within the starters. All starters furnished under this Section shall be mounted in individual NEMA I enclosures, unless otherwise specified or indicated on drawings. Special requirements are specified in the separate Sections of this Division or indicated on the drawings.

**LIGHTING CONTACTORS:**

Each lighting contactor shall have heavy-duty ballast load rated contacts. Each contactor shall have mechanically held contacts, and silver cadmium oxide double break contacts. Contacts shall be field convertible with normally open and normally closed indicators. Each contactor shall be UL listed and CSA certified. All new lighting contactors for each new building shall be housed in a properly sized NEMA-1 enclosure with fully hinged and lockable door.

**FIRE ALARM & HVAC CONTROLS:**

Electrical contractor is responsible for all conduit and wiring required to power any fire alarm control or booster panels, magnetic door holders, and the HVAC Building Automation Controls system cabinets. There shall be at least (2) Fire Alarm and (2) HVAC control system circuits per wing of the school. Coordinate exact location and quantity of cabinets with Fire Alarm and Mechanical's Controls Sub-Contractor. Termination to Fire Alarm and HVAC controllers and to HVAC equipment shall be by controls contractor. Electrician shall use 1P-20A circuits designated as Fire Alarm or HVAC Controls on panel schedules or the closest available spare 1P-20A (120V) breakers for powering the controls system. Notify Engineer if circuits were not indicated and update panel directories on Record Drawings.

**ELECTRONIC DOOR ACCESS CONTROL HARDWARE:**

Electrical contractor is responsible for all conduit and wiring required to power any and all electronic door access control hardware that is part of the Door Access Control system. Electrical contractor shall coordinate the exact quantities and locations of the Electronic Door Access Control equipment with the Door Hardware Schedules located in the Architectural Drawings and with the Door Access Control section of the Door Hardware specification. Electrical Contractor shall use 1P-20A circuits designated as Door Access Controls on electrical panel schedules or the closest available 1P-20A (120V) breakers for powering the Door Access Control equipment. Notify Engineer if circuits were not indicated and update panel directories on Record Drawings.

**GROUNDING:**

Provide a bare stranded continuous copper grounded conductor, size as indicated, from the service equipment grounding bus to the cold-water service main where it enters the building ahead of main valve on water pipe main. Also, provide a driven ground per NEC 250-81 (a). Provide all necessary grounding clamps and full-size jumpers around all valves, meters, and similar fittings between point of connection and street main. The main grounding conductor shall be connected to the neutral conductor at one location only, within and on the low voltage side of the main transformer and more specifically the equipment grounding bus associated with the main insulated neutral bus in the MDP. The insulated neutral bus must be insulated and serve to provide the neutral source for all the insulated neutral conductors of the system. Jumpers shall be installed to connect the insulated neutral bus to the uninsulated grounding bus and all grounding and bonding of equipment (not neutrals) shall be attached to the uninsulated grounding bus.

System and equipment grounds shall be checked for proper value of resistance using the Megger ground tester in accordance with the method prescribed by the manufacturer of the instruments. Resistance of ground shall not be in excess of 25 ohms, measured to include the grounding cable. The Contractor shall report the results of these tests to the Engineer in writing. If the resistance cannot be reduced to the value prescribed above, further instructions will be given the Contractor.

All equipment connected under this section shall be grounded and shall conform with the more stringent requirements of the NEC, National Electrical Safety Code, the N. C. State Building Code, or this specification.

Panels, junction boxes, safety switches, disconnect switches, contactors, starters, motors, dry transformers, bus duct and other equipment shall be bonded to the conduit system with a grounding conductor by means of grounding locknuts and bushings as required hereinafter, except where conduit terminates in threaded hub or fittings. All joints or terminations shall be made with standard tapered pipe threads drawn tight to preserve electrical continuity.

Provide grounding bushings and copper jumpers across all concentric or eccentric knockouts and on all conduits larger than 1". Elsewhere, double-lock-nuts with plastic or fiber bushings, or a single lock-nut and malleable bushing may be used. If Contractor selects to use a single locknut and malleable bushing, care shall be taken that the full number of threads project through to permit the bushing to pull tight against the ends of the conduit, after which the lock-nut shall be made up sufficiently tight to draw the bushing into firm electrical contact with the box.

Where flexible conduits are used, provide grounding conductor within flexible conduit to ensure continuity of ground. Minimum size of jumper around flex shall be No. 10.

**EQUIPMENT IDENTIFICATION:**

Provide black-on-white laminated plastic name plates for each switch or circuit breaker on service equipment, disconnect switches, terminal cabinets, panelboards and wiring troughs. The name plate shall be engraved to indicate the equipment controlled or identified. Name plates shall be securely fastened to equipment using two screws.

**CONNECTIONS TO EQUIPMENT:**

Electrical Contractor shall provide rough-in, junction box, or wiring trough as indicated. Electrical Contractor shall provide and install disconnect switches and motor starters for equipment provided under Division 16. All external disconnect switches, motor starters, and any fuses required for equipment furnished under Division 15 shall be provided by the Div 15 contractor and installed by the Electrical Contractor. Coordinate all equipment locations with all other contractors prior to installation of electrical equipment. Consult all Contract drawings which may affect location of equipment or apparatus furnished by others and make any minor adjustments as required. Electrical Contractor is responsible for all line side and load side wiring for all equipment requiring electrical power. Line side wiring is defined as the wiring from the distribution panel circuit to the point of disconnect (internal or external) for the equipment, whether provided by the contractor or factory installed by the equipment manufacturer. Load side wiring is defined as the wiring from the point of disconnect to all equipment requiring electrical power. All final electrical terminations to the piece of equipment shall be done by the contractor providing the equipment.

Electrical Contractor must closely coordinate with the equipment supplier regarding Voltage, H. P., F. L. A., outlet mounting heights, connection cord plug-receptacle electrode configurations and other special wiring requirements.

Electrical Contractor is responsible for coordinating quantity and location of all sprinkler system devices with sprinkler contractor.

Electrical Contractor shall review the Architectural, Civil, Plumbing, Mechanical, Fire Alarm and IC plans to provide branch circuits and final connections to powered equipment furnished by others for complete and operational equipment. This is a sample list and may not represent all connections required:

- 1) MDF & IDF equipment racks
- 2) Data Equipment Racks not in MDF or IDF rooms.
- 3) HVAC Controls Equipment
- 4) Heat trace for freeze protection (See Mechanical Plans)
- 5) Controlled Access electrified security doors (See Door Hardware Schedule)
- 6) Sprinkler controls/panels
- 7) Projectors and associated screens
- 8) Hand Dryers (See Architectural plans and elevations)
- 9) Electric Water Heaters & Associated Recirculation Pumps (Refer to Plumbing Plans)
- 10) Dishwashers (Kitchen and/or Science Prep)
- 11) Clothes Washers and Dryers
- 12) Art Room Kilns and associated fans
- 13) Fire Pumps (Main and Jockey)
- 14) Fire Alarm Control Panels and Booster Panels (See FA Contractor Shop Drawings)
- 15) Fire Shutters (See Architectural Plans & Specifications)
- 16) Overhead Doors
- 17) Motorized Basketball Goals and/or Gym Divider Curtains
- 18) Scoreboards and Shot Clocks
- 19) Motorized Bleachers
- 20) PA Systems and associated amplifiers (Gym, Café, Auditoriums and MP Rooms)
- 21) Powered Hotboxes (See Civil Site Plan for exact locations)

*END OF SECTION*

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**LIGHTING FIXTURES:**

Furnish and install all lighting fixtures as indicated on the drawings. Fixtures shall be complete with lens or reflector, lamps, and wired ready for operation at the completion of installation. All fixtures shall have UL approval under their latest rulings indicating that fixture is approved for the intended usage. This Contractor shall provide proper fixture frames to suit type and dimensions of ceilings, confirming ceiling data with Plans, Architectural RCP, and General Contractor prior to ordering fixtures.

All fixtures shall be self-supporting, independent of the suspended ceiling. Fixtures shall be secured to the structure at a minimum of two points at opposing ends by wire equal to gauge of wire suspending the ceiling. Where fixture channels are joined to form a continuous length, provide one hanger at each end of the run and at each joint. Damaged fixtures shall be replaced at Contractor's expense. All fixtures shall be wired with a "Luminaire Cable" that contains the 0-10v dimming conductors.

**ELECTRONIC DRIVERS/BALLASTS:**

LED ballasts shall be high efficiency factor electronic ballasts where indicated on schedule, designed for rapid start operation for LED lamps. 70% LED lumen maintenance at 60,000 hours (L70/60,000). 0-10V dimming driver, dims to 10% and contains non-isolated dimming leads. Electronic ballast shall have a frequency of operation of 20 KHZ or greater and operate without visible flicker. Driver/Ballast shall be UL listed Class P, CSA certified, sound rated "A", withstand line transients as defined in ANSE/IEEE C62-41 Category A, and meet FCC requirements of Rules and Regulations, Part 18 for non-consumer equipment. Electronic ballast casing temperature shall not exceed a 25°C rise over 40°C ambient temperature or not exceed 85°C total. Electronic ballasts shall be by Advance Transformer Co., model Mark V or approved equal by Motorola or Magnetek.

**LAMPS:**

All lamps shall be as manufactured by Sylvania, Phillips, or General Electric Co.. Incandescent lamps shall be inside frosted 130V extended service unless otherwise noted. The Contractor shall be responsible for replacing all lamps which burn out during warranty period starting after Owner accepts project.

Unless indicated otherwise on drawings, LED and/or fluorescent lamps shall have energy saving drivers/ballasts, and a 4000 K color temperature with a color rendering index of 80 or better.

High pressure sodium lamps shall be GE "Lucalox" series or equal with median value of rated life no less than 24,000 hours.

**EMERGENCY LIGHTING:**

Furnish and install specified battery-powered emergency lighting units where indicated on the plans. Emergency lighting unit shall comply with the State of North Carolina Department of Insurance Document entitled "Requirements for Battery Powered Emergency Lighting Units" all subsequent addenda. Fixture shall have test light and switch accessible and visible from floor.

**EXIT LIGHTING:**

Furnish and install LED emergency exit sign with battery backup, brown-out protection, pilot light, test switch, and regulated power supply, where indicated on the plans unless specified otherwise. Exit signs shall comply



with the State of North Carolina Department of Insurance Document entitled "Requirements for Electrically Powered Exit Signs" dated 20 March 1995 and all subsequent addenda.

**EXIT & EMERGENCY LIGHTING CONTROLS:**

Contractor shall make provisions for Building Automation System (BAS) under Division 15 to exercise batteries on 21 to 28 day cycles. Coordinate with MC during rough-in as required with junction box for low voltage input to contactor.

**LIGHTING CONTACTORS:**

Each lighting contactor shall have heavy-duty ballast load rated contacts. Each contactor shall be normally closed contacts with mechanically held operators for open position, and silver cadmium oxide double break contacts. Contacts shall be field convertible with normally open and normally closed indicators. Each contactor shall be UL listed and CSA certified. All new lighting contactors for each new building shall be housed in a properly sized NEMA-1 enclosure with fully hinged and lockable door.

**OUTDOOR LIGHTING CONTROLS:**

For outdoor lighting applications, furnish and install contactors rated for load and photocells. Contractor shall make provisions for Building Automation System (BAS) or energy management control. Coordinate with MC during rough-in as required with junction box for low voltage input to contactor.

Photocells where indicated on drawing, shall be mounted in weather-proof enclosure under eastern facing eaves/overhangs with turn-on / off operations at 3-5 fc. Photocell shall be intermatic type K4221, for 120V and K4233 for 277V applications. Acceptable manufacturers are Tork, Intermatic, or Paragon. Photo cells shall not control luminaires directly all luminaires shall be controlled through a lighting contactor. Coordinate photocell specified with contactor coil rating.

*END OF SECTION*

**PART 1.0 - GENERAL**

1.1 DESCRIPTION:

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Division 16 Basic Electrical Materials and Methods sections apply to work specified in this section. Fire Alarm System shall comply with N. C. Department of Insurance document entitled "Requirements for Fire Detection and Alarm Systems" dated 25 July 2005 as included within this specification section.
- C. This section of the specification includes the furnishing, installation, connection and testing of the microprocessor controlled, intelligent reporting fire alarm equipment required to form a complete, operative, coordinated system. It shall include, but not be limited to, alarm initiating devices, alarm notification appliances, Fire Alarm Control Panel (FACP), auxiliary control devices, annunciators, and wiring as shown on the drawings and specified herein.
- D. The fire alarm system shall comply with requirements of 2005 NFPA Standard 72 except as modified by the North Carolina State Building Code and local codes and ordinances. The system shall be electrically supervised and monitor the integrity of all conductors.
- E. The FACP and peripheral devices shall be manufactured 100% by a single U.S. manufacturer (or division thereof).
- F. The system and its components shall be Underwriters Laboratories, Inc. listed under the appropriate UL testing standard as listed herein for fire alarm applications and the installation shall be in compliance with the UL listing.
- G. The installing company shall employ NICET (minimum Level II Fire Alarm Technology) technicians on site to guide the final check-out and to ensure the systems integrity.

1.2 AUTHORITY HAVING JURISDICTION (AHJ) DEFINED, BUILDING PERMITS:

- A. **For State-owned facilities in North Carolina** the AHJ for Code compliance is the NC Department of Insurance - Office of State Fire Marshal. The AHJ for construction administration and inspection purposes is the entity that contracted for the design services, either the State Construction Office or the owning Agency, as applicable.  
NOTE: Fire alarm system inspection or acceptance testing may be delegated to the design engineer by contract.

No building permit is required for construction or renovation of facilities that are funded by the State of North Carolina and located on State-owned land. However, privately-funded projects on land leased from the State (e.g., student housing) must still be submitted to local building officials for approval, permits, and inspections.. (See below.) Written NCDol approval of the plans and specifications submitted for review is considered the equivalent of a building permit for State projects but that alone does not give authorization to proceed with construction. Such authorization requires written clearance from the entity that administers the contract.

- B. **For private sector or local government projects** the AHJ is the local government entity that approves project plans, issues building permits, and inspects construction.

1.3 SCOPE:

- A. A new intelligent reporting, microprocessor-controlled fire detection system shall be installed in accordance to the project specifications and drawings.
- B. Basic Performance:

1. Alarm, trouble and supervisory signals from all intelligent reporting devices shall be encoded on NFPA Style 7 (Class A) Signaling Line Circuits (SLC).
2. Initiation Device Circuits (IDC) shall be wired Class A (NFPA Style D) as part of an addressable device connected by the SLC Circuit.
3. Notification Appliance Circuits (NAC) shall be wired Class A (NFPA Style Z) as part of an addressable device connected by the SLC Circuit.
4. Digitized electronic signals shall employ check digits or multiple polling.
5. A single ground fault or open circuit on the system Signaling Line Circuit shall not cause system malfunction, loss of operating power or the ability to report an alarm.
6. Alarm signals arriving at the main FACP shall not be lost following a primary power failure (or outage) until the alarm signal is processed and recorded.
7. NAC speaker circuits shall be arranged such that there is a minimum of one speaker circuit per floor of the building or smoke zone which ever is greater.
8. Audio amplifiers and tone generating equipment shall be electrically supervised for normal and abnormal conditions.
9. NAC speaker circuits and control equipment shall be arranged such that loss of any one (1) speaker circuit will not cause the loss of any other speaker circuit in the system.
10. Two-way telephone communication circuits shall be supervised for open and short circuit conditions.

**C. BASIC SYSTEM FUNCTIONAL OPERATION**

When a fire alarm condition is detected and reported by one of the system initiating devices, the following functions shall immediately occur:

1. The system alarm LED on the FACP shall flash.
2. A local piezo electric signal in the control panel shall sound.
3. A backlit 80-character LCD display on the FACP shall indicate all information associated with the fire alarm condition, including the type of alarm point and its location within the protected premises.
4. FACP history storage equipment shall log the information associated each new fire alarm control panel condition, along with time and date of occurrence.
5. All system output programs assigned via control-by-event interlock programming to be activated by the particular point in alarm shall be executed, and the associated system outputs (alarm notification appliances and/or relays) shall be activated.

**D. MONITORING OF SIGNALS BY SUPERVISING STATION:**

1. Each system with automatic fire detection, or which monitors a sprinkler system, shall be equipped with a 4-channel (minimum) Digital Alarm Communicator Transmitter (DACT) for transmission of fire alarm, supervisory, and trouble signals to a Central Station, Remote Supervising Station, or Proprietary Supervising Station. The following signals shall be reported as applicable, in accordance with 3.4.
  - Fire Alarm
  - Burglary / Intrusion / Duress / Other Security or Emergency Alarm (See 3.3)
  - Fire Alarm System AC Power Trouble (only if 120vac interrupted for 8 hours)

EXCEPTION #1: In lieu of a DACT, the use of an addressable network is acceptable. Other appropriate means of transmitting fire alarm system signals off-premises may be permitted to be used, at the discretion of the AHJ who approves the plans.

2. The precedence of signals transmitted to the Supervising Station shall be as follows:
  1. Fire Alarm
  2. Security Alarm
  3. Supervisory Signal
  4. Trouble Signal

Fire Alarm System AC Power Trouble signal must not be sent unless maintained for 8 hours, to avoid nuisance transmissions to the supervising station from short term 120vac power outages (from switching transients, thunderstorms, etc.).

3. The Contractor must provide a type of DACT that is compatible with the owner's alarm receiving equipment, or the Supervising Station selected by the owner, as applicable. He must also program the PROM, connect each DACT to the telephone line(s) provided to him, and verify proper signal receipt by the Supervising Station.

#### 1.4 SUBMITTALS

##### A. General:

1. Two copies of all submittals shall be submitted to the Architect/Engineer for review.
2. All references to manufacturer's model numbers and other pertinent information herein is intended to establish minimum standards of performance, function and quality. Equivalent compatible UL-listed equipment from other manufacturers may be substituted for the specified equipment as long as the minimum standards are met.
3. For equipment other than that specified, the contractor shall supply proof that such substitute equipment equals or exceeds the features, functions, performance, and quality of the specified equipment.

##### B. Shop Drawings:

1. Sufficient information, clearly presented, shall be included to determine compliance with drawings and specifications.
2. Include manufacturer's name(s), model numbers, ratings, power requirements, equipment layout, device arrangement, complete wiring point-to-point diagrams, and conduit layouts.
3. Show annunciator layout, configurations, and terminations.

##### C. Manuals:

1. Submit simultaneously with the shop drawings, complete operating and maintenance manuals listing the manufacturer's name(s), including technical data sheets.
2. Wiring diagrams shall indicate internal wiring for each device and the interconnections between the items of equipment.
3. Provide a clear and concise description of operation that gives, in detail, the information required to properly operate the equipment and system.

##### D. Software Modifications

1. Provide the services of a factory trained and authorized technician to perform all system software modifications, upgrades or changes. Response time of the technician to the site shall not exceed 4 hours.
2. Provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification includes addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software shall place no limit on the type or extent of software modifications on-site. Modification of software shall not require power-down of the system or loss of system fire protection while modifications are being made.

- E. Certifications: Together with the shop drawing submittal, submit a certification from the major equipment manufacturer indicating that the proposed supervisor of the installation and the proposed performer of contract maintenance is an authorized representative of the major equipment manufacturer. Include names and addresses in the certification.

#### 1.5 GUARANTEE:

All work performed and all material and equipment furnished under this contract shall be free from defects and shall remain so for a period of at least one (1) year from the date of acceptance. The full cost of maintenance, labor and materials required to correct any defect during this one year period shall be included in the submittal bid.

**1.6 POST CONTRACT MAINTENANCE:**

- A. Complete maintenance and repair service for the fire alarm system shall be available from a factory trained authorized representative of the manufacturer of the major equipment for a period of five (5) years after expiration of the guaranty.
- B. As part of the bid/proposal, include a quote for a maintenance contract to provide all maintenance, tests, and repairs described below. Include also a quote for unscheduled maintenance/repairs, including hourly rates for technicians trained on this equipment, and response travel costs for each year of the maintenance period. Submittals that do not identify all post contract maintenance costs will not be accepted. Rates and costs shall be valid for the period of five (5) years after expiration of the guaranty.
- C. Maintenance and testing shall be on a semiannual basis or as required by the AHJ. A preventive maintenance schedule shall be provided by the contractor describing the protocol for preventive maintenance. The schedule shall include:
  - 1. Systematic examination, adjustment and cleaning of all detectors, manual fire alarm stations, control panels, power supplies, relays, waterflow switches and all accessories of the fire alarm system.
  - 2. Each circuit in the fire alarm system shall be tested semiannually.
  - 3. Each smoke detector shall be tested in accordance with the requirements of NFPA 72 Chapter 7.

**1.7 POST CONTRACT EXPANSIONS:**

- A. The contractor shall have the ability to provide parts and labor to expand the system specified, if so requested, for a period of five (5) years from the date of acceptance.
- B. As part of the submittal, include a quotation for all parts and material, and all installation and test labor as needed to increase the number of intelligent or addressable devices by ten percent (10%). This quotation shall include intelligent smoke detectors, intelligent heat detectors, addressable manual stations, addressable monitor modules and addressable control modules equal in number to one tenth of the number required to meet this specification (list actual quantity of each type).
- C. The quotation shall include installation, test labor, and labor to reprogram the system for this 10% expansion. If additional FACP hardware is required, include the material and labor necessary to install this hardware.
- D. Do not include cost of conduit or wire or the cost to install conduit or wire except for labor to make final connections at the FACP and at each intelligent addressable device. Do not include the cost of conventional peripherals or the cost of initiating devices or notification appliances connected to the addressable monitor/control modules.
- E. Submittals that do not include this estimate of post contract expansion cost will not be accepted.

**1.8 APPLICABLE STANDARDS AND SPECIFICATIONS:**

The specifications and standards listed below form a part of this specification. The system shall fully comply with the latest issue of these standards, if applicable.

- A. National Fire Protection Association (NFPA) - USA:
  - No. 12 CO2 Extinguishing Systems (low and high)
  - No. 12B Halon 1211 Extinguishing Systems
  - No. 16 Foam/Water Deluge and Spray Systems
  - No. 17 Dry Chemical Extinguishing Systems
  - No. 17A Wet Chemical Extinguishing Systems
  - Clean Agent Extinguishing Systems
  - No. 72-1996 National Fire Alarm Code

- B. Underwriters Laboratories Inc. (UL) - USA:
  - No. 268 Smoke Detectors for Fire Protective Signaling Systems
  - No. 864 Control Units for Fire Protective Signaling Systems
  - No. 268A Smoke Detectors for Duct Applications
  - No. 521 Heat Detectors for Fire Protective Signaling Systems
  - No. 464 Audible Signaling Appliances
  - No. 38 Manually Actuated Signaling Boxes
  - No. 1076 Control Units for Burglar Alarm Proprietary Protective Signaling Systems
  - No. 1971 Visual Notification Appliances
- C. Local and State Building Codes.
- D. All requirements of the Authority Having Jurisdiction (AHJ).

**1.9 APPROVALS:**

- A. The system shall have proper listing and/or approval from the following nationally recognized agencies:
  - UL Underwriters Laboratories Inc
  - FM Factory Mutual
- B. The fire alarm control panel shall meet UL Standard 864 (Control Units) and UL Standard 1076 (Proprietary Burglar Alarm Systems).

**PART 2.0 PRODUCTS**

**2.1 EQUIPMENT AND MATERIAL, GENERAL:**

- A. All equipment and components shall be new, and the manufacturer's current model. The materials, appliances, equipment and devices shall be tested and listed by a nationally recognized approvals agency for use as part of a protective signaling system, meeting the National Fire Alarm Code.
- B. All equipment and components shall be installed in strict compliance with manufacturers' recommendations. Consult the manufacturer's installation manuals for all wiring diagrams, schematics, physical equipment sizes, etc., before beginning system installation.
- C. All equipment shall be attached to walls and ceiling/floor assemblies and shall be held firmly in place (e.g., detectors shall not be supported solely by suspended ceilings). Fasteners and supports shall be adequate to support the required load.

**2.2 CONDUIT AND WIRE:**

- A. Conduit:
  - 1. Conduit shall be in accordance with The National Electrical Code (NEC), local and state requirements. Raceways shall be provided for all concealed installations, rated wall penetrations and exposed installations within the boiler room. Installations within other areas shall be run raceway.
  - 2. Where required, all wiring shall be installed in conduit or raceway. Conduit fill shall not exceed 40 percent of interior cross-sectional area where three or more cables are contained within a single conduit.
  - 3. Cable must be separated from any open conductors of power, or Class 1 circuits, and shall not be placed in any conduit, junction box or raceway containing these conductors, per NEC Article 760-29.
  - 4. Wiring for 24-volt DC control, alarm notification, emergency communication and similar power-limited auxiliary functions may be run in the same conduit as initiating and signaling line circuits. All circuits shall be provided with transient suppression devices and the system shall be designed to permit simultaneous operation of all circuits without interference or loss of signals.

5. Conduit shall not enter the fire alarm control panel, or any other remotely mounted control panel equipment or back boxes, except where conduit entry is specified by the FACP manufacturer.
  6. Conduit shall be 3/4-inch (19.1 mm) minimum and RED in color.
- B. Wire:
1. All fire alarm system wiring shall be new.
  2. Wiring shall be in accordance with local, state and national codes (e.g., NEC Article 760) and as recommended by the manufacturer of the fire alarm system. Number and size of conductors shall be as recommended by the fire alarm system manufacturer, but not less than 18 AWG (1.02 mm) for Initiating Device Circuits and Signaling Line Circuits, and 14 AWG (1.63 mm) for Notification Appliance Circuits.
  3. All wire and cable shall be listed and/or approved by a recognized testing agency for use with a protective signaling system.
  4. Wiring used for the multiplex communication circuit (SLC) shall be twisted and shielded and support a minimum wiring distance of 10,000 feet. In certain applications, the system shall support up to SLCs with up to 1,000 feet of untwisted, unshielded wire. The design of the system shall permit use of IDC and NAC wiring in the same conduit with the SLC communication circuit.
  5. All field wiring shall be electrically supervised for open circuit and ground fault.
- C. Terminal Boxes, Junction Boxes and Cabinets: All boxes and cabinets shall be UL listed for their use and purpose.
- D. Initiating circuits shall be arranged to serve like categories (manual, smoke, waterflow). Mixed category circuitry shall not be permitted except on signaling line circuits connected to intelligent reporting devices.
- E. The fire alarm control panel shall be connected to a separate dedicated branch circuit, maximum 20 amperes. This circuit shall be labeled at the main power distribution panel as FIRE ALARM. Fire alarm control panel primary power wiring shall be 12 AWG. The control panel cabinet shall be grounded securely to either a cold-water pipe or grounding rod.

### 2.3 MAIN FIRE ALARM CONTROL PANEL:

- A. The FACP shall contain a microprocessor based Central Processing Unit (CPU). The CPU shall communicate with and control the following types of equipment used to make up the system: intelligent addressable smoke and thermal (heat) detectors, addressable modules, printer, annunciators, and other system-controlled devices. Basis of Design shall be Notifier. Equivalent products by Gamewell, Potter and Edwards EST, shall be considered equals. Other manufacturers require approval prior to bid submission.
- B. Operator Control
1. Acknowledge Switch:
    - a. Activation of the control panel acknowledge switch in response to new alarms and/or troubles shall silence the local panel piezo electric signal and change the alarm and trouble LEDs from flashing mode to steady-ON mode. If multiple alarm or trouble conditions exist, depression of this switch shall advance the 80-character LCD display to the next alarm or trouble condition.
    - b. Depression of the Acknowledge switch shall also silence all remote annunciator piezo sounders.
  2. Alarm Silence Switch:

Activation of the alarm silence switch shall cause all programmed alarm notification appliances and relays to return to the normal condition after an alarm condition. The selection of notification circuits and relays that are silenceable by this switch shall be fully field programmable within the confines of all applicable standards. The FACP software shall include silence inhibit and auto-silence timers.
  3. Alarm Activate (Drill) Switch:

The Alarm Activate switch shall activate all notification appliance circuits. The drill function shall latch until the panel is silenced or reset.

4. System Reset Switch:  
Activation of the System Reset switch shall cause all electronically-latched initiating devices, appliances or software zones, as well as all associated output devices and circuits, to return to their normal condition.
  5. Lamp Test:  
The Lamp Test switch shall activate all system LEDs and light each segment of the liquid crystal display.
- C. System Capacity and General Operation
1. The control panel shall provide or be capable of expansion to 396 intelligent/addressable devices.
  2. The control panel shall include Form-C alarm, trouble, supervisory, and security relays rated at a minimum of 3.0 amps @ 30 VDC. It shall also include four Class B (NFPA Style Y) or Class A (NFPA Style Z) programmable Notification Appliance Circuits.
  3. The system shall support up to 8 additional output modules (signal, speaker, telephone, or relay), each with 8 circuits for an additional 64 circuits. These circuits shall be either Class A (NFPA Style D) or Class B (NFPA Style Y) per the project drawings.
  4. The fire alarm control panel shall include a full featured operator interface control and annunciation panel that shall include a backlit Liquid Crystal Display (LCD), individual color-coded system status LEDs, and an alphanumeric keypad for the field programming and control of the fire alarm system.
  5. All programming or editing of the existing program in the system shall be achieved without special equipment and without interrupting the alarm monitoring functions of the fire alarm control panel. The system shall be fully programmable, configurable, and expandable in the field without the need for special tools, PROM programmers or PC based programmers. It shall not require replacement of memory ICs to facilitate programming changes.
  6. The system shall allow the programming of any input to activate any output or group of outputs. Systems which have limited programming (such as general alarm), have complicated programming (such as a diode matrix), or require a laptop personal computer are not considered suitable substitutes.
  7. The FACP shall provide the following features:
    - a. Drift compensation to extend detector accuracy over life. Drift compensation shall also include a smoothing feature, allowing transient noise signals to be filtered out.
    - b. Detector sensitivity test, meeting requirements of NFPA 72, Chapter 7.
    - c. Maintenance alert, with two levels (maintenance alert/maintenance urgent), to warn of excessive smoke detector dirt or dust accumulation.
    - d. Nine sensitivity levels for alarm, selected by detector. The alarm level range shall be 1 to 2.35 percent per foot for photoelectric detectors and 0.5 to 2.5 percent per foot for ionization detectors. The system shall also include up to nine levels of prealarm, selected by detector, to indicate to maintenance personnel of impending alarms.
    - e. The ability to display or print system reports.
    - f. Alarm verification, with counters and a trouble indication to alert maintenance personnel when a detector enters verification 20 times.
    - g. PAS presignal, meeting NFPA 72 requirements.
    - h. Rapid manual station reporting (under 3 seconds).
    - i. Non-alarm points for general (non-fire) control.
    - j. Periodic detector test, conducted automatically by the software.



- k. Self optimizing pre-alarm for advanced fire warning, which allows each detector to learn its particular environment and set its prealarm level to just above normal peaks.
  - l. Cross zoning with the capability of counting: two detectors in alarm, two software zones in alarm, or one smoke detector and one thermal detector.
  - m. Walk test, with a check for two detectors set to same address.
  - n. Control-by-time for non-fire operations, with holiday schedules.
  - o. Day/night automatic adjustment of detector sensitivity.
  - p. UL-1076 security monitor points.
8. The FACP shall be capable of coding notification circuits in march time (120 PPM), temporal (NFPA 72). Main panel notification circuits (NAC 1,2,3 and 4) shall also support special two and three stage operations. The two-stage feature allows 20 Pulses Per Minute (PPM) on alarm and 120 PPM after 5 minutes or when a second device activates. The three-stage option provides 20 PPM with one detector in alarm, 120 PPM with two detectors in alarm, and steady on with release.
- D. Central Microprocessor
- 1. The microprocessor shall be a state-of-the-art, high speed, 16-bit RISC device and it shall communicate with, monitor and control all external interfaces. It shall include an EPROM for system program storage, non-volatile memory for building-specific program storage, and a "watch dog" timer circuit to detect and report microprocessor failure.
  - 2. The microprocessor shall contain and execute all control-by-event programs for specific action to be taken if an alarm condition is detected by the system. Control-by-event equations shall be held in non-volatile programmable memory and shall not be lost even if system primary and secondary power failure occurs.
  - 3. The microprocessor shall also provide a real-time clock for time annotation of system displays, printer, and history file. The time-of-day and date shall not be lost if system primary and secondary power supplies fail. The real time clock may also be used to control non-fire functions at programmed time-of-day, day-of-week, and day-of-year.
  - 4. A special program check function shall be provided to detect common operator errors.
  - 5. An auto-program (self-learn) function shall be provided to quickly install initial functions and make the system operational.
  - 6. For flexibility and to ensure program validity, an optional Windows(TM) based program utility shall be available. This program shall be used to off-line program the system with batch upload/download. This program shall also have a verification utility which scans the program files, identifying possible errors. It shall also have the ability to compare old program files to new ones, identifying differences in the two files to allow complete testing of any system operating changes. This shall be in compliance with the NFPA 72 requirements for testing after system modification.
- E. Display
- 1. The display shall provide all the controls and indicators used by the system operator and may also be used to program all system operational parameters.
  - 2. The display shall include status information and custom alphanumeric labels for all intelligent detectors, addressable modules, internal panel circuits, and software zones.
  - 3. The display shall include an 80-character back-lit alphanumeric Liquid Crystal Display (LCD). It shall also provide 8 Light-Emitting-Diodes (LEDs), that indicate the status of the following system parameters: AC POWER, FIRE ALARM, PREALARM WARNING, SECURITY ALARM, SUPERVISORY SIGNAL, SYSTEM TROUBLE, DISABLED POINTS, and ALARM SILENCED.
  - 4. The display keypad shall be an easy-to-use QWERTY type keypad, similar to a PC keyboard. This shall be part of the standard system and have the capability to command all system functions, entry of any alphabetic or numeric information, and

- field programming. Two different password levels shall be provided to prevent unauthorized system control or programming.
5. The display shall include the following operator control switches: ACKNOWLEDGE, ALARM SILENCE, ALARM ACTIVATE (drill), SYSTEM RESET, and LAMP TEST.
  6. The system shall support an optional battery ammeter/voltmeter display.
- F. Signaling Line Circuits (SLC)
1. The system shall include two SLCs. Each SLC interface shall provide power to and communicate with up to 99 intelligent detectors (ionization, photoelectric or thermal) and 99 intelligent modules (monitor or control) for a system capacity of 396 devices. Each SLC shall be capable of NFPA 72 Style 4, Style 6, or Style 7 (Class A or B) wiring.
  2. The Loop Interface Board (LIB) shall receive analog information from all intelligent detectors to be processed to determine whether normal, alarm, prealarm, or trouble conditions exist for each detector. The software shall automatically maintain the detector's desired sensitivity level by adjusting for the effects of environmental factors, including the accumulation of dust in each detector. The analog information shall also be used for automatic detector testing and for the automatic determination of detector maintenance requirements.
  3. The detector software shall meet NFPA 72, Chapter 7 requirements and be certified by UL as a calibrated sensitivity test instrument.
  4. The detector software shall allow manual or automatic sensitivity adjustment.
- G. Serial Interfaces
1. The system shall include two serial EIA-232 interfaces. Each interface shall be a means of connecting UL Listed Electronic Data Processing (EDP) peripherals.
  2. One EIA-232 interface shall be used to connect an UL-Listed 40 or 80 column printer. Printers which are not UL-Listed are not considered acceptable substitutes.
  3. The system shall include an EIA-485 port for the serial connection of optional annunciators and remote LCD displays.
  4. The EIA-485 interface may be used for network connection to a proprietary receiving unit.
- H. Notification Appliance Circuit (NAC) Module
1. The Notification Appliance Circuit module shall provide four fully supervised Class A or B (NFPA Style Z or Y) notification circuits. An expansion circuit board shall allow expansion to eight circuits per module.
  2. The notification circuit capacity shall be 3.0 amperes maximum per circuit and 6.0 amperes maximum per module.
  3. The module shall not affect other module circuits in any way during a short circuit condition.
  4. The module shall provide eight green ON/OFF LEDs and eight yellow TROUBLE LEDs.
  5. The module shall also provide a momentary switch per circuit that may be used to manually turn the particular circuit on or off or to disable the circuit.
  6. Each notification circuit shall include a custom label inserted to identify each circuit's location. Labels shall be created using a standard typewriter or wordprocessor.
  7. The notification circuit module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal strips shall be UL listed for use with up to 12 AWG wire.
  8. Each circuit shall be capable of, through system programming, deactivating upon depression of the signal silence switch.
  9. Alarm notification appliance (NAC) circuits shall be NFPA 72 Style Y (Class B). The load connected to each circuit must not exceed 80% of rated module output and the coverage of each circuit shall not exceed 3 floors (to limit the effect of faults, and to facilitate troubleshooting). The NAC voltage drop during alarm must not exceed **14%** of the voltage measured across the batteries at that time. To achieve this, the design must consider wire size, length of circuit, device load, inherent voltage loss within the

FACU's power supply, etc. The contractor shall use power outage testing to verify that the NAC circuit was designed and installed properly.

- I. Control Relay Module
  1. The control relay module shall provide four Form-C auxiliary relay circuits rated at 5 amperes, 28 VDC. An expansion circuit board shall allow expansion to eight Form-C relays per module.
  2. Each relay circuit shall be capable of being activated (change in state) by any initiating device or from any combination of initiating devices.
  3. The expansion module shall provide 8 green ON/OFF LEDs and 8 yellow LEDs (indicates disabled status of the relay).
  4. The module shall provide a momentary switch per relay circuit that may be used to manually turn the relay ON/OFF or to disable the relay.
  5. Each relay circuit shall include a custom label inserted to identify its location. Labels shall be created using a standard typewriter or word processor.
  6. The control relay module shall be provided with removable wiring terminal blocks for ease of installation and service. The terminal blocks shall be UL listed for use with up to 12 AWG wire.
- L. Enclosures:
  1. The control panel shall be housed in a UL-listed cabinet suitable for surface or semi-flush mounting. The cabinet and front shall be corrosion protected, given a rust-resistant prime coat, and manufacturer's standard finish.
  2. The back box and door shall be constructed of 0.060 steel with provisions for electrical conduit connections into the sides and top.
  3. The door shall provide a key lock and shall include a glass or other transparent opening for viewing of all indicators. For convenience, the door may be selected for either right or left hand hinging.
- N. Power Supply:
  1. The main power supply for the fire alarm control panel shall provide 6.0 amps of available power for the control panel and peripheral devices.
  2. Provisions will be made to allow the audio-visual power to be increased as required by adding modular expansion audio-visual power supplies.
  3. Positive-Temperature-Coefficient (PTC) thermistors, circuit breakers, or other over-current protection shall be provided on all power outputs. The power supply shall provide an integral battery charger for use with batteries up to 55 AH or may be used with an external battery and charger systems. Battery arrangement may be configured in the field.
  4. The main power supply shall continuously monitor all field wires for earth ground conditions, and shall have the following LED indicators:
    - Ground Fault LED
    - Battery Fail LED
    - AC Power Fail LED
  5. The main power supply shall operate on 120 VAC, 60 Hz, and shall provide all necessary power for the FACP.
  6. The main power supply shall provide a battery charger for 24 hours of standby using dual rate charging techniques for fast battery recharge.
  7. The main power supply shall provide a very low frequency sweep earth detect circuit, capable of detecting earth faults.
  8. The main power supply shall provide meters to indicate battery voltage and charging current.
  9. All circuits shall be power-limited, per 1995 UL864 requirements.
  10. The following protection against voltage transients and surges must be provided by the fire alarm equipment supplier, and installed by the electrical contractor:
    - On AC Input: A feed-through (not a shunt-type) branch circuit transient arrester such as the EFI HWM-120, Leviton OEM-120EFI, Northern Technologies TCS-HW,

Transtector ACP100BWN3, or any equivalent UL Listed device submitted to and approved by the electrical design engineer. Install suppressor in a listed enclosure near the electrical panelboard, and trim excess lead lengths. Wind small coil in the branch circuit conductor just downstream of the suppressor connection. Coil to be 5 to 10 turns, about 1" diameter, and securely tie-wrapped. This series impedance will improve the effectiveness of the arrester in suppressing voltage transients.

On DC Circuits Extending Outside Building: Adjacent to the FACU, and also near point of entry to outlying building, provide "pi"-type filter on each leg, consisting of a primary arrester, series impedance, and a fast-acting secondary arrester that clamps at 30v-40v. Some acceptable models: Innovative Technology D2S33-2ML, Simplex 2081-9027 and 2081-9028, Transtector TSP8601, Ditek DTKxLVL series, Citel America B280-24V, and Northern Technologies DLP-42. Submit specifications on others to the engineer for approval. UL 497B listing is normally a prerequisite for their consideration. Devices using only MOV active elements are not acceptable.

- O. Field Charging Power Supply: The FCPS is a device designed for use as either a remote 24-volt power supply or used to power Notification Appliances.
  - 1. The FCPS shall offer up to 6.0 amps (4.0 amps continuous) of regulated 24-volt power. It shall include an integral charger designed to charge 7.0-amp hour batteries and to support 60-hour standby.
  - 2. The Field Charging Power Supply shall have two input triggers. The input trigger shall be a Notification Appliance Circuit (from the fire alarm control panel) or a relay. Four outputs (two Style Y or Z and two style Y) shall be available for connection to the Notification devices.
  - 3. The FCPS shall include an attractive surface mount backbox.
  - 4. The Field Charging Power Supply shall include the ability to delay the AC fail delay per NFPA requirements.
  - 5. The FCPS include power limited circuitry, per UL standards.
  - 6. Refer to Item P.10.
- R. Specific System Operations
  - 1. Smoke Detector Sensitivity Adjust: A means shall be provided for adjusting the sensitivity of any or all addressable intelligent detectors in the system from the system keypad. Sensitivity range shall be within the allowed UL window and have a minimum of 9 levels.
  - 2. Alarm Verification: Each of the intelligent addressable smoke detectors in the system may be independently selected and enabled to be an alarm verified detector. The alarm verification delay shall be programmable from 5 to 30 seconds and each detector shall be able to be selected for verification. The FACP shall keep a count of the number of times that each detector has entered the verification cycle. These counters may be displayed and reset by the proper operator commands.
  - 3. Point Disable: Any addressable device or conventional circuit in the system may be enabled or disabled through the system keypad.
  - 4. Point Read: The system shall be able to display or print the following point status diagnostic functions:
    - a. Device status
    - b. Device type
    - c. Custom device label
    - d. View analog detector values
    - e. Device zone assignments
    - f. All program parameters
  - 5. System Status Reports: Upon command from an operator of the system, a status report will be generated and printed, listing all system status.
  - 6. System History Recording and Reporting: The fire alarm control panel shall contain a history buffer that will be capable of storing up to 1000 events. Up to 200 events shall be dedicated to alarm and the remaining events are general purpose. Each of these

- activations will be stored and time and date stamped with the actual time of the activation. The contents of the history buffer may be manually reviewed, one event at a time, or printed in its entirety.
7. The history buffer shall use non-volatile memory. Systems that use volatile memory for history storage are not acceptable substitutes.
  8. Automatic Detector Maintenance Alert: The fire alarm control panel shall automatically interrogate each intelligent detector and shall analyze the detector responses over a period of time. If any intelligent detector in the system responds with a reading that is above or below normal limits, then the system will enter the trouble mode, and the particular detector will be annunciated on the system display, and printed on the optional printer. This feature shall in no way inhibit the receipt of alarm conditions in the system, nor shall it require any special hardware, special tools or computer expertise to perform.
  9. Pre-Alarm Function: The system shall provide two levels of pre-alarm warning to give advance notice of a possible fire situation. Both pre-alarm levels shall be fully field adjustable. The first level shall give an audible indication at the panel. The second level shall give an audible indication and may also activate control relays. The system shall also have the ability to activate local detector sounder bases at the pre-alarm level, to assist in avoiding nuisance alarms.
  10. Software Zones: The FACP shall provide 99 software zones and 10 additional special function zones.
  11. The fire alarm control panel shall include a walk test feature. It shall include the ability to test initiating device circuits and notification appliance circuits from the field without returning to the panel to reset the system. Operation shall be as follows:
    - a. Alarming an initiating device shall activate programmed outputs, which are selected to participate in walk test, for 3 seconds.
    - b. Introducing a trouble into the initiating device shall activate the programmed outputs for 8 seconds.
    - c. Walk test shall be selectable on a per device/circuit basis. All devices and circuits which are not selected for walk test shall continue to provide fire protection and if an alarm is detected, will exit walk test and activate all programmed alarm functions.
    - d. All devices tested in walk test shall be recorded in the history buffer.
  12. Waterflow Operation: An alarm from a waterflow detection device shall activate the appropriate alarm message on the 80-character display, turn on all programmed notification appliance circuits and shall not be affected by the signal silence switch.
  13. Supervisory Operation: An alarm from a supervisory device shall cause the appropriate indication on the 80-character display, light a common supervisory LED, but will not cause the system to enter the trouble mode.
  14. Signal Silence Operation: The FACP shall have the ability to program each output circuit (notification, relay, speaker etc) to deactivate upon depression of the signal silence switch. Any addressable initiating device in the system may be used as a non-alarm input to monitor normally open contact type devices. Non-alarm functions are a lower priority than fire alarm initiating devices.
  15. Combo Zone: A special type code shall be available to allow waterflow and supervisory devices to share a common addressable module. Waterflow devices shall be wired in parallel, supervisory devices in series.

#### 2.4 SYSTEM COMPONENTS:

- A. Speakers:
  1. All speakers shall operate on 25 VRMS or with field selectable output taps from 0.5 to 2.0 Watts. Speakers in corridors and public spaces shall produce a nominal sound output of 84 dBA at 10 feet (3m).
  2. Frequency response shall be a minimum of 400 HZ to 4000 HZ.

3. The back of each speaker shall be sealed to protect the speaker cone from damage and dust.
- B. Strobe lights shall meet the requirements of the ADA, UL Standard 1971 and shall meet the following criteria:
  1. The maximum pulse duration shall be 2/10 of one second.
  2. Strobe intensity shall meet the requirements of UL 1971.
  3. The flash rate shall meet the requirements of UL 1971.
  4. Strobes within common spaces shall be sequenced to flash simultaneously.
- C. Serially Connected Annunciator
  1. The annunciator shall communicate with the fire alarm control panel via a two wire EIA 485 (multi-drop) communications circuit.
  2. The annunciator shall require no more than four wires for operation. Annunciation shall include: intelligent addressable points, system software zones, control relays, and notification appliance circuits. The following operations shall also be provided:
    - a. Up to 32 annunciators, each with up to 64 points, may be installed on the system.
    - b. The annunciator shall include a single electrical key switch to disable all switch functions.
    - c. The annunciator shall provide alarm and trouble resound, with flash for new conditions.
    - d. An optional repeater shall be available which allows the serial data to be repeated, supporting extended wire distances. A version shall also be available for connecting annunciators over a dual fiber optic pair.
    - e. This unit shall provide for each zone: alarm indications, using a red alarm and yellow trouble long-life LEDs and control switches for the control of fire alarm control panel functions. The annunciator will also have an ON-LINE LED, local piezo electric signal, local acknowledge/lamp test switch, and custom slide-in zone/function identification labels.
    - f. Switches shall be available for remote annunciation and control of output points in the system, system acknowledge, telephone zone select, speaker select, global signal silence, and global system reset within the confines of all applicable standards.
- D. Alphanumeric LCD Type Annunciator: Remote Monitoring Panel
  1. The alphanumeric display annunciator shall be a supervised, remotely located back-lit LCD display containing a minimum of eighty (80) characters for alarm annunciation in clear English text.
  2. The LCD annunciator shall display all alarm and trouble conditions in the system.
  3. An audible indication of alarm shall be integral to the alphanumeric display.
  4. The display shall be UL listed for fire alarm application.
  5. It shall be possible to connect up to 32 LCD displays and be capable of wiring distances up to 6,000 feet from the control panel.
  6. The annunciator shall connect to a separate, dedicated "terminal mode" EIA-485 interface. This is a two-wire loop connection and shall be capable of distances to 6,000 feet. Each terminal mode LCD display shall mimic the main control panel.
  7. The system shall allow a minimum of 32 terminal mode LCD annunciators. Up to 10 LCD annunciators shall be capable of the following system functions: Acknowledge, Signal Silence and Reset which shall be protected from unauthorized use by a key switch or password.
- G. All interfaces and associated equipment are to be protected so that they will not be affected by voltage surges or line transients consistent with UL standard 864.
- H. Universal Digital Alarm Communicator Transmitter (UDACT). The UDACT is an interface for communicating digital information between a fire alarm control panel and a UL-Listed central station.
  1. The UDACT shall be compact in size, mounting in a standard module position of the fire alarm control cabinet. Optionally, the UDACT shall have the ability for remote mounting, up to 6,000 feet from the fire alarm control panel. The wire connections

- between the UDACT and the control panel shall be supervised with one pair for power and one pair for multiplexed communication of overall system status. Systems that utilize relay contact closures are not acceptable.
2. The UDACT shall include connections for dual telephone lines (with voltage detect), per UL/NFPA/FCC requirements. It shall include the ability for split reporting of panel events up to three different telephone numbers.
  3. The UDACT shall be completely field programmable from a built-in keypad and 4-character red, seven segment display.
  4. The UDACT shall be capable of transmitting events in at least 15 different formats. This ensures compatibility with existing and future transmission formats.
  5. Communication shall include vital system status such as:
    - Independent Zone (Alarm, trouble, non-alarm, supervisory)
    - Independent Addressable Device Status
    - AC (Mains) Power Loss
    - Low Battery and Earth Fault
    - System Off Normal
    - 12 and 24 Hour Test Signal
    - Abnormal Test Signal (per UL requirements)
    - EIA-485 Communications Failure
    - Phone Line Failure
  6. The UDACT shall support independent zone/point reporting when used in the Contact ID format. In this format the UDACT shall support transmission of up to 2,040 points. This enables the central station to have exact details concerning the origin of the fire or response emergency.
- I. Field Wiring Terminal Blocks ease of service all panel I/O wiring terminal blocks shall be removable, plug-in types and have sufficient capacity for #18 to #12 AWG wire. Terminal blocks which are permanently fixed are not acceptable.
- J. Printer
1. The system shall have a strip printer capable of being mounted directly in the main FACP enclosure. Alarms shall be printed in easy-to-read RED, other messages, such as a trouble, shall be printed in BLACK. This printer shall receive power from the system power supply and shall operate via battery back-up if AC mains are lost. The strip printer shall be UL 864 listed. Printing shall be in ink. Thermal paper will not be accepted.

## 2.5 SYSTEM COMPONENTS - ADDRESSABLE DEVICES

- A. Addressable Devices - General
1. Addressable devices shall use simple to install and maintain decade (numbered 1 to 10) type address switches.
  2. Addressable devices which use a binary-coded address setting method, such as a DIP switch, are not an allowable substitute.
  3. Detectors shall be intelligent and addressable and shall connect with two wires to the fire alarm control panel signaling line circuits.
  4. Addressable smoke and thermal detectors shall provide dual alarm and power/polling LEDs. Both LEDs shall flash under normal conditions, indicating that the detector is operational and in regular communication with the control panel, and both LEDs shall be placed into steady illumination by the control panel, indicating that an alarm condition has been detected. If required, the LED flash shall have the ability to be removed from the system program. An output connection shall also be provided in the base to connect an external remote alarm LED.
  5. The fire alarm control panel shall permit detector sensitivity adjustment through field programming of the system. Sensitivity shall be automatically adjusted by the panel on a time-of-day basis.

6. Using software in the FACP, detectors shall automatically compensate for dust accumulation and other slow environmental changes that may affect their performance. The detectors shall be listed by UL as meeting the calibrated sensitivity test requirements of NFPA Standard 72.
  7. The detectors shall be ceiling-mount and shall include a separate twist-lock base with tamper proof feature. Base shall include a sounder base with a built-in (local) sounder rated at 85 DBA minimum, a relay base and an isolator base designed for Style 7 applications.
  8. The detectors shall provide a test means whereby they will simulate an alarm condition and report that condition to the control panel. Such a test may be initiated at the detector itself (by activating a magnetic switch) or initiated remotely on command from the control panel.
  9. Detectors shall also store an internal identifying type code that the control panel shall use to identify the type of device (ION, PHOTO, THERMAL).
  10. Detectors will operate in an analog fashion, where the detector simply measures its designed environment variable and transmits an analog value to the FACP based on real-time measured values. The FACP software, not the detector, shall make the alarm/normal decision, thereby allowing the sensitivity of each detector to be set in the FACP program and allowing the system operator to view the current analog value of each detector.
  11. Detectors shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LEDs shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.
  12. Addressable devices shall provide address-setting means using decimal switches and shall also store an internal identifying code that the control panel shall use to identify the type of device. LED(s) shall be provided that shall flash under normal conditions, indicating that the device is operational and is in regular communication with the control panel.
  13. A magnetic test switch shall be provided to test detectors and modules. Detectors shall report an indication of an analog value reaching 100% of the alarm threshold.
- B. Addressable Pull Box (manual station)
1. Addressable pull boxes shall, on command from the control panel, send data to the panel representing the state of the manual switch and the addressable communication module status. They shall use a key operated test-reset lock and shall be designed so that after actual emergency operation, they cannot be restored to normal use except by the use of a key.
  2. All operated stations shall have a positive, visual indication of operation and utilize a key type reset.
  3. In educational facilities, manual stations shall be provided with surface mounted clear polycarbonate covers with an integral sounder base (95 dB minimum). Power for sounder base shall be hard wired from the fire alarm system, battery powered sounder bases shall not be acceptable. STI Stopper II model STI-1130-PULL shall be the basis of design. Approved equals by other manufacturers are acceptable.
- C. Intelligent Photoelectric Smoke Detector
1. The detectors shall use the photoelectric (light-scattering) principal to measure smoke density and shall, on command from the control panel, send data to the panel representing the analog level of smoke density.
- D. Intelligent Ionization Smoke Detector
1. The detectors shall use the dual-chamber ionization principal to measure products of combustion and shall, on command from the control panel, send data to the panel representing the analog level of products of combustion.
- E. Intelligent Multi-Detector
1. The intelligent multi-detector shall be an addressable device which is designed to monitor photoelectric, ionization, and thermal technologies in a single sensing device.



- This detector shall utilize advanced electronics which react to smaller products of combustion found in fast flaming fires (ionization), slow smoldering fires (photoelectric), and heat (thermal) all within a single sensing device.
2. The multi-detector shall include two bicolor LEDs which flash green in normal operation and turn on steady red in alarm.
- F. Intelligent Thermal Detectors
1. Thermal detectors shall be intelligent addressable devices rated at 135 degrees Fahrenheit (58 degrees Celsius) and have a rate-of-rise element rated at 15 degrees F (9.4 degrees C) per minute. It shall connect via two wires to the fire alarm control panel signaling line circuit.
- G. Intelligent Duct Smoke Detector
1. The smoke detector housing shall accommodate either an intelligent ionization detector or an intelligent photoelectric detector, of that provides continuous analog monitoring and alarm verification from the panel.
  2. When sufficient smoke is sensed, an alarm signal is initiated at the FACP, and appropriate action taken to change over air handling systems to help prevent the rapid distribution of toxic smoke and fire gases throughout the areas served by the duct system.
- H. Addressable Dry Contact Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional alarm initiating devices (any N.O. dry contact device) to one of the fire alarm control panel SLCs.
  2. The monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box.
  3. The IDC zone shall be suitable for Style D or Style B operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
  4. For difficult to reach areas, the monitor module shall be available in a miniature package and shall be no larger than 2-3/4 inch x 1-1/4 inch x 1/2 inch. This version need not include Style D or an LED.
- I. Two Wire Detector Monitor Module
1. Addressable monitor modules shall be provided to connect one supervised IDC zone of conventional 2-wire smoke detectors or alarm initiating devices (any N.O. dry contact device).
  2. The two-wire monitor module shall mount in a 4-inch square, 2-1/8 inch deep electrical box or with an optional surface backbox.
  3. The IDC zone may be wired for Class A or B (Style D or Style B) operation. An LED shall be provided that shall flash under normal conditions, indicating that the monitor module is operational and in regular communication with the control panel.
- J. Addressable Control Module
1. Addressable control modules shall be provided to supervise and control the operation of one conventional NACs of compatible, 24 VDC powered, polarized audio/visual notification appliances. For fan shutdown and other auxiliary control functions, the control module may be set to operate as a dry contract relay.
  2. The control module shall mount in a standard 4-inch square, 2-1/8 inch deep electrical box, or to a surface mounted backbox.
  3. The control module NAC may be wired for Style Z or Style Y (Class A/B) with up to 1 amp of inductive A/V signal, or 2 amps of resistive A/V signal operation, or as a dry contact (Form-C) relay. The relay coil shall be magnetically latched to reduce wiring connection requirements, and to ensure that 100% of all auxiliary relay or NACs may be energized at the same time on the same pair of wires.
  4. Audio/visual power shall be provided by a separate supervised power circuit from the main fire alarm control panel or from a supervised, UL listed remote power supply.
  5. The control module shall be suitable for pilot duty applications and rated for a minimum of 0.6 amps at 30 VDC.
- K. Isolator Module

1. Isolator modules shall be provided to automatically isolate wire-to-wire short circuits on an SLC Class A or Class B branch. The isolator module shall limit the number of modules or detectors that may be rendered inoperative by a short circuit fault on the SLC loop segment or branch. At least one isolator module shall be provided for each floor or protected zone of the building.
2. If a wire-to-wire short occurs, the isolator module shall automatically open-circuit (disconnect) the SLC. When the short circuit condition is corrected, the isolator module shall automatically reconnect the isolated section.
3. The isolator module shall not require any address-setting, and its operations shall be totally automatic. It shall not be necessary to replace or reset an isolator module after its normal operation.
4. The isolator module shall mount in a standard 4-inch deep electrical box or in a surface mounted backbox. It shall provide a single LED that shall flash to indicate that the isolator is operational and shall illuminate steadily to indicate that a short circuit condition has been detected and isolated.

#### 2.6 SMOKE DETECTOR APPLICATION AND INSTALLATION:

- A. All addressable spot type and duct smoke detectors shall be the analog type and the alarm system shall automatically compensate for detector sensitivity changes due to ambient conditions and dust build-up within detectors. This feature must be armed and sensitivities set prior to acceptance of the system.
- B. Spot-type detectors must be the plug-in type, with a separate base (not a mounting ring), to facilitate their replacement and maintenance. The base shall have integral terminal strips for circuit connections, rather than wire pigtails. Each detector or detector base shall incorporate an LED to indicate alarm.
- C. Spot-type smoke detectors shall have a built-in locking device to secure the head to the base, for tamper resistance. For detectors mounted within 12 feet of the floor, activate this lock after the system has been inspected and given final acceptance.
- D. Spot-type smoke detectors shall not be used where ceiling height exceeds 25 feet because it makes access for maintenance very difficult and could impede response.
- E. Unless suitably protected against dust, paint, etc., spot type smoke detectors shall not be installed until the final construction clean-up has been completed. In the event of contamination during construction, the detectors must be replaced.  
CAUTION: Covers supplied with smoke detector heads do not provide protection against heavy construction dust, spray painting, etc., and must not be used for that purpose. They are suitable only during final, minor cleanup or touchup operations.
- F. A detector installed where accidental damage or deliberate abuse is expected shall be provided with a guard that is listed for use with it and is acceptable to the AHJ.
- G. Identification of individual detectors is required. Assign each a unique number as follows, in sequence starting at the FACU: (Addressable Loop # -- Device #). Put on the as-built plans, and also permanently mount on each detector's base so that it's readable standing on the floor below without having to remove the smoke detector. Exception: For detectors with housings (i.e., air duct, projected beam, air sampling, flame), apply the identification to a suitable location on exterior of their housing.
- H. All air duct/plenum detectors must have a Remote Alarm Indicator Lamp (RAIL) installed in the nearest corridor or public area and identified by an engraved label affixed to the wall or ceiling. Duct smoke detectors are permitted to be installed only inside an air duct. It is not appropriate to mount them in front of a return air opening. Duct detectors shall also be installed in a manner that provides suitable, convenient access for required periodic cleaning and calibration (see K.).
- I. Duct detector sampling tubes shall extend the full width of the duct. Those over 36 inches long must be provided with far end support for stability.
- J. Each duct detector installation shall have a hinged or latched duct access panel, 12x12 inches minimum, for sampling tube inspection and cleaning. Indicate airflow direction on the duct, adjacent to the detector, using stencil or permanent decal.

- K. AUTOMATIC FIRE/SMOKE DETECTORS USED SHALL BE SELECTED IN ACCORDANCE WITH TABLE I:

Applications Matrix for Selecting Detection Devices, which follows this Section.

**TABLE I -- APPLICATIONS MATRIX FOR SELECTING DETECTION DEVICES**

SMOKE/FIRE DETECTOR APPLICATION	ACCEPTABLE DETECTOR TYPES*			
	ION	PHOTO	IR/UV FLAME	HEAT
Atriums/Auditoriums		B**		
Corridors – Any Occupancy		X		
Office Areas	X	X		
Cable Rooms (PVC)		X		
Elevator Equipment Rooms	X			
Furnace/Boiler Rooms				X
Gymnasiums		B**		
Laboratories (Chemical)			X	X
Linen Rooms		X		
Mech/Elect. Equipment Rooms	X	X		X
Motor-Generator Rooms			X	X
Attics (Non-Conditioned Environment)				X
Loading Docks			X	X
Non-Conditioned or Hostile Environment			X	X
Storage (Conditioned Environment Only)	X	X		
Duct Smoke Detectors		X		

\* Multi-sensor detectors employing the indicated technology are an acceptable alternative to the type of detector(s) indicated for any application.

\*\* "B" symbol indicates projected beam (linear beam) type smoke detector with separate transmitter and receiver, or with transceiver and prism reflector. Typical operating range limits are 30-300 feet but best service is obtained when the IR light beam spans 50-200 feet. Consider potential obstructions (banners, etc.) and accessibility for required maintenance.

CAUTION: Spaces which may be exposed to vehicle exhaust, fumes from nearby cooking, fireplaces, etc., high/low temperatures or high humidity (including dishwashing, laundry) are generally unsuitable for the use of smoke detectors. Heat detectors should include the rate-of-rise feature unless installed where temperatures may rise more than 15<sup>o</sup>F/minute from space heaters, vehicle exhaust stacks, furnaces, or following outside door closure. **Always consider detection device ratings vs. the environment of planned installations!**

L. Emergency Voice/Alarm Communications:

Where specified by the design engineer, or required by Code, the system shall have Emergency Voice/Alarm Communications capability.

(1) One-way Emergency Voice-Alarm (PA Type) System

One-way Voice-Alarm (PA) systems are required for Assembly occupancies exceeding **1000** persons and may optionally be installed in large, low-rise buildings. The PA feature is useful for non-fire emergencies (e.g., bomb threat or severe weather) but is not for general building paging.

For all buildings, the One-way Voice/Alarm (PA) Communications System, where provided, must meet the requirements below.

Each floor, stairway, elevator **bank**, and Assembly space (>300) is to be a separate communication zone. Speakers are to be spaced to provide required sound levels. Check audio levels in all areas; adjust taps or install additional speakers, if needed.

Large Assembly occupancies generally require special system design and procedural considerations to assure safe and effective egress of large crowds in a fire (or other) emergency, without causing panic.

Normal audio amplifier power shall be a minimum of 120% of the system design load, per channel. For purposes of this calculation, use the amplifier's continuous two-tone output rating and the designed power setting of each individual speaker. **Provide a copy of this calculation with the shop drawing submittal to the engineer. Also include on the "calculations" sheet included as part of the as-built drawings.**

At least one backup amplifier shall be provided for each channel, equal in power to the largest primary amplifier. For systems with distributed amplifiers, provide one backup at each transponder location. Failure of any amplifier shall automatically result in the defective unit being switched off-line and replaced with the backup.

The audible emergency evacuation signal shall comply NCSBC and NFPA 72. This does not preclude the system from providing additional (non-evacuation) notification signals, including recorded voice messages, for specific emergency situations. Visible alarm notification appliances must also be provided per NC Code and ADA requirements.

One-way Voice/Alarm digital audio circuits are to be wired with twisted pair copper conductors (AWG 18 minimum) in jacketed cable, or with fiber optic cable. Analog audio circuits are to be wired with AWG 18 minimum twisted pair copper conductors in shielded cable, Belden 8790, West Penn 293, or equal. Cable jacket color is to be gray, with red (+) and black (-) conductor insulation. For shielded cables, the shield must be continuously connected from the amplifiers to the end of line. Tape the shield splice at each speaker and handset, to insulate from ground. Single point ground the shield at the amplifier or control unit unless prohibited by system manufacturer.

## 2.7 BATTERIES:

- A. The batteries shall be sized per Amp-hour calculations provided by the manufacturer with 25% additional capacity minimum, 12-volt nominal (two required).
- B. The battery shall have sufficient capacity to power the fire alarm system for not less than 60 hours plus 5 minutes of alarm upon a normal AC power failure.
- C. The batteries are to be completely maintenance free. No liquids are required. Fluid level checks for refilling, spills, and leakage shall not be required.
- D. If necessary to meet standby requirements, external battery and charger systems may be used.

## PART 3.0 - EXECUTION

### 3.1 SYSTEM CONFIGURATION AND INSTALLATION: (Refer to Attached Figure A)

- A. Signaling Line Circuits (SLC's, also called addressable loops) must be NFPA Style 6 (Class A) with no "T" taps. Each must have a minimum of 20% spare addresses, for future use. Individual loops are permitted to cover more than 1 floor of a building.
- B. To minimize wiring fault impact, isolation modules shall be provided as follows. If ceiling height ≤10 feet, isolator base type initiating devices are permitted to be used:
  - In or immediately adjacent to the FACU, at each end of the addressable loop. These two isolators must be in the same room as the FACU and within 15 feet.
  - After each 25 initiating devices and control points on the addressable loop, or a lesser number where recommended by the manufacturer. (Check instructions.)
  - Near the point each addressable circuit extends outside the building walls
  - For loops covering more than one floor, install isolator at terminal cabinet on each floor (with additional isolator[s] on any floor with over 25 addresses).

Each isolation module must be clearly labeled, readily accessible for convenient inspection (not above a lay-in ceiling), and shown on as-built drawings

- C. All fire alarm system wiring shall be in metal conduit, surface metal raceway, or (in finished areas only, for improved appearance) surface non-metallic raceway.  
EXCEPTION #1: PVC conduit is permitted to be used underground, in concrete, and in locations subject to severe corrosion (such as coastal facilities or lab/process areas).
- D. All conduits that penetrate outside walls from air-conditioned space must have internal sealing (duct-seal), to prevent condensation from infiltrating humid air.
- E. There shall be **no** splices in the system other than at device terminal blocks, or on terminal blocks in cabinets. "Wire nuts" and crimp splices will **not** be permitted. Permanent wire markers shall be used to identify all connections at the FACU and other control equipment, at power supplies, and in terminal cabinets (see F.).
- F. In multistory buildings, all circuits leaving the riser on each floor shall feed through a labeled terminal block in a hinged enclosure accessible from the floor. Terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.
- G. Addressable loop (signaling line) circuits shall be wired with type FPL/FPLR/FPLP fire alarm cable, AWG 18 minimum, low capacitance, twisted shielded copper pair. Cable shield drain wires are to be connected at each device on the loop to maintain continuity, taped to insulate from ground, and terminated at the FACU. Acceptable cables include Atlas 228-18-1-1STP, BSCC S1802s19 (same as EEC 7806LC), West Penn D975, D991 (AWG 16), D995 (AWG 14), or equal wire having capacitance of 30pf/ft. maximum between conductors. Belden 5320FJ acceptable if only FPL rating needed. The cable jacket color shall be red, with red (+) and black (-) conductor insulation. (See 6.9 for other wiring.)  
EXCEPTION #1: Unshielded cable, otherwise equal to the above, is permitted to be used if the manufacturer's installation manual requires, or states preference for, unshielded cable.  
EXCEPTION #2: In underground conduit, use Type TC or PLTC cable (PE insulated) to avoid problems from moisture.
- H. Addressable interface modules (used to monitor all contact type initiating devices) must be located in conditioned space, unless they are tested, listed, and marked for continuous duty across the range of temperatures and humidity expected at their installed location. With AHJ approval they may be permitted to serve as many as 6 heat detectors, or 3 sprinkler system valve supervisory switches, in a single space. A minimum of 1 sprinkler system valve supervisory switch installed at sprinkler system hotbox (location indicated on Civil Site Plan) and 2 sprinkler system valve supervisory switches in sprinkler room (Flow and Tamper Devices).
- I. Except as required by elsewhere in these specifications 2.8 and G, all other circuits in the system shall be wired with AWG 14, stranded copper, THHN/THWN conductors, installed in conduit. Color code as shown below throughout the system, without color change in any wire run:
- Alarm notification Appliance Circuits (horns/strobes).....Blue (+)/Black (-)
  - Separate 24vdc Operating Power (for equipment)..... Yellow (+)/Brown (-)
  - Door Control Circuits (magnet power, if from system).....Orange
  - Circuits from ZAM's to Monitored Devices (AWG 14/16)...Violet(+)/Grey (-)
- J. Notification Appliance Circuit booster ("ADA") power supplies must be individually monitored by the FACU and protected by a smoke detector per NFPA 72. They shall not be located above a ceiling, or in non-conditioned space. NOTE: A 24vdc power circuit serving addressable control relays must also be monitored for integrity.
- K. All junction boxes shall be painted red **prior** to pulling the wire. Those installed in finished areas are permitted to be painted outside to match the finish color.

### 3.2 TEST:

The service of a competent, factory-trained engineer or technician authorized by the manufacturer of the fire alarm equipment shall be provided to technically supervise and participate during all of the adjustments and tests for the system. All testing shall be in accordance with NFPA 72.

1. Before energizing the cables and wires, check for correct connections and test for short circuits, ground faults, continuity, and insulation.
2. Close each sprinkler system flow valve and verify proper supervisory alarm at the FACP.

3. Verify activation of all waterflow switches.
4. Open initiating device circuits and verify that the trouble signal actuates.
5. Open and short signaling line circuits and verify that the trouble signal actuates.
6. Open and short notification appliance circuits and verify that trouble signal actuates.
7. Ground all circuits and verify response of trouble signals.
8. Check presence and audibility of tone at all alarm notification devices.
9. Check installation, supervision, and operation of all intelligent smoke detectors using the walk test.
10. Each of the alarm conditions that the system is required to detect should be introduced on the system. Verify the proper receipt and the proper processing of the signal at the FACP and the correct activation of the control points.
11. When the system is equipped with optional features, the manufacturer's manual shall be consulted to determine the proper testing procedures. This is intended to address such items as verifying controls performed by individually addressed or grouped devices, sensitivity monitoring, verification functionality and similar.

### 3.3 FINAL INSPECTION:

- A. At the final inspection, a factory trained representative of the manufacturer of the major equipment shall demonstrate that the system functions properly in every respect. The fire alarm contractor shall provide prior notice to the owner, engineer and the AHJ, minimum 10 working days prior to 100% operational test. This operational test shall not be considered the contractor's start up activity, these activities shall be performed prior to the witness testing.
- B. Contractor shall submit a completed copy of the NFPA 72, RECORD OF COMPLETION upon successful 100% operational test.

### 3.4 PROGRAMMING, TESTING, AND CERTIFICATION:

- A. All connections to the FACU and the system's programming shall be done only by the manufacturer, or by an authorized distributor that stocks a full compliment of spare parts for the system. The technicians who do this are required to be trained and individually certified by the manufacturer, for the FACU model/series being installed. This training and certification must have occurred within the most recent 24 months. Copies of the certifications must be part of the Shop Drawing submittal to the engineer, prior to installation. The submittal cannot be approved without this info.
- B. When programming the system, activate the automatic drift compensation feature for all spot-type smoke detectors. Whether or not to activate the alarm verification feature for such detectors is to be determined by the design engineer/owner's rep. In the absence of clear guidance on the latter, do not activate alarm verification.
- C. Set spot-type smoke detector sensitivities to normal/medium, unless directed otherwise by the design engineer/owner's rep.
- D. Print a complete System Status and Programming Report, after the above steps have been done. This must include the program settings for each alarm initiating device and the current sensitivity of each analog addressable smoke detector. See E.
- E. The manufacturer or authorized distributor must 100% test all site-specific software functions for the system and then provide a detailed report or check list showing the system's operational matrix. This documentation must be part of the "System Status and Programming Report" described in D.
- F. Upon completion of the installation and its programming, the fire alarm technician shall test every alarm initiating device for proper response and indication, and all alarm notification appliances for effectiveness. Also, in coordination with the other building system contractors, all other system functions shall be verified, including (where applicable) elevator capture and the control of HVAC systems, door locks, pressurization fans, fire or smoke doors/dampers/shutters, etc. The engineer must be notified in advance of these 100% tests, to permit witnessing them if desired.
- G, The contractor must fill out and submit the following documentation to the owner, through the engineer, prior to the AHJ's system acceptance inspection:
  1. The NFPA 72-1999, Figure 1-6.2.1, "Record of Completion" Form. Use this form (no substitutes) to detail the system installation and also to certify that: (a.) It was done per Code, and (b.) The Code-required 100% test was performed. If a representative of the AHJ, owner, or engineer witnesses the tests, they sign the last line of the form to signify that fact only (annotating the form as needed).

2. For buildings with a smoke control or smoke purge system, an HVAC balance report, in the smoke control / smoke purge mode.
3. The System Status and Programming Report described in D. This must be generated on the day of the system acceptance inspection.
- H. After completion of the 100% system test per F and submission of documentation per G, the contractor is to request the engineer to set up an inspection. The system must operate for at least two days prior to this inspection.
- I. The fire alarm system will be inspected, with portions of it functionally tested. This will normally include the use of appropriate means to simulate smoke for testing detectors, as well as functionally testing the system interface with building controls, fire extinguishing systems and any off-premises supervising station. Operation of any smoke removal system will be checked as instructed by the AHJ. This statistical (sampling) inspection is intended to assure that the contractor has properly installed the system and performed the 100% operational test as required by NFPA 72. The contractor normally provides two-way radios, ladders, and other materials needed for testing the system, included a suitable smoke source.

### 3.5 DOCUMENTATION, OWNER TRAINING, AND SPARE PARTS:

- A. In addition to the Shop Drawing submittal described in 1.1, the fire alarm system contractor shall provide the engineer two bound copies of the following technical information, for transmittal to the owner: (1) As-Built wiring diagram showing all loop numbers and device addresses, plus terminal numbers where they connect to control equipment, (2) Manufacturer's detailed maintenance requirements, (3) Technical literature on all control equipment, isolation modules, power supplies, alarm/supervisory signal initiating devices, alarm notification appliances, relays, etc, (4) The as-built "calculations" sheet referenced in paragraphs 1.14 and 2.5.
- B. Complete configuration data (site-specific programming) for the system must be stored on electronic media and archived by the fire alarm system manufacturer or authorized distributor. A diskette or CD copy of this data shall be submitted to the engineer for transmission to the owner on the day the system is commissioned.
- C. The manufacturer, or authorized distributor, must maintain software version (VER) records on the system installed. The system software shall be upgraded free of any charge if a new VER is released during the warranty period. For new VER to correct operating problems, free upgrade shall apply during the entire life of the system.
- D. Basic operating instructions shall be framed and permanently mounted at the FACU. (If the owner concurs, they may instead be affixed to the inside of the FACU's door.) In addition, the NFPA 72 "Record of Completion" (see 7.7) must either be kept at/in the FACU, or its location shall be permanently indicated there by engraved label.
- E. Provide an engraved label inside the FACU identifying its 120vac power source, as follows:  
**Panelboard location, panelboard identification, and branch circuit number.**
- F. Instruction shall be provided as required for operating the system. Hands-on demonstrations of the operation of all system components and the entire system including program changes and functions shall be provided.
- G. Instruction shall include a minimum of 8 hours instruction provided by the factory technical representative or the factory trained fire alarm technician of the local contractor. Contractor shall provide a minimum of five working days notice for the owner maintenance personnel.
- H. The contractor and/or the systems manufacturer's representatives shall provide a typewritten "Sequence of Operation" and typewritten bound summary, minimum 3 copies shall be provided.

### 3.6 SPARE AND RENEWAL COMPONENTS

Contractor shall provide the owner with a minimum of spares for all notification and detection devices, minimum quantities as follows:

#### SPARES

Fuses	2 of each size in system
Manual Fire Pull Station	2% of installed qty



Addressable Control Relays	4% of installed qty
Indoor Horn Strobes	4% of installed qty
Indoor Strobe only	4% of installed qty
Addressable Monitor Modules	4% of installed qty
Isolation Modules / Isolation Bases	4% of installed qty
Addressable Electronic Heat Detectors	4% of installed qty
Spot Type Smoke Detectors – Sounder Bases	6% of installed qty

No Spares are required for projected beam, air sampling or duct smoke detectors.

Increase decimal quantities to the next whole number (example 1.1 would equal 2 spare devices)

Contractor shall provide a renewal component price list, prices guaranteed for five years for all devices and equipment installed.

### 3.7 QUALITY ASSURANCE:

Manufacturer's Qualifications: Firms regularly engaged in manufacture of fire alarm systems of types, sizes, and electrical characteristics required, and whose products have been in satisfactory use in similar service for not less than 5 years.

Installer's Qualifications: Firm with at least 5 years of successful installation experience on projects with fire alarm systems work similar to that required for this project. Qualified firm shall be a factory authorized service organization and possess a complete spare parts stock.

*END OF SECTION*

**DATE:** \_\_\_\_\_

**TIME:** \_\_\_\_\_

**SERVICE ORGANIZATION**

**PROPERTY NAME (USER)**

NAME: \_\_\_\_\_

NAME: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

ADDRESS: \_\_\_\_\_

REPRESENTATIVE: \_\_\_\_\_

OWNER CONTACT: \_\_\_\_\_

LICENSE NO.: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

**MONITORING ENTITY**

**APPROVING AGENCY**

CONTACT: \_\_\_\_\_

CONTACT: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

TELEPHONE: \_\_\_\_\_

MONITORING ACCOUNT REF. NO.: \_\_\_\_\_

**TYPE TRANSMISSION**

- ]-McCulloh
- ]-Multiplex
- ]-Digital
- ]-Reverse Priority
- ]-RF
- ]-Other (Specify)

**SERVICE**

- ]-Weekly
- ]-Monthly
- ]-Quarterly
- ]-Semiannually
- ]-Annually
- ]-Other (Specify)

PANEL MANUFACTURER: \_\_\_\_\_

MODEL NO.: \_\_\_\_\_

CIRCUIT STYLES: \_\_\_\_\_

NO. OF CIRCUITS: \_\_\_\_\_

SOFTWARE REV: \_\_\_\_\_

LAST DATE SYSTEM HAD ANY SERVICE PERFORMED: \_\_\_\_\_

LAST DATE THAT ANY SOFTWARE OR CONFIGURATION WAS REVISED: \_\_\_\_\_

**ALARM-INITIATING DEVICES AND CIRCUIT INFORMATION**

**QTY OF**

**CIRCUIT STYLE**

_____	_____	MANUAL STATIONS
_____	_____	ION DETECTORS
_____	_____	PHOTO DETECTORS
_____	_____	DUCT DETECTORS
_____	_____	HEAT DETECTORS
_____	_____	WATERFLOW SWITCHES
_____	_____	SUPERVISORY SWITCHES
_____	_____	OTHER (SPECIFY): _____

Figure 7-5.2.2 Inspection and Testing Form. 1996 Edition

REPRINTED WITHOUT PERMISSION FROM NATIONAL FIRE ALARM CODE NFPA 72

**NATIONAL FIRE ALARM CODE**

**ALARM NOTIFICATION APPLIANCES AND CIRCUIT INFORMATION**

QTY OF	CIRCUIT STYLE	
_____	_____	BELLS
_____	_____	HORNS
_____	_____	CHIMES
_____	_____	STROBES
_____	_____	SPEAKERS
_____	_____	OTHER (SPECIFY): _____

NO. OF ALARM INDICATING CIRCUITS: \_\_\_\_\_

ARE CIRCUITS SUPERVISED?     YES     NO

**SUPERVISORY SIGNAL-INITIATING DEVICES AND CIRCUIT INFORMATION**

QTY OF	CIRCUIT STYLE	
_____	_____	BUILDING TEMP.
_____	_____	SITE WATER TEMP.
_____	_____	SITE WATER LEVEL
_____	_____	FIRE PUMP POWER
_____	_____	FIRE PUMP RUNNING
_____	_____	FIRE PUMP AUTO POSITION
_____	_____	FIRE PUMP OR PUMP CONTROLLER TROUBLE
_____	_____	FIRE PUMP RUNNING
_____	_____	GENERATOR IN AUTO POSITION
_____	_____	GENERATOR OR CONTROLLER TROUBLE
_____	_____	SWITCH TRANSFER
_____	_____	GENERATOR ENGINE RUNNING
_____	_____	OTHER: _____

**SIGNALING LINE CIRCUITS**

Quantity and style (See NFPA 72, Table 3-6) of signaling line circuits connected to system:

Quantity \_\_\_\_\_ Style(s) \_\_\_\_\_

**SYSTEM POWER SUPPLIES**

- a. Primary (Main): Nominal Voltage \_\_\_\_\_, Amps \_\_\_\_\_  
 Overcurrent Protection: Type \_\_\_\_\_, Amps \_\_\_\_\_  
 Location (Panel Number): \_\_\_\_\_  
 Disconnecting Means Location: \_\_\_\_\_
- b. Secondary (Standby): \_\_\_\_\_  
 Storage Battery: Amp-Hr. Rating \_\_\_\_\_  
 Calculated capacity to operate system, in hours: \_\_\_\_\_ 24 \_\_\_\_\_ 60 \_\_\_\_\_  
 Engine-driven generator dedicated to fire alarm system:  
 Location of fuel storage: \_\_\_\_\_

**TYPE BATTERY**

- Dry Cell
- Nickel-Cadmium
- Sealed Lead-Acid
- Lead-Acid
- Other (Specify)

c. Emergency or standby system used as a backup to primary power supply, instead of using a secondary power supply:

\_\_\_\_\_ Emergency system described in NFPA 70, Article 700  
 \_\_\_\_\_ Legally required standby described in NFPA 70, Article 701  
 \_\_\_\_\_ Optional standby system described in NFPA 70, Article 702, which also meets the performance requirements of Article 700 or 701.

**Figure 7-5.2.2 Inspection and Testing Form (continued).  
 REPRINTED WITHOUT PERMISSION FROM NATIONAL FIRE ALARM CODE NFPA 72**

**PRIOR TO ANY TESTING**

**NOTIFICATIONS ARE MADE:**

	YES	NO	WHO	TIME
MONITORING ENTITY	[ ]	[ ]	_____	_____
BUILDING OCCUPANTS	[ ]	[ ]	_____	_____
BUILDING MANAGEMENT	[ ]	[ ]	_____	_____
OTHER (SPECIFY)	[ ]	[ ]	_____	_____
AHJ (NOTIFIED) OF ANY IMPAIRMENTS	[ ]	[ ]	_____	_____

**SYSTEM TESTS AND INSPECTIONS**

TYPE	VISUAL	FUNCTIONAL	COMMENTS
CONTROL PANEL	[ ]	[ ]	_____
INTERFACE EQ.	[ ]	[ ]	_____
LAMPS/LEDS	[ ]	[ ]	_____
FUSES	[ ]	[ ]	_____
PRIMARY POWER SUPPLY	[ ]	[ ]	_____
TROUBLE SIGNALS	[ ]	[ ]	_____
DISCONNECT SWITCHES	[ ]	[ ]	_____
GROUND FAULT MONITORING	[ ]	[ ]	_____

**SECONDARY POWER**

TYPE	VISUAL	FUNCTIONAL	COMMENTS
BATTERY CONDITION	[ ]	[ ]	_____
LOAD VOLTAGE	[ ]	[ ]	_____
DISCHARGE TEST	[ ]	[ ]	_____
CHARGER TEST	[ ]	[ ]	_____
SPECIFIC GRAVITY	[ ]	[ ]	_____

**TRANSIENT SUPPRESSORS** [ ] [ ] \_\_\_\_\_

**REMOTE ANNUNCIATORS** [ ] [ ] \_\_\_\_\_

**NOTIFICATION APPLIANCES**

AUDIBLE	[ ]	[ ]	_____
VISUAL	[ ]	[ ]	_____
SPEAKERS	[ ]	[ ]	_____
VOICE CLARITY	[ ]	[ ]	_____

**INITIATING AND SUPERVISORY DEVICE TESTS AND INSPECTIONS**

LOC. & S/N	DEVICE TYPE	VISUAL CHECK	FUNCTIONAL TEST	FACTORY SETTING	MEAS. SETTING	PASS	FAIL
_____	_____	[ ]	[ ]	_____	_____	[ ]	[ ]
_____	_____	[ ]	[ ]	_____	_____	[ ]	[ ]
_____	_____	[ ]	[ ]	_____	_____	[ ]	[ ]
_____	_____	[ ]	[ ]	_____	_____	[ ]	[ ]
_____	_____	[ ]	[ ]	_____	_____	[ ]	[ ]
_____	_____	[ ]	[ ]	_____	_____	[ ]	[ ]

COMMENTS: \_\_\_\_\_

Figure 7-5.2.2 Inspection and Testing Form (continued). 1996 Edition

REPRINTED WITHOUT PERMISSION FROM NATIONAL FIRE ALARM CODE NFPA 72

NATIONAL FIRE ALARM CODE

EMERGENCY COMMUNICATIONS EQUIPMENT VISUAL FUNCTIONAL COMMENTS

PHONE SET	[ ]	[ ]	_____
PHONE JACKS	[ ]	[ ]	_____
OFF-HOOK INDICATOR	[ ]	[ ]	_____
AMPLIFIER(S)	[ ]	[ ]	_____
TONE GENERATOR(S)	[ ]	[ ]	_____
CALL-IN SIGNAL	[ ]	[ ]	_____
SYSTEM PERFORMANCE	[ ]	[ ]	_____

	VISUAL	DEVICE OPERATION	SIMULATED OPERATION
<b>INTERFACE EQUIPMENT</b>			
(SPECIFY)	[ ]	[ ]	_____
(SPECIFY)	[ ]	[ ]	_____
(SPECIFY)	[ ]	[ ]	_____

<b>SPECIAL HAZARD SYSTEMS</b>			
(SPECIFY)	[ ]	[ ]	_____
(SPECIFY)	[ ]	[ ]	_____
(SPECIFY)	[ ]	[ ]	_____

SPECIAL PROCEDURES: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

COMMENTS: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

ON/OFF PREMISES MONITORING:	YES	NO	TIME	COMMENTS
ALARM SIGNAL	[ ]	[ ]	_____	_____
ALARM RESTORAL	[ ]	[ ]	_____	_____
TROUBLE SIGNAL	[ ]	[ ]	_____	_____
SUPERVISORY SIGNAL	[ ]	[ ]	_____	_____
SUPERVISORY RESTORAL	[ ]	[ ]	_____	_____

NOTIFICATIONS THAT TESTING IS COMPLETE:	YES	NO	WHO	TIME
BUILDING MANAGEMENT	[ ]	[ ]	_____	_____
MONITORING AGENCY	[ ]	[ ]	_____	_____
BUILDING OCCUPANTS	[ ]	[ ]	_____	_____
OTHER (SPECIFY)	[ ]	[ ]	_____	_____

THE FOLLOWING DID NOT OPERATE CORRECTLY: \_\_\_\_\_  
 \_\_\_\_\_  
 \_\_\_\_\_

SYSTEM RESTORED TO NORMAL OPERATION: DATE \_\_\_\_\_ TIME \_\_\_\_\_

**THIS TESTING WAS PERFORMED IN ACCORDANCE WITH APPLICABLE NFPA STANDARDS.**

NAME OF INSPECTOR: \_\_\_\_\_ DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 SIGNATURE: \_\_\_\_\_  
 NAME OF OWNER OR REPRESENTATIVE: \_\_\_\_\_  
 DATE: \_\_\_\_\_ TIME: \_\_\_\_\_  
 SIGNATURE: \_\_\_\_\_

**Figure 7-5.2.2 Inspection and Testing Form (continued).  
 REPRINTED WITHOUT PERMISSION FROM NATIONAL FIRE ALARM CODE NFPA 72**

**RELATED DOCUMENTS:**

Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.

**TESTS:**

Test all lines to be concealed before burying or covering with new construction. Tests shall include proper operation of lights, receptacles, and equipment, continuity of conduit system, insulation leakage and impedance, elimination of motor single phasing or reverse rotation, and ground system resistance (see also Section 16400).

After the interior wiring system is completed and at such time as the Engineer or Owner's representative may direct, the Contractor shall conduct an operating test for approval. The tests shall be performed in the presence of the authorized representative of the Engineer and the installation shall be demonstrated to operate in accordance with the requirements of this specification. The Contractor shall furnish all instruments and personnel required for the test. The Contractor shall have sufficient tools and personnel available at the scheduled inspection to remove panel fronts, device plates, etc., as required for proper inspection of equipment, devices and wiring installation as may be required by the inspectors. Any material or workmanship which does not meet with approval of the engineer shall be promptly removed, repaired or replaced as directed, at no additional cost to the Owner.

**ADJUSTMENTS:**

Adjustments shall include load balancing of all electrical phases, at devices and panels. Balance all panelboards so that the maximum deviation of any one phase from the average of all the phases shall not exceed 10%. Re-type circuit directory as required after completion of adjustment.

**CLEANING AND PAINTING:**

Prior to final inspection, all equipment having factory finishes shall be thoroughly cleaned inside and outside. All damaged surfaces shall be replaced or refinished by Contractor, with paint same as original manufacturer. Engineer shall determine whether the damaged surface is to be replaced or painted.

**RECORD DRAWINGS:**

The Contractor shall maintain accurate records of all deviations in work as actually installed from work indicated on the drawings. On completion of the project, two (2) complete sets of marked-up prints shall be delivered to the Architect.

**OPERATING AND MAINTENANCE INSTRUCTIONS:**

Unless directed otherwise elsewhere in these specifications, the Contractor shall compile and bind three sets of all manufacturer's instructions and descriptive literature on all items of equipment furnished under this work. These instructions shall be delivered to the Engineer for approval prior to final inspection. Instructions shall include operating and testing procedures and a parts list of all equipment. The Contractor shall instruct the Owner's personnel in the proper operation of all systems and equipment. The front and side of the binder shall be titled "Electrical Operating and Maintenance Instructions", with name of the job and firm name of the Contractor.

**WARRANTY:**

The Contractor shall submit upon completion of the work, a warranty by his acceptance of the contract, that all work installed will be free from defects in workmanship and materials. If, during the period of one year, or as otherwise specified from date of Certificate of Completion and acceptance of work, any such defects in

workmanship, materials, or performance appear, the Contractor shall, without cost to the Owner, remedy such defects within reasonable time to be specified in notice from the Architect. In default, the Owner may have such work done and charge cost to Contractor.

*END OF SECTION*

*END OF SPECIFICATIONS*