## **PROJECT MANUAL**

# BREATHITT COUNTY SCHOOLS SEBASTIAN ELEMENTARY SCHOOL PARTIAL RENOVATION KDE Project: 19-320

Owner Breathitt County Board of Education 420 Court Street, PO Box 750

Jackson, Kentucky 41339 T: (606) 666-2491 F: (606) 666-2493

#### **Architect**

Tate • Hill • Jacobs: Architects, Inc.

346 East Main Street Lexington, Kentucky 40507 T: (859) 252-5994 F: (859) 253-1607

#### Structural Engineer SDG, LLC

306 West Main Street Frankfort, Kentucky 40601 T: (859) 351-9169

#### Mechanical / Electrical Engineers

Shrout Tate Wilson Consulting Engineers 628 Winchester Rd. Lexington, Kentucky 40505 T: (859) 277-8177 F: (859) 277-8372

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#### INVITATION TO BID

The Breathitt County Board of Education will receive sealed bids at the Superintendent's office at 420 Court Street, Jackson, KY until <u>2:00 PM local time on Tuesday, September 10, 2019</u> for the Partial Renovation of the Sebastian Elementary School, located at 244 L.B.J. Road, Jackson, KY. Specifications and Bid Documents may be obtained by contacting Lynn Imaging 328 East Vine Street Lexington, KY. 859-255-1021. A Pre-Bid Meeting will be held at <u>2:00 p.m.</u> local time on Tuesday, August 27, 2019 at Sebastian Elementary School, mandatory attendance for all General Contractors. Inquiries related to the project may be made by contacting Mark Isbell of Tate Hill Jacobs Architects at (859) 252-5994 or via email at mark@thjarch.com. Form of Proposal, Form of Contract, Plans and Specifications, and Forms of Bid Bond, Performance and Payment Bond and other contract documents may be examined at the following:

Tate Hill Jacobs: Architects	346 East Main Street	Lexington, KY	859.252.5994
Shrout Tate Wilson Engineers	628 Winchester Rd.	Lexington, KY	859.277.8177
Breathitt County Bd. of Education	420 Court St.	Jackson, KY	606.666.2491

Immediately following the scheduled closing time for receiving the bids, all proposals that have been completely filled out and have been properly submitted with the appropriate attachments in accordance with the Contract Documents will be publicly opened and read.

Plans and Specifications may be purchased from Lynn Imaging, 328 Old Vine Street Lexington, KY for a non-refundable amount of \$145.00 per printed set, or \$110.00 per digital copy. No partial sets will be issued. Documents may be obtained from the distribution department of Lynn Imaging, 859.255.1021 or on their website, <www.lynnimaging.com.> If documents are to be mailed, an additional non-refundable charge will apply; contact Lynn Imaging for the cost. The successful bidder is responsible for purchase of all additional sets they may require.

Bids must be accompanied by a certified check or bid bond, payable to the Owner in an amount not less than 5% of the bid. The award of the contract shall be made on the basis of the lowest and best bid in the interest of Breathitt County Schools. No bidder may withdraw his/her bid for a period of thirty (30) days after the date set for the bid opening. A 100% Performance and Payment Bond shall be provided by the successful Bidder at the time of Contracting. The Owner reserves the right to waive informalities and irregularities, and shall have the right to reject any and all bids.

#### END OF DOCUMENT

# Kentucky Department of Education Version of $\widehat{\mathbf{AIA}}^*$ Document A701<sup>TM</sup> – 1997

# Instructions to Bidders



This version of AIA Document A701<sup>™</sup>–1997 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A701–1997 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A701–1997 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site.

Cite this document as "AIA Document A701<sup>™</sup>– 1997, Instructions to Bidders — KDE Version," or "AIA Document A701<sup>™</sup>–1997 — KDE Version."

# Kentucky Department of Education Version of $\textcircled{B}{B}AIA$ Document A701<sup>TM</sup> – 1997

### Instructions to Bidders

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

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

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

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

#### ARTICLE 1 DEFINITIONS

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

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

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

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

§ 1.5 The Base Bid is the sum stated in the Form of Proposal for which the Bidder offers to perform the Work described in the Bidding Documents as the base, to which Work may be added or from which Work may be deleted for sums stated in Alternate Bids. The Base Bid shall include all labor, material, bonds, and the cost of all direct purchase orders for material to be purchased by the Owner

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

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

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

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

#### ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

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

 $\S$  2.1.2 The Bid is made in compliance with the Bidding Documents.

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

1. The submission of a Bid will be construed as evidence that a site visit and examination of local conditions have been made. Later claims for labor, equipment, or materials required or difficulties encountered which could have been foreseen had such an examination been made will not be recognized.

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

#### ARTICLE 3 BIDDING DOCUMENTS

§ 3.1 Copies

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

§ 3.1.2 (Not Used)

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

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

#### § 3.2 Interpretation or Correction of Bidding Documents

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

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

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

#### § 3.3 Substitutions

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

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

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

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

#### § 3.4 Addenda

§ 3.4.1 Addenda will be transmitted to all who are known by the Architect and Construction Manager (if utilized) to have received a complete set of Bidding Documents.

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

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

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

ARTICLE 4 BIDDING PROCEDURES

#### § 4.1 Preparation of Bids

 $\S\,4.1.1$  Bids shall be submitted on the forms included with the Bidding Documents.

§ 4.1.2 All blanks on the Form of Proposal shall be legibly executed in a non-erasable medium.

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

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

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

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

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

#### § 4.2 Bid Security

§ 4.2.1 Each Bid greater than \$25,000 shall be accompanied by bid security in the form of a Bond provided by a Surety Company authorized to do business in the Commonwealth of Kentucky, or in the form of a certified check, and in an amount equal to at least five percent (5%) of the Base Bid amount, pledging that the Bidder will enter into a contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payments 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.

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

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

#### § 4.3 Submission of Bids

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

§ 4.3.2 Bids shall be deposited at the designated location prior to the time and date for receipt of Bids as indicated in the Advertisement or Invitation to Bid or any extensions thereof made by Addendum. Bids received after the closing time and date for receipt and opening of Bids will be rejected and returned to the Bidder unopened.

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

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

#### § 4.4 Modification or Withdrawal of Bid

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

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

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

#### ARTICLE 5 CONSIDERATION OF BIDS

#### § 5.1 Opening of Bids

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

#### § 5.2 Rejection of Bids

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

#### § 5.3 Acceptance of Bid (Award) [Reference: KRS 45A.365]

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

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

#### ARTICLE 6 POST-BID INFORMATION

#### § 6.1 Contractor's Qualification Statement

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

§ 6.2 (Not Used)

#### § 6.3 Submittals

§ 6.3.1 Each Bidder shall submit as part of the Form of Proposal a list of subcontractors proposed for each major branch of work itemized and described in the specifications for the Project. The Bidder's listing of a subcontractor for a work category certifies that the subcontractor has in current employment, skilled staff and necessary equipment to complete that category. The Architect and Construction Manager (if utilized) will evaluate the ability of all listed subcontractors to complete the work and notify the Owner. Listing of the Bidder as the subcontractor may invalidate the Bid should the Architect's and Construction Manager's (if utilized) review indicate the bidder does not have skilled staff and equipment to complete the work category at the time the Bid was submitted.

.1 Changing subcontractors from those listed with the Form of Proposal is prohibited unless the bidder provides grounds for such a change that are consistent with provisions of the Instructions to Bidders. Said change shall be accompanied by a written explanation from the Bidder as well as a written release from the listed subcontractor. All letters shall be on original company stationary with original signatures from an officer in the company legally approved to act for the company. An unjustifiable change of subcontractors may invalidate the Bid. Any change to a proposed person or entity shall be addressed as noted in Section 6.3.3 of these Instructions to Bidders

§ 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.

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

 $\S$  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.

#### § 6.4 List of Materials, Suppliers, and Manufacturers

§ 6.4.1 Each Bidder shall submit a complete list of materials/equipment with supplier's and manufacturer's name in the form and manner indicated on the Form of Proposal and in compliance with materials and equipment specified.

§ 6.4.2 In addition to the list furnished with the Form of Proposal, the successful Bidder thereafter known as the Contractor, may be requested within thirty (30) calendar days after award of contract to furnish to the Architect and Construction Manager (if utilized) a more detailed and complete list of the materials and equipment, together with the manufacturer's or maker's name, brand and/or catalogue number, and product data or illustration thereof.

§ 6.4.3 Prior to the award of contract, the Architect and Construction Manager (if utilized) will make a preliminary check of the lists included with the Form of Proposal and advise the Bidder and the Owner of the acceptance thereof, and of such other actions as may be necessary in order to meet the requirements of the contract specifications. Should it develop that any of the materials or equipment named in the list do not meet the requirements of the project specifications, the Bidder shall be required to offer to the Owner other materials or equipment in compliance with the specifications at no change in contract price. Preliminary review and acceptance of the above list shall not relieve the Contractor of furnishing equipment and materials in accordance with the specifications.

6.4.4 Written approval shall be obtained from the Architect regarding any material/equipment, supplier, and manufacturer substitution. Substitutions are permitted in the following instance:

- .1 Failure to comply with contract requirements;
- .2 Failure of the supplier or manufacturer to meet delivery schedules or other conditions of the contract;
- .3 Written release by the supplier or manufacturer.

#### § 6.5 Unit Prices

§ 6.5.1 Each Bidder shall submit as part of the Bid a list of unit prices as designated on the Form of Proposal.

6.5.2 Unit prices are for changing or adjusting the scope or quantity of work from that indicated by the contract drawings and specifications.

§ 6.5.3 Unit prices shall include all labor, materials, equipment, appliances, supplies, overhead and profit.

6.5.4 Only a single unit price per item shall be given and it shall apply for either more or less work than indicated or specified in the contract documents. In the event the contract is adjusted by unit prices, a change order shall be issued for the change and for the increased or decreased amount.

6.5.6 For unit prices that apply to a lump sum Base Bid, the Owner reserves the right, prior to an award of contract, to negotiate, adjust and/or reject any price that is determined by the Architect, Construction Manager, or Owner to be excessive or unreasonable in amount.

§ 6.5.7 On line item total sum bids where Bidders are quoting firm unit prices for estimated quantities of units of work, the unit price is the Bid and is not subject to change, either by the Bidder or Owner. The Owner reserves the right to correct mathematical errors in extensions and additions by the Bidder. The Owner's corrected bid sum total shall take preference over the Bidder's computed bid sum total.

#### § 6.6 Bid Division, Material Suppliers, and Purchase Orders

§ 6.6.1 This Section applies to projects with or without Bid Division (Multiple Prime Contracts), and those Projects that provide for direct purchase by the Owner of materials and equipment from Material Suppliers.

§ 6.6.2 For Projects with Bid Division: General Construction and Concrete, Masonry, Plumbing, HVAC and Electrical Contractors shall provide with their Bid a breakdown of major material items (excluding sales tax). This breakdown shall include description of the item, name of the manufacturer, name of the supplier, and the amount of the supplier's quote. The Owner will issue Purchase Orders direct to the suppliers for these materials. The following shall be provided:

- 1 Within four (4) days from the Bid Date, the low Bidder shall furnish to the Owner the list of material suppliers of the items listed on the bid breakdown, with authorization given to the Contractor to quote the materials listed and that the Supplier will furnish the listed materials to the Owner under the Owner's standard Purchase Order for the amount stated on the Contractor's bid breakdown. Failure of any Contractor to provide this written list of material suppliers with authorization will cause forfeiture of the bid security.
- .2 The Contractor shall also guarantee to the Owner that materials listed in the breakdown to be purchased directly by the Owner shall comply with requirements of the Contract Documents and that the quantity of such material is sufficient to complete the Bid Division. The Performance and Payment Bonds required of the Contractor shall be in the combined amount of the materials designated in its bid to be acquired by Purchase Order by the Owner and all remaining items of cost in the respective Bid Division. Contractor shall provide an invoice from the supplier to the Owner with Contractor's Application for Payment.
- .3 Material Suppliers will be paid the full amount of their invoices. Retainage that would otherwise be withheld from invoices submitted by and paid to a material supplier shall be withheld from the approved payment request of the Contractor. Refer to General Conditions for further requirements regarding retainage.
  - .a Lockers, Library, Kitchen, Shop, Technology, Science or other major equipment bid divisions shall provide with their Bid a breakout price for the material portions of the Bid (excluding sales tax). Award of contract will be based on the lump sum price of the accepted Bid that includes labor and materials. The Owner will issue a Purchase Order for the material and a contract for the labor and incidental materials. Retainage will be held on both the Purchase Order and the Contract in accordance with the General Conditions.
  - .b The language of the Bid Divisions is designed to outline and define the work in general to be included in a particular Bid Division and to prevent overlapping and conflicting requirements within other Bid Divisions. No Bidder shall use the omission of any item from this language as a basis for a claim for additional cost when such item is specified or indicated to be part of a complete and workable system.
  - C It is the responsibility of the Bidder to determine which Bid Division or combination of Bid Divisions the Bidder desires to Bid.

§ 6.6.3 For Projects without Bid Division but with direct purchase by the Owner of materials and equipment from Material Suppliers, Contractors shall comply with paragraph 6.6.2 above as applicable to the Project. The Owner will issue Purchase Orders direct to the suppliers for these materials. Award of contract will be based on the lump sum price of the accepted bid that includes labor and materials. Retainage will be held on both the Purchase Orders and the Contract(s) in accordance with the General Conditions.

#### ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

#### § 7.1 Bond Requirements

§ 7.1.1 Unless stipulated otherwise in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds shall be executed by a surety company authorized to do business in Kentucky.

§ 7.1.2 The cost of such bonds 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.

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

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

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312<sup>TM</sup>–2010, Performance Bond and Payment Bond — KDE Version. Both bonds shall be written in the amount of the Contract Sum, being the total of the Base Bid, as described in Section 1.5 herein, and all Alternates accepted by the Owner.

 $\S$  7.2.3 The bonds shall be dated on or after the date of the Contract.

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

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

Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101<sup>TM</sup>–2007, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum — KDE Version, except for those Projects utilizing a Construction Manager the Agreement will be written on AIA Document A132<sup>TM</sup>–2009, Standard Form of Agreement Between Owner and Contractor, Construction Manager as Advisor Edition — KDE Version. Owner-Contractor Agreements shall be valid only after written notice by the Kentucky Department of Education that the proposed Agreements are approved.

#### ARTICLE 9 PUBLIC WORKS ACT [Reference: KRS 337.505 to 337.550]

#### § 9.1 Labor Regulations

§ 9.1.1 Work shall be performed in compliance with applicable provisions of the Kentucky Prevailing Wage Act on Public Works Projects, KRS 337.505 through KRS 337.550.

§ 9.1.2 Prevailing wage rates, included with the Bidding Documents, shall be paid on this Project if required under Section 10.1.1. The stipulated wage rates represent prevailing minimum wage rates of pay allowable and shall not be construed to mean that higher rates may not have to be paid in order to secure labor.

§ 9.1.3 Any Bidder and/or subcontract bidder in violation of any wage or work act provision (KRS 337.510 to KRS 337.550) and under citation by the Kentucky Department of Labor is prohibited by KRS 337.990 from bidding on or working on any and all public works contracts either in their name or in the name of any other company, firm, or other entity in which there is vested interest. No Bid shall be submitted by a prime Bidder or sub-bidder in violation of KRS Chapter 337. The responsibility of the qualifications of the sub-contract Bidder is solely that of the prime Bidder. The rejection of the subcontract Bidder and resubmittal of a qualified subcontract Bidder shall be addressed per the provisions of these Instructions to Bidders relating to subcontract Bidders (subcontractors) and materials.

#### § 9.2 Davis-Bacon Act Provisions

Projects funded with Federal Funds shall comply with the Davis-Bacon Act (Subchapter IV of Chapter 31 of the Title 40 of the United States Code). Where the amount received from federal revenue sharing is less than 25 percent of the estimated total construction cost of a public school project, state law and not the federal applies to the wage rate and the prevailing wage scale to be used for the project (OAG 74-329). Refer to Supplementary Conditions for direction regarding application of federal rates, if included in the bidding documents, to this project. In the event both state and federal wage rates apply, the higher of the two rates shall be used to determine labor costs.

#### ARTICLE 10 TAXES

#### § 10.1 Kentucky Sales and/or Use Tax [Reference KRS 139.495(1)]

Bidders are informed that construction contracts of the Commonwealth of Kentucky and political subdivisions are not exempt from the provisions of the Kentucky Sales and/or Use Tax, unless provisions are clearly noted in the bidding documents for the direct purchase of certain materials and equipment by the Owner. Materials and equipment which are to be submitted for direct purchase are as noted by the Architect or Construction Manager in the Form of Proposal and shall be limited to forty (40) items with a minimum price of \$5,000 each. All other materials and equipment shall be included in the Contract Price and are subject to Kentucky Sales and/or Use Taxes. Current Sales and/or Use Tax shall be provided for and included in the bid amount as no adjustment will be permitted nor made after the receipt of bids.

#### § 10.2 Federal Excise Tax

The Commonwealth of Kentucky and its political subdivisions are exempt from Federal Excise Tax.

#### ARTICLE 11 POST BID REVIEW AND MATERIAL SUBMITTAL

#### § 11.1 Representative at Bid Opening

§ 11.1.1 Each prime Bidder shall have an authorized representative at the bid opening for submittal of the list of materials and equipment, and the post bid review which follows immediately after the opening and reading of bids.

§ 11.1.2 Following the opening of bids, the three (3) apparent low Bidders shall remain for a post-bid review, and shall submit a completed list of materials, equipment and suppliers within one (1) hour from the close of the reading of the bids. The list of materials and equipment shall be the listing contained in the Form of Proposal.

§ 11.1.3 The post bid review, open to all bidders, will be conducted jointly with representatives of the Architect and Construction Manager (if utilized), Owner, and apparent low Bidder. Preliminary review will be directed toward Bidder's qualifications, list of subcontractors, list of materials and equipment, and unit prices.

#### ARTICLE 12 EQUAL EMPLOYMENT AND NONDISCRIMINATION

The Commonwealth of Kentucky and its political subdivisions are committed to equal job opportunities on public contracts and prohibited from discrimination based on race, creed, color, sex, age, religion, or national origin.

# ARTICLE 13 CONFLICT OF INTEREST, GRATUITIES AND KICKBACKS, USE OF CONFIDENTIAL INFORMATION [Reference KRS 45A.455]

Conflict of Interest, Gratuities, Kickbacks, and Use of Confidential Information as described in KRS 45A.455 are expressly prohibited. Penalties for any violation under this statute are located in KRS 45A.990.

#### ARTICLE 14 KENTUCKY FAIRNESS IN CONSTRUCTION ACT OF 2007 [Reference KRS 371.400 to 371.425]

Projects constructed for school districts in the Commonwealth of Kentucky are subject to provisions of the Kentucky Fairness in Construction Act of 2007 as it relates to the right to litigate, the right to delay damages against the Owner, the right to file a mechanic's lien, prompt payment by Owners, amount of retainage that can be withheld and other provisions of the Act.

#### ARTICLE 15 KENTUCKY PREFERENCE LAW [Reference KRS 45A.490 to 45A.494]

§ 15.1 Projects constructed for school districts in the Commonwealth of Kentucky are subject to provisions of the reciprocal preference for Kentucky Preference for Resident Bidders law, KRS 45A.490 to KRS 45A.494. Reciprocal preference shall be given by public agencies to resident bidders.

§ 15.2 The Kentucky Finance and Administration Cabinet shall maintain a list of states that give to or require a preference for their own resident bidders, including details of the preference given to such bidders, to be used by public agencies in determining resident bidder preferences. The cabinet shall also promulgate administrative regulations in accordance with KRS Chapter 13A establishing the procedure by which the preferences required by this Section shall be given.

§ 15.3 The reciprocal preference as described in KRS 45A.490 to KRS 45A.494 above shall be applied in accordance with Kentucky Administrative Regulation 200 KAR 5:400.

#### SECTION 003050 - SUPPLEMENTARY INSTRUCTIONS TO BIDDERS

- 1.1 SCOPE
  - A. The following instructions modify, change, delete from or add to AIA Document A701-Instructions to Bidders as amended by the Kentucky Department of Education, Division of Facilities Management. Where any article of the Instructions to Bidders is modified or any paragraph, subparagraph or clause thereof is modified or deleted by these Supplementary Instructions to Bidders, the unaltered provisions of that Article, paragraph, subparagraph or clause shall remain in effect.

#### 1.2 ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

- Revise the last sentence of paragraph 7.2.2 to read: Unless otherwise provided, both bonds shall be written in the amount of the sum of the contract amount plus the total amount of all purchase orders.
- 1.3 ARTICLE 9 PUBLIC WORKS ACT
  - A. Delete this Article in its' entirety. Work of this contract is not subject to compliance with Kentucky Prevailing Wage Act on Public Works Projects.
- 1.4 ARTICLE 10 TAXES
  - A. Add the following paragraphs:
    - 10.3 It is the Owner's intent to purchase significant quantities of materials through direct Purchase Orders. As provided by KRS 139.310 and Kentucky Administrative Regulation 103 KAR 26:070 (Contract Construction), sales and use tax is to be excluded only on those material items purchased by the Owner directly from material suppliers.
    - 10.4 If a company is listed on the bid forms as both the installing Contractor and material supplier, the Owner will not issue a Purchase Order for those materials. Accordingly, the sales and use tax on the materials used to fulfill the terms of the contract will be the liability of the Contractor.

#### 1.5 ARTICLE 6 POST BID INFORMATION

#### A. Add the following paragraphs:

- 6.6.4 The Contractor will be provided prepared Purchase Orders. Upon receipt, the Contractor shall have fourteen (14) business days to have each Purchase Order executed by the respective material suppliers and returned to the Architect. Purchase Orders are not to be altered, amended, or changed in any way. Any Purchase Order not returned within the allotted time shall become null and void and the value of the Purchase Order will be added to the Contract sum with the Contractor assuming responsibility for all taxes. Upon execution of the Purchase Orders by the Owner, the Purchase Orders will be delivered to the Contractor for distribution to the respective suppliers.
- 6.6.5 In the event the quantities of materials supplied via Purchase Orders are insufficient to complete the Work, the Contractor shall, at no expense to the Owner, provide such materials as necessary to complete the Work
- 6.6.6 In the event that at the completion of the Work the Contractor has not

submitted invoices totaling the value of any individual Purchase Order, that Purchase Order shall be considered complete and closed. NO ADJUSTMENT WILL BE MADE TO THE CONTRACTORS' CONTRACT.

6.6.7 The Owner will provide to the Contractor Kentucky Sales Tax Exemption Certificates for each Material Supplier.

END OF SECTION

#### KENTUCKY DEPARTMENT OF EDUCATION 702 KAR 4:160

Date:	_ To: (Owner)
Project Name:	Bid Package No
City, County:	
Name of Contractor:	
Mailing Address:	

Business Address: \_\_\_\_\_\_Telephone: \_\_\_\_\_\_

Having carefully examined the Instructions to Bidders, Contract Agreement, General Conditions, Supplemental Conditions, Specifications, and Drawings, for the above referenced project, the undersigned bidder proposes to furnish all labor, materials, equipment, tools, supplies, and temporary devices required to complete the work in accordance with the contract documents and any addenda listed below for the price stated herein.

Addendum \_\_\_\_\_ (Insert the addendum numbers received or the word "none" if no addendum received.)

<u>BASE BID:</u> For the construction required to complete the work, in accordance with the contract documents, I/We submit the following lump sum price of:

Use Figures

Dollars & \_\_\_\_\_

Use Words

Cents

ALTERNATE BIDS: (If applicable and denoted in the Bidding Documents):

#### ALTERNATES ARE NOT APPLICABLE TO THIS PROJECT.

For omission from or addition to those items, services, or construction specified in Bidding Documents by alternate number, the following lump sum price will be added or deducted from the base bid.

Alternate Bid No.	Alternate Description	+ (Add to the Base Bid)	- (Deduct from the Base Bid)	No Cost Change from the Base Bid)

#### LIST OF PROPOSED SUBCONTRACTORS:

Use Words

List on the lines below each major branch of work and the subcontractor involved with that portion of work. If the branch of work is to be done by the Contractor, so indicate.

The listing of more than one subcontractor in a work category shall invalidate the bid.

The listing of the bidder as the subcontractor for a work category certifies that the bidder has in current employment, skilled staff and necessary equipment to complete that category. The architect/engineer will evaluate the ability of all listed subcontractors to complete the work and notify the owner. Listing of the bidder as the subcontractor may invalidate the bid should the architect's review indicate bidder does not have skilled staff and equipment to complete the work category at

#### This form shall not be modified.

#### FORM OF PROPOSAL

the time the bid was submitted.

A maximum of 40 subcontractors will be acceptable with each bid. Do not add supplemental sheets for subcontractors to this document.

#### The bidder shall submit the list of subcontractors with the bid.

	BRANCH OF WORK (to be filled out by the Architect)	SUBCONTRACTOR (to be filled out by the contractor)
1	BUILDING CONCRETE	
2	UNIT MASONRY	
3	STEEL ERECTION	
4	STEEL FABRICATOR	
5	ARCHITECTURAL CASEWORK	
6	DOOR, FRAME & HARDWARE	
7	ALUMINUM STOREFRONT / WINDOWS	
8	GYPSUM BOARD ASSEMBLIES	
9	TILE	
10	SUSPENDED CEILING SYSTEMS	
11	RESILIENT FLOORING	
12	PAINTING	
13	FIRE PROTECTION	
14	PLUMBING	
15	HVAC	
16	HVAC PIPING	
17	SHEET METAL	
18	TEMPERATURE CONTROLS	
19	HVAC BALANCING	
20	ELECTRICAL (DIVISION 26)	

21	COMMUNICATIONS SYSTEMS (DIVISION 27)	
22	SAFETY AND SECURITY SYSTEMS (DIVISION 28)	

#### LIST OF PROPOSED SUPPLIERS AND MANUFACTURERS:

List on the lines below each major material category for this project and the suppliers and manufacturers involved with that portion of work. Listing the supplier below means the Contractor is acknowledging authorization from the Supplier to include the Supplier in this bid.

The listing of more than one supplier or manufacturer in a material category shall invalidate the bid.

# A maximum of 40 suppliers and manufacturers will be acceptable with each bid. Do not add supplemental sheets for suppliers to this document.

#### The bidder shall submit the list of suppliers and manufacturers within one (1) hour of the bid.

	MATERIAL DESCRIPTION BY SPECIFICATION DIVISION AND CATEGORY (to be filled out by the Architect or Contractor)	SUPPLIER (to be filled out by the Contractor)	MANUFACTURER (to be filled out by the Contractor)
1	CONCRETE SUPPLIER		
2	UNIT MASONRY SUPPLIER		
3	STEEL SUPPLIER		
4	STANDARD STEEL FRAMES		
5	STANDARD STEEL DOORS		
6	FLUSH WOOD DOORS		
7	GYPSUM BOARD ASSEMBLIES		
8	TILE		
9	VCT		
10	SUSPENDED CEILINGS		
11	PAINT		
12	TOILET COMPARTMENT		
13	TOILET ACCESSORIES		

14	PLUMBING FIXTURES – CHINA	
15	FAUCETS	
16	FLUSH VALVES	
17	WASH STATIONS	
18	WATER HEATERS	
19	VAV BOXES	
20	HYDRONIC PUMPS	
21	EXHAUST FANS	
22	DIFFUSERS/REGRISTERS/GRILLES	
23	TEMPERATURE CONTROLS	
24	LIGHT FIXTURES (submit a complete listing using light fixture letter)	
25	LIGHTING CONTROLS	
26	PANELBOARDS	
27	FIRE ALARM DEVICES	
28	COMMUNICATION CABLING & CONNECTORS	
29	INTERCOM SYSTEM DEVICES	

#### UNIT PRICES:

Indicate on the lines below those unit prices to determine any adjustment to the contract price due to changes in work or extra work performed under this contract. The unit prices shall include the furnishing of all labor and materials, cost of all items, and overhead and profit for the Contractor, as well as any subcontractor involved. These unit prices shall be listed in units of work.

A maximum of 40 unit prices will be acceptable with each bid. Do not add supplemental sheets for unit pricing to this document.

The bidder shall submit the list of unit prices within one (1) hour of the bid.

	WORK (to be filled out by the Architect)	PRICE / UNIT (to be filled out by the	(to be filled out by the
1	DOOR/FRAME/HARDWARE SET: Flush Wood Door Type 'B1' + Steel Frame Type 'A3' + Hardware Set #07. Include demolition of existing and	Contractory	Contractory
2	Installation of new in existing masonry wall. Include painted frame. \$/Set 1/2" Interior Copper Domestic Water Piping with insulation. \$/LF		
3	1" Interior Copper Domestic Water Piping with insulation. \$/LF		
4	4" Underslab Sanitary Sewer Installed 42" Deep. \$/LF		
5	1-1/2" Hot Water Piping (heating loop) with insulation, installed. \$/LF		
6	3/4" EMT Conduit, installed. \$/LF		
7	3 #12 Conductors, installed. \$/LF		
8	Duplex Receptacle, installed.		
9	GFI Receptacle, installed.		
10	Quad Receptacle, installed.		
11	120-Volt, 20 Amp, Single Pole Circuit Breaker, installed.		
12	Fire Alarm A/V Unit, installed.		
13	Fire Alarm Pull Station, installed.		
14	Duct-mounted Smoke Detector, installed.		
15	Light Fixture (Type A), installed.		
16	Exit Sign (Type X), installed.		
17	Voice/Data Outlet with Three Company 6 RJ-45 Jacks, installed.		
18	Category 6 UTP Cable, installed in conduit.		

#### DIRECT MATERIAL PURCHASES:

Indicate on the lines below those materials to be purchased directly by the Owner with a Purchase Order to be issued by the Owner to the individual suppliers. The value of the direct Purchase Order cannot be less than \$5,000. Following the approval of bids, the Contractor shall formalize this list by completing and submitting the electronic Purchase Order Summary Form provided by KDE. Listing the supplier below means the Contractor is acknowledging authorization from the Supplier to include the Supplier in this bid.

A maximum of 40 POs will be acceptable with each bid. Add supplemental sheet for additional POs to this document.

The bidder shall submit the list of Purchase Orders within four (4	4) da	ays of the bi	d.
--	-------	---------------	----

	SUPPLIER	PURCHASE ORDER DESCRIPTION	PURCHASE ORDER AMT.
	(to be filled out by the Contractor)	(to be filled out by the Contractor)	(to be filled out by the Contractor)
1.			
2.			
3.			
4.			
5.			
6.			
7.			
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10.			
11.			
12.			
13.			
14.			
15.			
16.			
17.			
18.			
19.			
20.			

#### TIME LIMIT FOR EXECUTION OF CONTRACT DOCUMENTS:

In the event that a bidder's proposal is accepted by the Owner and such bidder should fail to execute the contract within ten (10) consecutive days from the date of notification of the awarding of the contract, the Owner, at his option, may determine that the awardee has abandoned the contract. The bidder's proposal shall then become null and void, and the bid bond or certified check which accompanied it shall be forfeited to and become the property of the Owner as liquidated damages for failure to execute the contract.

The bidder hereby agrees that failure to submit herein above all required information and/or prices can cause disqualification of this proposal.

Submitted by:

NAME OF CONTRACTOR / BIDDER:	
AUTHORIZED REPRESENTATIVE'S NAME: _	
AUTHORIZED REPRESENTATIVE'S NAME (p	Signature printed):
AUTHORIZED REPRESENTATIVE'S TITLE:	

NOTICE: Bid security must accompany this proposal if the Base Bid price is greater than of \$25,000.

# ▲IA<sup>®</sup> Document A310<sup>™</sup> – 2010

### Bid Bond

CONTRACTOR: (Name, legal status and address)

SURETY: (Name, legal status and principal place of business)

OWNER: (Name, legal status and address)

BOND AMOUNT:

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

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

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

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

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

When this Bond has been furnished to comply with a statutory or other legal requirement in the location of the Project, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

day of

Signed and sealed this

1

(Witness)	(Principal)	(Seal)
	(Title)	
(Witness)	(Surety)	(Seal)
(	(Title)	

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FACPAC Purchase Order Form Status:	Form
Project: Sebastian Elementary School - Partial BG Number: 19-320 Status:	Renovation District: BREATHITT COUNTY PUBLIC SCHOOLS Phase:
Contract: Type: General Contractor	Proposed
District PO Number	
Ky Sales Tax Exempt Number	
Date of Order	
Specification Section	
Material Description / Category	
Requested By	
Vendor Name	
Vendor Address	
Vendor Phone	
Vendor Email	
Bill To	
Bill To Address	
Ship To	

Ship To Address

Attention Of

### Contacts

The following project contacts must be notified 48 hours in advance of delivery to jobsite.

#### **Contact Name**

#### **Contact Phone**

## Materials

Furnish the necessary materials to complete the following bid package(s) / specification section(s) in its entirety. All materials shall be in accordance with the requirements of the Contract.

Item Description	Item Number	Quantity	Unit Price	Total
		Purcha	ase Order Total:	\$0.00
Authorization				
Owner Authorization Date				
Vendor Authorization Date				

tatement Phase	Final Statement	Final PO Amount	•	•	•	•	1	•	•	1	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•	•
PO Certification S	Initial Statement Change Order Stmt.	Reason For Change																											
	GESC	Change Order Amount To Date																											
Delivery Method	C CC	Initial PO Amount																											
	ARY SCHOOL	Vendor Name																											
	BREATHITT COUNTY SEBASTIAN ELEMENT	Purchase Order Description																											
Date Submitted	District Name Facility Name	Specification Section No.																											
		Bid. Pack.#																											
19-320	061 390	PO Numbe																											
BG	District Code School Code	Contractor Name																											

BG#	19-320		)ate Submitted			Delivery Method		PO Certification S	tatement Phase	
District Code School Code	061 390		District Name Facility Name	BREATHITT COUNTY SEBASTIAN ELEMENTAF	ZY SCHOOL	C C C	GESC	Initial Statement Change Order Stmt.	Final Statement	
Contractor Name	PO Number	Bid. Pack. #	Specification Section No.	Purchase Order Description	Vendor Name	Initial PO Amount	Change Order Amount To Date	Reason For Change	Final PO Amount	
									•	
									•••	
									•••	
									•	
									•	
									•	
All signatures held	ow are required b	ased unc	on the appropriate	e PO certification	Initial BO Tatal			Cincl DO Toto	•	
statement phase.	(Initial / Final)	2				٠ م	Э		- Α	
Initial Certification To the best of my will be purchased	on Statement · knowledge, I cer in accordance wi	tify that <i>e</i> ith 103 K.	all materials listed AR 26:070 and 7	l within this document 02 KAR 4:160.		Final Certification St To the best of my knov purchased in accordar	atement vledge, I certify that all r ice with 103 KAR 26:07	materials listed within this doc 0 and 702 KAR 4:160.	ument have been	II
Owner's Signatu	JICE			Date		Owner's Signature			Date	1
General Contrac	ctor's / Construc	tion Mar	nager's Signatu	Date		General Contractor's	. / Construction Manaç	ger's Signature	Date	1
Architect's Signs	ature			Date		Architect's Signature			Date	1

# Kentucky Department of Education Version of $\widehat{\mathbb{AIA}}^*$ Document A101<sup>TM</sup> – 2007

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



This version of AIA Document A101<sup>™</sup>–2007 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A101–2007 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A101–2007 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site.

Cite this document as "AIA Document A101<sup>™</sup>– 2007, Standard Form of Agreement Between Owner and Contractor where the basis of payment is a Stipulated Sum — KDE Version," or "AIA Document A101<sup>™</sup>–2007 — KDE Version."

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# Kentucky Department of Education Version of $\$ **AIA** Document A101 – 2007

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

day of

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

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

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

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



This version of AIA Document A101–2007 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A101 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A101–2007 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site.

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

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

The Owner and Contractor agree as follows.

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#### TABLE OF ARTICLES

- 1 THE CONTRACT DOCUMENTS
- 2 THE WORK OF THIS CONTRACT
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- 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), Owner direct Purchase Orders, 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

Init.

1

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

#### ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION

§ 3.1 The date of commencement of the Work shall be 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.)

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.

2

§ 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. Either list requirements for earlier Substantial Completion here or refer to an exhibit attached to this Agreement.)

Portion of Work

Substantial Completion Date

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

Liquidated Damages: As actual damages for delay in completion of Work are impossible to determine, the Contractor and his Surety shall be liable for and shall pay to the Owner the sum of

(\$ ), not as a penalty, but as fixed, agreed and liquidated damages for each calendar day of delay until the Contract Work is substantially completed as defined in the General Conditions of the Contract for Construction. The Owner shall have the right to deduct liquidated damages from money in hand otherwise due, or to become due, to the Contractor, or to sue and recover compensation for damages for failure to substantially complete the Work within the time stipulated herein. Said liquidated damages shall cease to accrue from the date of Substantial Completion.

#### ARTICLE 4 CONTRACT SUM

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 $\S$  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.

(List the base bid amount, sum of accepted alternates, total construction cost (the sum of base bid amount plus sum of accepted alternates), sum of Owner's direct Purchase Orders. The Contract Sum shall equal the sum of Total Construction Cost, less Owner direct Purchase Orders. Either list this information here or refer to an exhibit attached to this Agreement.)

	Amount
Base Bid	\$
Sum of Accepted Alternates	\$
Total Construction Cost (the sum of base bid amount plus sum of accepted alternates)	\$
Sum of Owner's direct Purchase Orders	\$
	¢

Contract Sum (total construction cost less Owner direct Purchase Orders) \$

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§ 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. Either list alternates here or refer to an exhibit attached to this Agreement.)

Number	Item Description	Amount
	Total of Alternates	

#### § 4.3 Unit prices, if any:

(Identify and state the unit price; state quantity limitations, if any, to which the unit price will be applicable. Either list unit prices here or refer to an exhibit attached to this Agreement.)

Item

Units and Limitations

Price per Unit (\$0.00)

§ 4.4 Allowances included in the Contract Sum, if any:

(Identify allowance and state exclusions, if any, from the allowance price. Either list allowances here or refer to an exhibit attached to this Agreement.)

Item

Price

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#### 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.

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

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the 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.

State law (KRS 371.405) requires the Owner to pay undisputed Applications for Payment within forty-five (45) business days following receipt of the invoices. If the Owner fails to pay the Contractor within forty-five (45) business days following receipt of an undisputed Application for Payment, state law requires the Owner shall pay interest to the Contractor beginning on the forty-sixth business day after receipt of the Application for Payment, computed at the rate required by state law.

§ 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.

 $\S\,5.1.6$  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 of

percent (%). 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<sup>TM</sup>–2007, General Conditions of the Contract for Construction — KDE Version;

- .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 of percent ( %);
- .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 KDE Version.

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

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 — KDE Version requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)

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.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 — KDE Version.

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

When Owner direct Purchase Orders are used, retainage that would otherwise be held on materials and equipment shall transfer to the Contractor, and the material suppliers will be paid the full amount of their invoices. The Owner shall retain ten percent (10%) from each Application for Payment, and an amount equal to ten percent (10%) of approved Purchase Order payments, up to fifty percent (50%) completion of the Work, then provided the Work is on schedule and satisfactory, and upon written request of the Contractor together with consent of surety and the recommendation of the Architect, the Owner shall approve a reduction in Retainage to five percent (5%) of the current Contract Sum plus Purchase Orders. No part of the five percent (5%) retainage shall be paid until after Substantial Completion, if reasons for reduction in retainage are certified in writing by the Architect, a reduction to a lump sum amount less than the five percent (5%) retainage may be approved by the Owner when deemed reasonable. The minimum lump sum retainage shall be twice the estimated cost to correct deficient or incomplete work.

§ 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

 $\S\,5.2.1$  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 — KDE Version, and to satisfy other requirements, if any, which extend beyond final payment;
- .2 a final Certificate for Payment has been issued by the Architect; and
- .3 the Contractor provides the Owner with affidavits that all payrolls, bills for materials, supplies and equipment, and other indebtedness connected with the Work have been paid or otherwise satisfied, and with Consent of Surety for final payment.

#### 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 — KDE Version, 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.)

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#### § 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 — KDE Version, 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.)

Arbitration pursuant to Section 15.4 of AIA Document A201–2007 — KDE Version



Litigation in a court of competent jurisdiction where the Project is located

Other: (*Specify*)

#### 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 — KDE Version.

 $\S$  7.2 The Work may be suspended by the Owner as provided in Article 14 of AIA Document A201–2007 — KDE Version.

#### ARTICLE 8 MISCELLANEOUS PROVISIONS

§ 8.1 Where reference is made in this Agreement to a provision of AIA Document A201–2007 — KDE Version 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 bear interest from the date payment is due at such rate required by state law, or in the absence of law, at the legal rate prevailing at the time and place where the Project is located. (*Insert rate of interest agreed upon, if any.*)

§ 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 — KDE Version.

§ 9.1.2 The General Conditions are AIA Document A201–2007, General Conditions of the Contract for Construction — KDE Version.

§ 9.1.3 The Supplementary and other Conditions of the Contract: *(Either list Supplementary and other Conditions of the Contract here or refer to an exhibit attached to this Agreement.)* 

Document

Title

Date

Pages

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

Section

Title

Date

Pages

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Number

Title

Date

§ 9.1.6 The Addenda, if any: (*Either list the Addenda here or refer to an exhibit attached to this Agreement.*)

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:

AIA Document E201<sup>TM</sup>–2007, Digital Data Protocol Exhibit, if completed by the parties, or the following:

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(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2007 — KDE Version 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.)

- A. AIA Document A701–1997, Instructions to Bidders KDE Version
- B. Contractor's Form of Proposal
- C. KDE Purchase Order Summary Form

#### 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 – KDE Version.

(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007 – KDE Version. Either list insurance and bond information here or refer to an exhibit attached to this Agreement.)

Type of Insurance or Bond

Limit of Liability or Bond Amount (\$0.00)

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

CONTRACTOR (Signature)

(Printed name and title)

(Printed name and title)

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# Kentucky Department of Education Version of **MAIA**<sup>®</sup> Document A201<sup>™</sup> – 2007

# General Conditions of the Contract for Construction



This version of AIA Document A201<sup>™</sup>–2007 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A201–2007 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A201–2007 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site.

Cite this document as "AIA Document A201<sup>™</sup>–2007, General Conditions of the Contract for Construction—KDE Version," or "AIA Document A201<sup>™</sup>–2007 — KDE Version."

# Kentucky Department of Education Version of $\textcircled{Bar}{AIA}$ Document A201<sup>TM</sup> – 2007

# General Conditions of the Contract for Construction

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

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

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

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- 3 CONTRACTOR
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- 5 SUBCONTRACTORS
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This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification.

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

#### § 1.1.2 The Contract

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

#### §1.1.3 The Work

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

#### §1.1.4 The Project

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

#### § 1.1.5 The Drawings

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

#### § 1.1.6 The Specifications

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

#### § 1.1.7 Instruments of Service

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

#### § 1.1.8 Initial Decision Maker

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

#### § 1.2 Correlation and Intent of the Contract Documents

§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

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

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

#### §1.3 Capitalization

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

#### § 1.4 Interpretation

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

#### § 1.5 Ownership and Use of Drawings, Specifications and Other Instruments of Service

§ 1.5.1 The Architect and the Architect's consultants shall be deemed the authors and owners of their respective Instruments of Service, including the Drawings and Specifications, and will retain all common law, statutory and other reserved rights, including copyrights. The Contractor, Subcontractors, Sub-subcontractors, and material or equipment suppliers shall not own or claim a copyright in the Instruments of Service. Submittal or distribution to meet official regulatory requirements or for other purposes in connection with this Project is not to be construed as publication in derogation of the Architect's or Architect's consultants' reserved rights.

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

#### § 1.6 Transmission of Data in Digital Form

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

#### ARTICLE 2 OWNER

#### § 2.1 General

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

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

# § 2.2 Information and Services Required of the Owner § 2.2.1 (Not Used)

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

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

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

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

#### § 2.3 Owner's Right to Stop the Work

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

#### § 2.4 Owner's Right to Carry Out the Work

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

#### ARTICLE 3 CONTRACTOR

#### § 3.1 General

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

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

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

#### § 3.2 Review of Contract Documents and Field Conditions by Contractor

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.3, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for

information in such form as the Architect may require. It is recognized that the Contractor's review is made in the Contractor's capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

#### § 3.3 Supervision and Construction Procedures

§ 3.3.1 The Contractor shall supervise and direct the Work, using the Contractor's best skill and attention. The Contractor shall be solely responsible for, and have control over, construction means, methods, techniques, sequences and procedures and for coordinating all portions of the Work under the Contract, unless the Contract Documents give other specific instructions concerning these matters. If the Contract Documents give specific instructions concerning construction means, methods, techniques, sequences or procedures, the Contractor shall evaluate the jobsite safety thereof and, except as stated below, shall be fully and solely responsible for the jobsite safety of such means, methods, techniques, sequences or procedures that such means, methods, techniques, sequences or procedures from the Architect. If the Contractor is then instructed to proceed with the required means, methods, techniques, sequences or procedures without acceptance of changes proposed by the Contractor, the Owner shall be solely responsible for any loss or damage arising solely from those Owner-required means, methods, techniques, sequences or procedures.

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

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

#### § 3.4 Labor and Materials

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

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

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

#### § 3.5 Warranty

The Contractor warrants to the Owner and Architect that materials and equipment furnished under the Contract will be of good quality and new unless the Contract Documents require or permit otherwise. The Contractor further

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

#### § 3.6 Taxes

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

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

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

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

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

#### § 3.7.4 Concealed or Unknown Conditions

If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor's cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect's determination or recommendation, that party may proceed as provided in Article 15.

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

#### § 3.8 Allowances

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

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

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

#### § 3.9 Superintendent

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

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

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

#### § 3.10 Contractor's Construction Schedules

§ 3.10.1 The Contractor, promptly after being awarded the Contract, shall prepare and submit for the Owner's and Architect's information a Contractor's construction schedule for the Work. The schedule shall not exceed time limits current under the Contract Documents, shall be revised at appropriate intervals as required by the conditions of the Work and Project, shall be related to the entire Project to the extent required by the Contract Documents, and shall provide for expeditious and practicable execution of the Work.

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

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

#### § 3.11 Documents and Samples at the Site

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

#### § 3.12 Shop Drawings, Product Data and Samples

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

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

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

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

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

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

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

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

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

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

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concept expressed in the Contract Documents. The Contractor shall not be responsible for the adequacy of the performance and design criteria specified in the Contract Documents.

#### § 3.13 Use of Site

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

#### § 3.14 Cutting and Patching

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

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

#### § 3.15 Cleaning Up

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

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

#### § 3.16 Access to Work

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

#### § 3.17 Royalties, Patents and Copyrights

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

#### § 3.18 Indemnification

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

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

#### ARTICLE 4 ARCHITECT § 4.1 General

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

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

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

#### § 4.2 Administration of the Contract

§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner's representative during construction until the date the Architect issues the final Certificate for Payment, and, at the discretion of the Owner may be the Owner's representative during the one-year period for correction of Work described in Section 12.2. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

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

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

#### § 4.2.4 Communications Facilitating Contract Administration

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

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

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

§ 4.2.7 The Architect will review and approve, or take other appropriate action upon, the Contractor's submittals such as Shop Drawings, Product Data and Samples, but only for the limited purpose of checking for conformance

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

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

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

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

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

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

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

#### ARTICLE 5 SUBCONTRACTORS

#### § 5.1 Definitions

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

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

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

§ 5.2.1 Unless otherwise stated in the Contract Documents or the bidding requirements, the Contractor, as soon as practicable after award of the Contract, shall furnish in writing to the Owner through the Architect the names of persons or entities (including those who are to furnish materials or equipment fabricated to a special design)

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proposed for each principal portion of the Work. The Architect may reply within 14 days to the Contractor in writing stating (1) whether the Owner or the Architect has reasonable objection to any such proposed person or entity or (2) that the Architect requires additional time for review. Failure of the Owner or Architect to reply within the 14-day period shall constitute notice of no reasonable objection.

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

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

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

#### § 5.3 Subcontractual Relations

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

#### § 5.4 Contingent Assignment of Subcontracts

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

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

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

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

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

## ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

### $\S\,6.1$ Owner's Right to Perform Construction and to Award Separate Contracts

 $\S$  6.1.1 The Owner reserves the right to perform construction or operations related to the Project with the Owner's own forces, and to award separate contracts in connection with other portions of the Project or other construction or operations on the site under Conditions of the Contract identical or substantially similar to these including those portions related to insurance and waiver of subrogation. If the Contractor claims that delay or additional cost is involved because of such action by the Owner, the Contractor shall make such Claim as provided in Article 15.

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

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

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

#### § 6.2 Mutual Responsibility

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

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

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

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

#### § 6.3 Owner's Right to Clean Up

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

#### ARTICLE 7 CHANGES IN THE WORK

#### § 7.1 General

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

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

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

§ 7.1.4 Proposed Change in the Work equal to or exceeding \$25,000 additive or deductive, shall be subject to approval by the Kentucky Department of Education prior to execution of the Change Order by the Owner.

#### § 7.2 Change Orders

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

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

#### § 7.3 Construction Change Directives

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

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

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

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

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

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

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

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit not to exceed fifteen (15%) of the net cost of the change. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

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

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

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

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

#### § 7.4 Minor Changes in the Work

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

#### ARTICLE 8 TIME

#### § 8.1 Definitions

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

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

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

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

#### § 8.2 Progress and Completion

§ 8.2.1 Time limits stated in the Contract Documents are of the essence of the Contract. By executing the Agreement the Contractor confirms that the Contract Time is a reasonable period for performing the Work.

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

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furnished by the Contractor and Owner. The date of commencement of the Work shall not be changed by the effective date of such insurance.

 $\S\,8.2.3$  The Contractor shall proceed expeditiously with adequate forces and shall achieve Substantial Completion within the Contract Time.

#### § 8.3 Delays and Extensions of Time

§ 8.3.1 If the Contractor is delayed at any time in the commencement or progress of the Work by an act or neglect of the Owner or Architect, or of an employee of either, or of a separate contractor employed by the Owner; or by changes ordered in the Work; or by labor disputes, fire, unusual delay in deliveries, unavoidable casualties or other causes beyond the Contractor's control; or by delay authorized by the Owner pending mediation and arbitration; or by other causes that the Architect determines may justify delay, then the Contract Time shall be extended by Change Order for such reasonable time as the Architect may determine.

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

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

#### ARTICLE 9 PAYMENTS AND COMPLETION

#### § 9.1 Contract Sum

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

#### § 9.2 Schedule of Values

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

#### § 9.3 Applications for Payment

§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor's right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage as stipulated in Section 9.3.4.

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

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

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

§ 9.3.3 The Contractor warrants that title to all Work covered by an Application for Payment will pass to the Owner no later than the time of payment. The Contractor further warrants that upon submittal of an Application for Payment all Work for which Certificates for Payment have been previously issued and payments received from the

Owner shall, to the best of the Contractor's knowledge, information and belief, be free and clear of liens, claims, security interests or encumbrances in favor of the Contractor, Subcontractors, material suppliers, or other persons or entities making a claim by reason of having provided labor, materials and equipment relating to the Work.

§ 9.3.4 When Owner direct Purchase Orders are used, retainage that would otherwise be held on materials and equipment shall transfer to the Contractor, and the material suppliers will be paid the full amount of their invoices. The Owner shall retain ten percent (10%) from each Application for Payment, and an amount equal to ten percent (10%) of approved Purchase Order payments, up to fifty percent (50%) completion of the Work, then provided the Work is on schedule and satisfactory, and upon written request of the Contractor together with consent of surety and the recommendation of the Architect, the Owner shall approve a reduction in Retainage to five percent (5%) of the current Contract Sum plus Purchase Orders. No part of the five percent (5%) retainage shall be paid until after Substantial Completion of the Work, as defined in Section 9.8. herein. After Substantial Completion, if reasons for reduction in retainage may be approved by the Owner when deemed reasonable. The minimum lump sum retainage shall be twice the estimated cost to correct deficient or incomplete work.

#### § 9.4 Certificates for Payment

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

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

#### § 9.5 Decisions to Withhold Certification

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

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

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

§ 9.5.3 If the Architect withholds certification for payment under Section 9.5.1.3, the Owner may, at its sole option, issue joint checks to the Contractor and to any Subcontractor or material or equipment suppliers to whom the Contractor failed to make payment for Work properly performed or material or equipment suitably delivered. If the Owner makes payments by joint check, the Owner shall notify the Architect and the Architect will reflect such payment on the next Certificate for Payment.

#### § 9.6 Progress Payments

§ 9.6.1 After the Architect has issued a Certificate for Payment, the Owner shall make payment in the manner and within the time provided in the Contract Documents or as required by state law, whichever is more restrictive, and shall so notify the Architect.

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

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

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

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

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

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

#### § 9.7 Failure of Payment

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

#### § 9.8 Substantial Completion

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

occupancy permit issued by the Kentucky Department of Housing, Building, and Construction and any other agencies that have statutory authority and approval requirements.

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

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

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

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

#### § 9.9 Partial Occupancy or Use

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

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

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

#### § 9.10 Final Completion and Final Payment

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

.1 Upon receipt and approval of the final Application for Payment, for each Contract and Purchase Order, if any, the Architect will prepare, and the Architect and Owner shall complete their portion of the Kentucky Department of Education BG-4 Contract Closeout Form – 2013, and forward the board-approved BG-4 form to the Kentucky Department of Education with a copy of the final Certificate for Payment upon the Board authorizing the BG-4 form, accepting the Work, and approving final payment to the Contractor or Material Supplier.

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

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

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

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

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

#### ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

#### § 10.1 Safety Precautions and Programs

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

#### § 10.2 Safety of Persons and Property

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

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

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

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

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

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

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

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

#### § 10.2.8 Injury or Damage to Person or Property

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

#### § 10.3 Hazardous Materials

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

§ 10.3.2 Upon receipt of the Contractor's written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor's reasonable additional costs of shut-down, delay and start-up.

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

§ 10.3.4 The Owner shall not be responsible under this Section 10.3 for materials or substances the Contractor brings to the site unless such materials or substances are required by the Contract Documents. The Owner shall be responsible for materials or substances required by the Contract Documents, except to the extent of the Contractor's fault or negligence in the use and handling of such materials or substances.

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

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

#### § 10.4 Emergencies

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

#### ARTICLE 11 INSURANCE AND BONDS

#### § 11.1 Contractor's Liability Insurance

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

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

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor's completed operations coverage, until the expiration of the period for correction of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents. Such insurance shall be no less than the following amounts:

(1) Public Liability	\$200,000.00 one person/maximum each person \$500,000.00 one accident/maximum each person
(2) Property Damage	\$200,000.00 one accident/maximum \$500,000.00 aggregate

**§** 11.1.2.1 The insurance required by Section 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 (e.g., Longshoreman's)	Statutory
	c.	Employer's Liability	\$500,000

#### (2) Comprehensive or Commercial General Liability (including Premises-Operations; Independent Contractor's Protection; Product Liability and Completed Operations; Broad Form Property Damage);

Co	ntractor's Protection; Product Liability and Complete	d Operations; Broad Form Pro
a.	General Aggregate	
	(except Products-Completed Operations)	\$1,000,000
b.	Products-Completed Operations Aggregate	\$1,000,000
c.	Personal/Advertising Injury	
	(per person/organization)	\$1,000,000
d.	Each Occurrence	
	(Bodily Injury and Property Damage)	\$1,000,000
e.	Limit per Person Medical Expense	\$10,000

- f. Exclusions of Property in Contractors Care, Custody or Control will be eliminated.
- g. Property Damage Liability Insurance will provide Coverage for Explosion, Collapse, and Underground Damage.
- (3) Contractual Liability:

/			
	a.	General Aggregate	\$1,000,000
	b.	Each Occurrence (Bodily Injury and Property Damage)	\$1,000,000

(4)	Au	tomobile Liability:	
	a.	Bodily Injury	\$500,000 Each Person
			\$1,000,000 Each Accident
	b.	Property Damage	\$500,000 Each Accident, or
			a combined single limit of \$1,000,000

(5) Liability coverage for the Owner, the Architect, the Architect's Consultants and others listed in the Supplementary Conditions will be provided (subject to customary exclusions for professional liability), by endorsement as additional insured's on the Contractor's Liability Policy.

Excess Liability Umbrella Form:		
a.	General Aggregate	\$1,000,000
b.	Each Occurrence	\$1,000,000
	Exc a. b.	<ul><li>Excess Liability Umbrella Form:</li><li>a. General Aggregate</li><li>b. Each Occurrence</li></ul>

§ 11.1.2.2 There shall be an endorsement in each of the above policies reading as follows: "It is hereby agreed that in the event of a claim arising under this policy, the company may not deny liability be reason of the insured being a state, county, municipal corporation or governmental agency."

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

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

#### § 11.2 Owner's Liability Insurance

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

#### § 11.3 Property Insurance

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

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

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

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

 $\S$  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 Owner and the Contractor shall take reasonable steps to obtain consent of the insurance company or
companies and shall, without mutual written consent, take no action with respect to partial occupancy or use that would cause cancellation, lapse or reduction of insurance.

#### § 11.3.2 Boiler and Machinery Insurance

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

#### § 11.3.3 Loss of Use Insurance

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

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

§ 11.3.5 If during the Project construction period the Owner insures properties, real or personal or both, at or adjacent to the site by property insurance under policies separate from those insuring the Project, or if after final payment property insurance is to be provided on the completed Project through a policy or policies other than those insuring the Project during the construction period, the Owner shall waive all rights in accordance with the terms of Section 11.3.7 for damages caused by fire or other causes of loss covered by this separate property insurance. All separate policies shall provide this waiver of subrogation by endorsement or otherwise.

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

§ 11.3.6.1 Before an exposure to loss may occur, the Owner shall provide the Architect and the Kentucky Department of Education with certificates of insurance coverage required by this Section 11.3.

#### § 11.3.7 Waivers of Subrogation

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

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

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

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

#### § 11.4 Performance Bond and Payment Bond

§ 11.4.1 Unless otherwise provided, when the Contract Sum exceeds twenty-five thousand dollars (\$25,000) the Contractor shall furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder. A surety company authorized to do business in Kentucky shall execute bonds, and the cost thereof shall be included in the Contract Sum. Unless otherwise provided, the amount of each bond shall be equal to 100% of the Contract Sum plus Purchase Orders, or 100% of the Lump Sum Base Bid plus or minus accepted Alternates, whichever is greater.

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

#### ARTICLE 12 UNCOVERING AND CORRECTION OF WORK

#### § 12.1 Uncovering of Work

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

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

#### § 12.2 Correction of Work

#### § 12.2.1 Before or After Substantial Completion

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

#### § 12.2.2 After Substantial Completion

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

Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.

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

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

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

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

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

#### § 12.3 Acceptance of Nonconforming Work

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

#### ARTICLE 13 MISCELLANEOUS PROVISIONS

#### §13.1 Governing Law

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

§ 13.1.1 None of the Contract Documents for this project shall be construed against the party preparing documents on the grounds that the party prepared or drafted the document, or any portion thereof.

#### § 13.2 Successors and Assigns

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

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

#### §13.3 Written Notice

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

#### § 13.4 Rights and Remedies

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

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

#### § 13.5 Tests and Inspections

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

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

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

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

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

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

#### § 13.6 Interest

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as required by state law, or in the absence of law, at the legal rate prevailing at the time and place where the Project is located.

#### § 13.7 Time Limits on Claims

The Owner and Contractor shall commence all claims and causes of action, whether in contract, tort, breach of warranty or otherwise, against the other arising out of or related to the Contract in accordance with the requirements of the final dispute resolution method selected in the Agreement within the time period specified by applicable law, but in any case not more than 10 years after the date of Substantial Completion of the Work. The Owner and Contractor waive all claims and causes of action not commenced in accordance with this Section 13.7.

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

#### § 14.1 Termination by the Contractor

§ 14.1.1 The Contractor may terminate the Contract if the Work is stopped for a period of 30 consecutive days through no act or fault of the Contractor or a Subcontractor, Sub-subcontractor or their agents or employees or any

other persons or entities performing portions of the Work under direct or indirect contract with the Contractor, for any of the following reasons:

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

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

§ 14.1.3 If one of the reasons described in Section 14.1.1 or 14.1.2 exists, the Contractor may, upon seven days' written notice to the Owner and Architect, terminate the Contract and recover from the Owner payment for Work executed, including reasonable overhead and profit, costs incurred by reason of such termination, and damages.

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

#### § 14.2 Termination by the Owner for Cause

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

§ 14.2.2 When any of the above reasons exist, the Owner, upon certification by the Initial Decision Maker that sufficient cause exists to justify such action, may without prejudice to any other rights or remedies of the Owner and after giving the Contractor and the Contractor's surety, if any, seven days' written notice, terminate employment of the Contractor and may, subject to any prior rights of the surety:

- 1 Exclude the Contractor from the site and take possession of all materials, equipment, tools, and construction equipment and machinery thereon owned by the Contractor;
- .2 Accept assignment of subcontracts pursuant to Section 5.4; and
- .3 Finish the Work by whatever reasonable method the Owner may deem expedient. Upon written request of the Contractor, the Owner shall furnish to the Contractor a detailed accounting of the costs incurred by the Owner in finishing the Work.

§ 14.2.3 When the Owner terminates the Contract for one of the reasons stated in Section 14.2.1, the Contractor shall not be entitled to receive further payment until the Work is finished.

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect's services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case

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

#### § 14.3 Suspension by the Owner for Convenience

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

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

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

#### § 14.4 Termination by the Owner for Convenience

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

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner's convenience, the Contractor shall .1

- cease operations as directed by the Owner in the notice;
- .2 take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
- .3 except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

§ 14.4.3 In case of such termination for the Owner's convenience, the Contractor shall be entitled to receive payment for Work executed, and costs incurred by reason of such termination, along with reasonable overhead and profit on the Work not executed.

#### ARTICLE 15 CLAIMS AND DISPUTES

#### § 15.1 Claims

#### § 15.1.1 Definition

A Claim is a demand or assertion by one of the parties seeking, as a matter of right, payment of money, or other relief with respect to the terms of the Contract. The term "Claim" also includes other disputes and matters in question between the Owner and Contractor arising out of or relating to the Contract. The responsibility to substantiate Claims shall rest with the party making the Claim.

#### § 15.1.2 Notice of Claims

Claims by either the Owner or Contractor must be initiated by written notice to the other party and to the Initial Decision Maker with a copy sent to the Architect, if the Architect is not serving as the Initial Decision Maker. Claims by either party must be initiated within 21 days after occurrence of the event giving rise to such Claim or within 21 days after the claimant first recognizes the condition giving rise to the Claim, whichever is later.

#### § 15.1.3 Continuing Contract Performance

Pending final resolution of a Claim, except as otherwise agreed in writing or as provided in Section 9.7 and Article 14, the Contractor shall proceed diligently with performance of the Contract and the Owner shall continue to make payments in accordance with the Contract Documents. The Architect will prepare Change Orders and issue Certificates for Payment in accordance with the decisions of the Initial Decision Maker.

#### § 15.1.4 Claims for Additional Cost

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

#### § 15.1.5 Claims for Additional Time

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

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.

#### § 15.1.6 Claims for Consequential Damages

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

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

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

#### § 15.2 Initial Decision

§ 15.2.1 Claims, excluding those arising under Sections 10.3, 10.4, 11.3.9, and 11.3.10, shall be referred to the Initial Decision Maker for initial decision. The Architect will serve as the Initial Decision Maker, unless otherwise indicated in the Agreement. Except for those Claims excluded by this Section 15.2.1, an initial decision shall be required as a condition precedent to mediation of any Claim arising prior to the date final payment is due, unless 30 days have passed after the Claim has been referred to the Initial Decision Maker with no decision having been rendered. Unless the Initial Decision Maker and all affected parties agree, the Initial Decision Maker will not decide disputes between the Contractor and persons or entities other than the Owner.

§ 15.2.2 The Initial Decision Maker will review Claims and within ten days of the receipt of a Claim take one or more of the following actions: (1) request additional supporting data from the claimant or a response with supporting data from the other party, (2) reject the Claim in whole or in part, (3) approve the Claim, (4) suggest a compromise, or (5) advise the parties that the Initial Decision Maker is unable to resolve the Claim if the Initial Decision Maker lacks sufficient information to evaluate the merits of the Claim or if the Initial Decision Maker concludes that, in the Initial Decision Maker's sole discretion, it would be inappropriate for the Initial Decision Maker to resolve the Claim.

§ 15.2.3 In evaluating Claims, the Initial Decision Maker may, but shall not be obligated to, consult with or seek information from either party or from persons with special knowledge or expertise who may assist the Initial Decision Maker in rendering a decision. The Initial Decision Maker may request the Owner to authorize retention of such persons at the Owner's expense.

§ 15.2.4 If the Initial Decision Maker requests a party to provide a response to a Claim or to furnish additional supporting data, such party shall respond, within ten days after receipt of such request, and shall either (1) provide a response on the requested supporting data, (2) advise the Initial Decision Maker when the response or supporting data will be furnished or (3) advise the Initial Decision Maker that no supporting data will be furnished. Upon receipt of the response or supporting data, if any, the Initial Decision Maker will either reject or approve the Claim in whole or in part.

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

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

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

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

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

#### § 15.3 Mediation

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

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

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

#### § 15.4 Arbitration

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

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

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

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

#### § 15.4.4 Consolidation or Joinder

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

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

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



#### SECTION 006500 - SUPPLEMENTARY CONDITIONS

#### 1.1 SCOPE

- A. The following instructions modify, change, delete from or add to AIA Document A201-General Conditions of the Contract for Construction as amended by the Kentucky Department of Education, Division of Facilities Management. Where any article of the General Conditions is modified or any paragraph, subparagraph or clause thereof is modified or deleted by these Supplementary Instructions to Bidders, the unaltered provisions of that Article, paragraph, subparagraph or clause shall remain in effect.
- B. The Kentucky Fairness in Construction Act, KRS 371.400 to 371.990, applies to this construction contract, and where there is a conflict between the terms and conditions of these contract documents and the provisions of the Kentucky Fairness in Construction Act, the latter shall prevail.

#### 1.2 ARTICLE 1 GENERAL CONDITIONS

- A. Add the following:
  - 1.7 A Material Supplier (Supplier) is a person or organization who has a direct Purchase Order responsibility to the Owner. A Material Supplier can not be an installing contractor.

#### 1.3 ARTICLE 3 - CONTRACTOR

- A. Add the following:
  - 3.4.4 Material Supplier assumes all responsibility for materials until delivery is accepted by the Contractor. The designated Contractor or Subcontractor responsible for installation of Purchase Order material or equipment is to supervise and accept delivery, unload, handle store, layout and install the items.
  - 3.4.4.1 Upon delivery, the designated Contractor is to verify product suitability, quantity, quality and condition as soon as it can be ascertained and shall accept care, custody and control responsibility as if it were his own purchase. Any damage or loss after delivery will be the responsibility of the responsible Contractor or Subcontractor.
  - 3.5.1 Material Supplier will guarantee all materials furnished under a purchase order to be in accordance with the requirements of the contract documents. This guarantee shall extend through the construction period and one (1) year from the date of Substantial Completion, upon final acceptance by the Owner. The Contractor shall also guarantee and warrant to the Owner all materials purchased directly by the Owner by Purchase Order shall fully conform to the requirements of the Contract Documents.
  - 3.6.1 Kentucky Sales Tax does not apply to materials purchased directly by the Owner with an approved Purchase Order in accordance with KRS 139.495 (1) after appropriate Advertisement for Bids.

#### 1.4 ARTICLE 9 PAYMENTS AND COMPLETION

- A. Add the following:
  - 9.3.1.3 The Contractor and Sub-Contractor shall submit with each Application for Payment a Purchase Order Payment Authorization, authorizing the Owner to make payment for materials being supplied via a Purchase Order. The Contractor and/or Subcontractors shall assemble and attach

to the Purchase Order Payment Authorization, Original Invoices for materials that are to be incorporated in the work. Invoiced materials must either be at the job site at the time of invoice, or, if properly stored off-site, invoices must be accompanied by a properly executed certificate of insurance as required by Article 11.4.1.4 of the General Conditions, Each invoice must indicate the purchase order number, and include only changers for material incorporated into the Work. Invoices that include items such as tools, sales tax, finance charges, deposits, etc. will be rejected and returned to the Contractor. Invoices submitted directly to the Owner will be rejected and returned to the Contractor.

- 9.3.1.3.1 Interest/Finance charges by a Material Supplier, due to the Contractor approval of a partial payment of a submitted invoice, shall be the responsibility of the Contractor.
- 9.3.1.3.2 In the event that at the completion of the Work the contractor has not submitted invoices totaling the value of any individual purchase order, that purchase order shall be considered complete and closed. NO ADJUSTMENT WILL BE MADE TO THE CONTRACTOR'S CONTRACT.

END OF SECTION

# Kentucky Department of Education Version of $\mathbb{AIA}^{\mathbb{A}}$ Document A312<sup>TM</sup> – 2010

### Performance Bond and Payment Bond



This version of AIA Document A312<sup>™</sup>–2010 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A312–2010 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A312–2010 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site.

Cite this document as "AIA Document A312<sup>™</sup>–2010, Performance Bond and Payment Bond— KDE Version," or "AIA Document A312<sup>™</sup>–2010 — KDE Version."

# Kentucky Department of Education Version of BAIA Document A312TM – 2010

### Performance Bond

CONTRACTOR: *(Name, legal status and address)* 

SURETY: (Name, legal status and principal place of business)

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

CONSTRUCTION CONTRACT **Date:** 

Amount:

Description: (*Name and location*)

BOND Date: (Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond:  $\Box$  None

□ See Section 16

CONTRACTOR AS PRINCIPAL
Company: (Corporate Seal)

SURETY **Company**:

(Corporate Seal)

Signature:	Signature:
Name	Name
and Title:	and Title:
(Any additional signatures appear on the last	t page of this Performance Bond.)

(FOR INFORMATION ONLY — Name, address and telephone) AGENT or BROKER: OWNER'S REPRESENTATIVE: (Architect, Engineer or other party:)



This version of AIA Document A312-2010 is modified by the Kentucky Department of Education. Publication of this version of AIA Document A312 does not imply the American Institute of Architects' endorsement of any modification by the Kentucky Department of Education. A comparative version of AIA Document A312-2010 showing additions and deletions by the Kentucky Department of Education is available for review on the Kentucky Department of Education Web site. This document has important legal consequences. Consultation with an attorney is encouraged with respect to its completion or modification. Any singular reference to Contractor, Surety, Owner or other party shall be considered plural where applicable.

AIA Document A312–2010 combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

Init.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner for the performance of the Construction Contract, which is incorporated herein by reference.

 $\S$  2 If the Contractor performs the Construction Contract, the Surety and the Contractor shall have no obligation under this Bond, except when applicable to participate in a conference as provided in Section 3.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation under this Bond shall arise after

- 1 the Owner first provides notice to the Contractor and the Surety that the Owner is considering declaring a Contractor Default. Such notice shall indicate whether the Owner is requesting a conference among the Owner, Contractor and Surety to discuss the Contractor's performance. If the Owner does not request a conference, the Surety may, within five (5) business days after receipt of the Owner's notice, request such a conference. If the Surety timely requests a conference, the Owner shall attend. Unless the Owner agrees otherwise, any conference requested under this Section 3.1 shall be held within ten (10) business days of the Surety's receipt of the Owner's notice. If the Owner's notice. If the Owner, the Contractor and the Surety agree, the Contractor shall be allowed a reasonable time to perform the Construction Contract, but such an agreement shall not waive the Owner's right, if any, subsequently to declare a Contractor Default;
- 2 the Owner declares a Contractor Default, terminates the Construction Contract and notifies the Surety; and
- .3 the Owner has agreed to pay the Balance of the Contract Price in accordance with the terms of the Construction Contract to the Surety or to a contractor selected to perform the Construction Contract.

 $\S$  4 Failure on the part of the Owner to comply with the notice requirement in Section 3.1 shall not constitute a failure to comply with a condition precedent to the Surety's obligations, or release the Surety from its obligations, except to the extent the Surety demonstrates actual prejudice.

 $\S\,5$  When the Owner has satisfied the conditions of Section 3, the Surety shall promptly and at the Surety's expense take one of the following actions:

§ 5.1 Arrange for the Contractor, with the consent of the Owner, to perform and complete the Construction Contract;

§ 5.2 Undertake to perform and complete the Construction Contract itself, through its agents or independent contractors;

 $\S$  5.3 Obtain bids or negotiated proposals from qualified contractors acceptable to the Owner for a contract for performance and completion of the Construction Contract, arrange for a contract to be prepared for execution by the Owner and a contractor selected with the Owner's concurrence, to be secured with performance and payment bonds executed by a qualified surety equivalent to the bonds issued on the Construction Contract, and pay to the Owner the amount of damages as described in Section 7 in excess of the Balance of the Contract Price incurred by the Owner as a result of the Contractor Default; or

§ 5.4 Waive its right to perform and complete, arrange for completion, or obtain a new contractor and with reasonable promptness under the circumstances:

- .1 After investigation, determine the amount for which it may be liable to the Owner and, as soon as
  - practicable after the amount is determined, make payment to the Owner; or
- Deny liability in whole or in part and notify the Owner, citing the reasons for denial.

§ 6 If the Surety does not proceed as provided in Section 5 with reasonable promptness, the Surety shall be deemed to be in default on this Bond seven days after receipt of an additional written notice from the Owner to the Surety demanding that the Surety perform its obligations under this Bond, and the Owner shall be entitled to enforce any remedy available to the Owner. If the Surety proceeds as provided in Section 5.4, and the Owner refuses the payment or the Surety has denied liability, in whole or in part, without further notice the Owner shall be entitled to enforce any remedy available to the Owner.

§ 7 If the Surety elects to act under Section 5.1, 5.2 or 5.3, then the responsibilities of the Surety to the Owner shall not be greater than those of the Contractor under the Construction Contract, and the responsibilities of the Owner to the Surety shall not be greater than those of the Owner under the Construction Contract. Subject to the commitment by the Owner to pay the Balance of the Contract Price, the Surety is obligated, without duplication, for

- .1 the responsibilities of the Contractor for correction of defective work and completion of the Construction Contract;
- .2 additional legal, design professional and delay costs resulting from the Contractor's Default, and resulting from the actions or failure to act of the Surety under Section 5; and
- .3 liquidated damages, or if no liquidated damages are specified in the Construction Contract, actual damages caused by delayed performance or non-performance of the Contractor.

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§ 8 If the Surety elects to act under Section 5.1, 5.3 or 5.4, the Surety's liability is limited to the amount of this Bond.

§ 9 The Surety shall not be liable to the Owner or others for obligations of the Contractor that are unrelated to the Construction Contract, and the Balance of the Contract Price shall not be reduced or set off on account of any such unrelated obligations. No right of action shall accrue on this Bond to any person or entity other than the Owner or its heirs, executors, administrators, successors and assigns.

10 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 11 Any proceeding, legal or equitable, under this Bond may be instituted in any court of competent jurisdiction in the location in which the work or part of the work is located and shall be instituted within two years after a declaration of Contractor Default or within two years after the Contractor ceased working or within two years after the Surety refuses or fails to perform its obligations under this Bond, whichever occurs first. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 12 Notice to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears.

§ 13 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

#### §14 Definitions

§ 14.1 Balance of the Contract Price. The total amount payable by the Owner to the Contractor under the Construction Contract after all proper adjustments have been made, including allowance to the Contractor of any amounts received or to be received by the Owner in settlement of insurance or other claims for damages to which the Contractor is entitled, reduced by all valid and proper payments made to or on behalf of the Contractor under the Construction Contract.

§ 14.2 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and changes made to the agreement and the Contract Documents.

§ 14.3 Contractor Default. Failure of the Contractor, which has not been remedied or waived, to perform or otherwise to comply with a material term of the Construction Contract.

§ 14.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 14.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 15 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 16 Modifications to this bond are as follows:

§ 16.1 Surety Company shall be licensed to conduct business in the Commonwealth of Kentucky.

§ 16.2 Insurance Agency and Agents issuing bond shall be registered and licensed to conduct business in the Commonwealth of Kentucky with the appropriate Power of Attorney included.

§ 16.3 Bond shall comply with all statutory requirements of the Commonwealth of Kentucky including the Kentucky Unemployment Insurance Law.

§ 16.4 No suit, action or proceeding by reason or any default whatever shall be brought on this bond after two (2) years from the date on which final payment of the contract fall due and provided further that if any alterations or additions which may be made under the contract or in the work to be done under it, or the giving by the Owner of any extension of time for the performance of the contract or any other forbearance on the part of either the Owner or the Principal shall not, in any way, release the Principal and Surety, or either of them, their heirs, executors, administrators, successors, or assigns for their liability hereunder. Notice to the Surety of any such alterations, extensions, or forbearance being expressly waived.

This obligation shall remain in force and effect until the performance of all covenants, terms and conditions herein stipulated and after such performance, it shall become null and void.

(Space is provided below for additional signatures of added parties, other than those appearing on the cover page.)CONTRACTOR AS PRINCIPALSURETYCompany:(Corporate Seal)Company:Company:

Signature:	
Name and [	Fitle:
Address	

Signature: Name and Title: Address

Init.

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## Kentucky Department of Education Version of BAIA Document A312TM – 2010

### Payment Bond

CONTRACTOR: *(Name, legal status and address)* 

SURETY: (Name, legal status and principal place of business)



CONSTRUCTION CONTRACT **Date**:

Amount:

Description: (*Name and location*)

BOND Date: (Not earlier than Construction Contract Date)

Amount:

Modifications to this Bond:  $\Box$  None

□ See Section 18

CONTRACTOR AS PRINCIPAL
Company: (Corporate Seal)

SURETY **Company**:

(Corporate Seal)

Signature:	Signature:
Name	Name
and Title:	and Title:
(Any additional signatures appear on the last	page of this Payment Bond.)

(FOR INFORMATION ONLY — Name, address and telephone) AGENT or BROKER: OWNER'S REPRESENTATIVE: (Architect, Engineer or other party:)



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combines two separate bonds, a Performance Bond and a Payment Bond, into one form. This is not a single combined Performance and Payment Bond.

Init.

§ 1 The Contractor and Surety, jointly and severally, bind themselves, their heirs, executors, administrators, successors and assigns to the Owner to pay for labor, materials and equipment furnished for use in the performance of the Construction Contract, which is incorporated herein by reference, subject to the following terms.

§ 2 If the Contractor promptly makes payment of all sums due to Claimants, and defends, indemnifies and holds harmless the Owner from claims, demands, liens or suits by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract, then the Surety and the Contractor shall have no obligation under this Bond.

§ 3 If there is no Owner Default under the Construction Contract, the Surety's obligation to the Owner under this Bond shall arise after the Owner has promptly notified the Contractor and the Surety (at the address described in Section 13) of claims, demands, liens or suits against the Owner or the Owner's property by any person or entity seeking payment for labor, materials or equipment furnished for use in the performance of the Construction Contract and tendered defense of such claims, demands, liens or suits to the Contractor and the Surety.

 $\S$  4 When the Owner has satisfied the conditions in Section 3, the Surety shall promptly and at the Surety's expense defend, indemnify and hold harmless the Owner against a duly tendered claim, demand, lien or suit.

§ 5 The Surety's obligations to a Claimant under this Bond shall arise after the following:

§ 5.1 Claimants, who do not have a direct contract with the Contractor,

- 1 have furnished a written notice of non-payment to the Contractor, stating with substantial accuracy the amount claimed and the name of the party to whom the materials were, or equipment was, furnished or supplied or for whom the labor was done or performed, within ninety (90) days after having last performed labor or last furnished materials or equipment included in the Claim; and
- <sup>1</sup>have sent a Claim to the Surety (at the address described in Section 13).

§ 5.2 Claimants, who are employed by or have a direct contract with the Contractor, have sent a Claim to the Surety (at the address described in Section 13).

 $\S$  6 If a notice of non-payment required by Section 5.1.1 is given by the Owner to the Contractor, that is sufficient to satisfy a Claimant's obligation to furnish a written notice of non-payment under Section 5.1.1.

 $\S$  7 When a Claimant has satisfied the conditions of Sections 5.1 or 5.2, whichever is applicable, the Surety shall promptly and at the Surety's expense take the following actions:

§ 7.1 Send an answer to the Claimant, with a copy to the Owner, within sixty (60) days after receipt of the Claim, stating the amounts that are undisputed and the basis for challenging any amounts that are disputed; and

§ 7.2 Pay or arrange for payment of any undisputed amounts.

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§ 7.3 The Surety's failure to discharge its obligations under Section 7.1 or Section 7.2 shall not be deemed to constitute a waiver of defenses the Surety or Contractor may have or acquire as to a Claim, except as to undisputed amounts for which the Surety and Claimant have reached agreement. If, however, the Surety fails to discharge its obligations under Section 7.1 or Section 7.2, the Surety shall indemnify the Claimant for the reasonable attorney's fees the Claimant incurs thereafter to recover any sums found to be due and owing to the Claimant.

 $\S$  8 The Surety's total obligation shall not exceed the amount of this Bond, plus the amount of reasonable attorney's fees provided under Section 7.3, and the amount of this Bond shall be credited for any payments made in good faith by the Surety.

§ 9 Amounts owed by the Owner to the Contractor under the Construction Contract shall be used for the performance of the Construction Contract and to satisfy claims, if any, under any construction performance bond. By the Contractor furnishing and the Owner accepting this Bond, they agree that all funds earned by the Contractor in the performance of the Construction Contract are dedicated to satisfy obligations of the Contractor and Surety under this Bond, subject to the Owner's priority to use the funds for the completion of the work.

§ 10 The Surety shall not be liable to the Owner, Claimants or others for obligations of the Contractor that are unrelated to the Construction Contract. The Owner shall not be liable for the payment of any costs or expenses of any

Claimant under this Bond, and shall have under this Bond no obligation to make payments to, or give notice on behalf of, Claimants or otherwise have any obligations to Claimants under this Bond.

§ 11 The Surety hereby waives notice of any change, including changes of time, to the Construction Contract or to related subcontracts, purchase orders and other obligations.

§ 12 No suit or action shall be commenced by a Claimant under this Bond other than in a court of competent jurisdiction in the state in which the project that is the subject of the Construction Contract is located or after the expiration of one year from the date (1) on which the Claimant sent a Claim to the Surety pursuant to Section 5.1.2 or 5.2, or (2) on which the last labor or service was performed by anyone or the last materials or equipment were furnished by anyone under the Construction Contract, whichever of (1) or (2) first occurs. If the provisions of this Paragraph are void or prohibited by law, the minimum period of limitation available to sureties as a defense in the jurisdiction of the suit shall be applicable.

§ 13 Notice and Claims to the Surety, the Owner or the Contractor shall be mailed or delivered to the address shown on the page on which their signature appears. Actual receipt of notice or Claims, however accomplished, shall be sufficient compliance as of the date received.

§ 14 When this Bond has been furnished to comply with a statutory or other legal requirement in the location where the construction was to be performed, any provision in this Bond conflicting with said statutory or legal requirement shall be deemed deleted herefrom and provisions conforming to such statutory or other legal requirement shall be deemed incorporated herein. When so furnished, the intent is that this Bond shall be construed as a statutory bond and not as a common law bond.

§ 15 Upon request by any person or entity appearing to be a potential beneficiary of this Bond, the Contractor and Owner shall promptly furnish a copy of this Bond or shall permit a copy to be made.

#### §16 Definitions

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§ 16.1 Claim. A written statement by the Claimant including at a minimum

- .1 the name of the Claimant;
- .2 the name of the person for whom the labor was done, or materials or equipment furnished;
- .3 a copy of the agreement or purchase order pursuant to which labor, materials or equipment was furnished for use in the performance of the Construction Contract;
- .4 a brief description of the labor, materials or equipment furnished;
- 5 the date on which the Claimant last performed labor or last furnished materials or equipment for use in the performance of the Construction Contract;
- .6 the total amount earned by the Claimant for labor, materials or equipment furnished as of the date of the Claim;
- .7 the total amount of previous payments received by the Claimant; and
- .8 the total amount due and unpaid to the Claimant for labor, materials or equipment furnished as of the date of the Claim.

§ 16.2 Claimant. An individual or entity having a direct contract with the Contractor or with a subcontractor of the Contractor to furnish labor, materials or equipment for use in the performance of the Construction Contract. The term Claimant also includes any individual or entity that has rightfully asserted a claim under an applicable mechanic's lien or similar statute against the real property upon which the Project is located. The intent of this Bond shall be to include without limitation in the terms "labor, materials or equipment" that part of water, gas, power, light, heat, oil, gasoline, telephone service or rental equipment used in the Construction Contract, architectural and engineering services required for performance of the work of the Contractor and the Contractor's subcontractors, and all other items for which a mechanic's lien may be asserted in the jurisdiction where the labor, materials or equipment were furnished.

§ 16.3 Construction Contract. The agreement between the Owner and Contractor identified on the cover page, including all Contract Documents and all changes made to the agreement and the Contract Documents.

§ 16.4 Owner Default. Failure of the Owner, which has not been remedied or waived, to pay the Contractor as required under the Construction Contract or to perform and complete or comply with the other material terms of the Construction Contract.

§ 16.5 Contract Documents. All the documents that comprise the agreement between the Owner and Contractor.

§ 17 If this Bond is issued for an agreement between a Contractor and subcontractor, the term Contractor in this Bond shall be deemed to be Subcontractor and the term Owner shall be deemed to be Contractor.

§ 18 Modifications to this bond are as follows:

§ 18.1 Surety Company shall be licensed to conduct business in the Commonwealth of Kentucky.

§ 18.2 Insurance Agency and Agents issuing bond shall be registered and licensed to conduct business in the Commonwealth of Kentucky with the appropriate Power of Attorney included.

§ 18.3 Bond shall comply with all statutory requirements of the Commonwealth of Kentucky including the Kentucky Unemployment Insurance Law.

§ 18.4 No suit, action or proceeding by reason or any default whatever shall be brought on this bond after two (2) years from the date on which final payment of the contract fall due and provided further that if any alterations or additions which may be made under the contract or in the work to be done under it, or the giving by the Owner of any extension of time for the performance of the contract or any other forbearance on the part of either the Owner or the Principal shall not, in any way, release the Principal and Surety, or either of them, their heirs, executors, administrators, successors, or assigns for their liability hereunder. Notice to the Surety of any such alterations, extensions, or forbearance being expressly waived.

This obligation shall remain in force and effect until the performance of all covenants, terms and conditions herein stipulated and after such performance, it shall become null and void.

(Space is provided below for additiond	al signatures of addea	l parties, other than t	hose appearing on the cover page.)
CONTRACTOR AS PRINCIPAL		SURETY	
Company:	(Corporate Seal)	Company:	(Corporate Seal)

Signature:	
Name and	Title:
Address	

Signature: Name and Title: Address

SECTION 011000 - SUMMARY

PART 1 GENERAL

#### SECTION INCLUDES

- 1.1 The Contract Documents
- 1.2 Contract description
- 1.3 Times of Completion and Liquidated Damages
- 1.4 Pre-Bid Meeting
- 1.5 Work by Owner
- 1.6 Owner-Supplied Products
- 1.7 Contractor's Use of Site and Premises
- 1.8 Work sequence
- 1.9 Owner Occupancy
- 1.10 Specification Conventions

#### 1.1 THE CONTRACT DOCUMENTS

- A. The drawings and specifications are intended to be fully explanatory and supplementary. However, should anything be shown, indicated or specified on one and not the other, it shall be done the same as if shown, indicated or specified in both.
- B. It shall be the responsibility of all Contractors and Subcontractors to carefully examine all Drawings, Specifications and Contract Documents pertaining to all phases of the construction in order that Contractor and Subcontractors may foresee all requirements for coordination of their work. Submission of a bid shall be construed as evidence that such an examination has been made. Claims based on unforeseen requirements will not be considered.
- C. Should any error or inconsistency appear in Drawings or Specifications, the Contractor, before proceeding with the work, must make mention of the same to the Architect for proper adjustment, and in no case proceed with the work in uncertainty or with insufficient drawings.
- D. Bidders, subcontractors and suppliers, before submitting proposals, shall become fully familiar with the documents as to the nature and scope of work. Requests for additional compensation resulting from any difficulties encountered, which could have been foreseen with a thorough examination of the Bid Documents and asking questions for clarifications, will not be recognized.
- E. The Contractor and each Subcontractor shall be responsible for verification of all

measurements at the building before ordering any materials or doing any work. No additional compensation shall be allowed due to differences between actual dimensions and dimensions indicated on the Drawings. Any such discrepancy in dimensions, which may be found, shall be submitted to the Architect for consideration before the Contractor proceeds with the work in the affected areas.

- F. Contractors shall follow sizes in Specifications or figures on Drawings, in preference to scale measurements and follow detail drawings in preference to general drawings.
- G. Where it is obvious that a drawing illustrates only part of a given work or of a number of items, the remaining shall be deemed repetitious and so constructed.

#### 1.2 CONTRACT DESCRIPTION

A. Work of the Project involves Partial Interior Renovation of the existing Sebastian Elementary School for the Breathitt County Board of Education at 244 L.B.J. Road, Jackson, KY 41339.

The work includes the following:

(1) Area 'A' – New interior security entrance Vestibule 100 and adjacent secured Reception 103 with new hollow metal frames and entry doors, electronic door access hardware, finishes, transaction window, custom casework, new gypsum board wall assemblies and structural steel lintel.

(2) Area 'B' – New interior SRO 200, general Office 201, Storage 202 & 203, with new gypsum board wall assemblies, hollow metal frames and wood doors, door hardware, and finishes.

(3) Area 'C' – New interior classrooms, office and restrooms in area of existing locker rooms. Work includes Classrooms 306 & 308, Office 307, Boy's Restroom 303, Girl's Restroom 305, Janitors 302.1 & Storage 304, with new concrete slab subfloor, new cmu walls, new structural steel, new hollow metal frames & wood doors, new hardware, new alum frame windows, and finishes.

(4) All Areas – New work to include, but not limited to, new CMU walls, Gypsum Bd./Metal Framed walls, Structural steel beam/columns, Steel lintels, Aluminum storefront/window assemblies, VCT flooring, ACT ceilings, paint, steel door frames, wood and steel doors, door hardware, floor/wall tile, toilet compartments, new fire protection, plumbing, mechanical and electrical.

SITE: No site work is included in the Work of this Contract.

BUILDING ENVELOPE: Except for the following specific items, there is no Work to the exterior envelope of the existing building:

- 1. Replacement of two pairs of existing doors at main entrance in Area 'A'.
- 2. Two (2) new masonry openings for new windows in Area 'C'.
- 3. Infilling of three (3) existing masonry openings in Area 'C'.
- 4. Provision of miscellaneous insulated covers on existing roof penetrations where plumbing and mechanical items removed.

B. Perform work of Contract under stipulated sum contact with Owner in accordance with Conditions of Contract.

#### 1.3 TIMES OF COMPLETION AND LIQUIDATED DAMAGES

- A. Work shall begin upon execution of the Owner-Contractor agreement which is scheduled to occur on or before <u>Tuesday, October 1, 2019</u>.
- B. All work must be achieve Substantial Completion on or before end of day on <u>Tuesday</u>, <u>March 31, 2020</u>.
- C. Substantial Completion: Subject to the conditions of "Article 22 Time of Completion" of the General Conditions, the total work to be done under this contract shall commence on the date the Contractor receives the Work Order and shall Substantially Complete the work within the time specified above.
- D. The date of Substantial Completion shall be the date certified by the Architect when the work is sufficiently complete, in accordance with the Contract Documents, so that the Owner may conditionally accept, and beneficially occupy and use, all of the systems and facilities provided under this Construction Contract. The Owner will not take possession of the work if it has not been cleaned under the requirements of the Contract.
- E. Final Completion: Subject to the conditions of Article 22 "Time of Completion" of the General Conditions, the total work to be done under this combined Construction Contract shall be fully completed within thirty (30) consecutive calendar days after the Date of Substantial Completion. The Date of Final Completion shall be the date that the work is complete and all Contract requirements have been fulfilled by the Contractor.
- F. Liquidated Damages will NOT be assessed for this Project.
- 1.4 PRE-BID MEETING

<u>A Pre-Bid Meeting will be held at the time and date identified in the Advertisement for Bids.</u> <u>Attendance at this meeting is MANDATORY for all General Contractors</u>

- 1.5 WORK BY OWNER
  - A. The Owner will award contracts for supply and installation of the following items:
    - 1. All furnishings for offices and classroom areas.
    - 2. Office equipment including computers, fax machines and copier machines.
    - 3. Active data network components and phone system equipment.

#### 1.6 OWNER-SUPPLIED PRODUCTS

- A. Owner's Responsibilities:
  - 1. Arrange for and deliver Owner-reviewed Shop Drawings, Product Data, and Samples, to Contractor.
  - 2. Arrange and pay for delivery to site.
  - 3. On delivery, inspect products jointly with Contractor.
  - 4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
  - 5. Arrange for manufacturers' warranties, inspections, and service.

#### B. Contractor's Responsibilities:

- 1. Review Owner-reviewed Shop Drawings, Product Data, and Samples.
- 2. Receive and assist with unloading products at site; inspect for completeness or damage jointly with Owner.
- 3. Handle and store products.
- 4. Repair or replace items damaged by work of this contract after receipt.

#### 1.7 CONTRACTOR'S USE OF SITE AND PREMISES

- A. Limit use of site and premises to allow:
  - 5. Owner occupancy (staff and students) of all adjacent areas of site and building.
  - 6. Work by Others and Work by Owner.
- C. Construction Operations: Limited to areas noted on Drawings. DO NOT disturb areas of the site beyond areas in which the Work is indicated except as specifically noted. This requirement will be strictly observed and enforced.
- D. Site trailers and storage limits: Confine storage of materials and support facilities to area on site to be determined by Owner at Pre-Construction Meeting. Use of other areas of the site for storage facilities is prohibited without prior approval and authorization by Owner.
- E. Conduct of Construction Workers:
  - 1. No use of tobacco is allowed on site during this work, including vaping or dipping.
  - 2. No alcoholic beverages or firearms are allowed on school property, including those kept in locked vehicles.
  - 3. Workers must dress properly while on school property (including shirts and long pants), may not use foul language or fraternize with students and staff.
  - 4. The possession or use of drugs while on-site is strictly forbidden.
  - 5. Per the intent of KRS 160.380, subsection (3), employment of workers convicted of sex crimes is prohibited on this project.
  - 6. Violation of these conditions is grounds for immediate and permanent dismissal from the site.
- F. Photo ID Badges of all personnel are required to be provided by the contractor, identifying name and company for each employee on this jobsite.
- G. General Contractor is responsible for daily clean-up of all construction areas, including non-construction areas that are impacted by construction work.

#### 1.8 WORK SEQUENCE

A. Construct Work in phases to accommodate Owner's occupancy requirements during construction period.

#### 1.9 OWNER OCCUPANCY

- A. Owner Occupancy of Building: The Owner will be occupying the adjacent areas of the building during the course of the Work, including staff and students.
- B. Partial Owner Occupancy of Project Site: Owner reserves the right to occupy and to place and install equipment in completed areas of project, before Substantial Completion,

provided such occupancy does not interfere with completion of the Work. Such placement of equipment and partial occupancy shall not constitute acceptance of the total work.

- C. Architect will prepare a Certificate of Substantial Completion for any specific portion of Work to be occupied before Owner Occupancy.
- D. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner Occupancy.
- E. Before partial Owner occupancy, mechanical and electrical systems shall be fully operational, and required tests and inspections shall be successfully completed. On occupancy, Owner will provide, operate and maintain mechanical and electrical systems serving occupied areas of the building.
- F. On occupancy, Owner will assume responsibility for maintenance and custodial service for occupied areas of the building.
- G. Obtain a Certificate of Occupancy from authorities having jurisdiction before Owner Occupancy.
- H. Cooperate with Owner to minimize conflict, and to facilitate Owner's operations.

#### 1.10 SPECIFICATION CONVENTIONS

A. These specifications are written in imperative mood and streamlined form. This imperative language is directed to the Contractor, unless specifically noted otherwise. The words "shall be" are included by inference where a colon (:) is used within sentences or phrases.

PART 2 PRODUCTS - Not Used.

PART 3 EXECUTION - Not Used.

END OF SECTION

#### SECTION 012000 - PRICE AND PAYMENT PROCEDURES

#### PART 1 GENERAL

- 1.1 SECTION INCLUDES
  - A. Schedule of Values.
  - B. Application for Payment.
  - C. Change procedures.
  - D. Defect assessment.

#### 1.2 SCHEDULE OF VALUES

- A. Submit printed schedule on AIA Form G703 Continuation Sheet for G702.
- B. Submit Schedule of Values in duplicate within 7 days after date of Notice of Intent to Award.
- C. Format: Utilize Table of Contents of this Project Manual. Identify each line item with number and title of major specification Section. Separate each line item into material and labor cost. Provide line items for the following:
  - 1. Closeout Documents As-Builts
  - 2. Closeout Documents Manuals
  - 3. Final Cleaning
  - 4. Provide additional breakdown of costs when requested by either the Architect or the Engineer.
- D. Include within each line item, direct proportional amount of Contractor's overhead and profit.
- E. Revise schedule to list approved Change Orders, with each Application For Payment.

#### 1.3 APPLICATIONS FOR PAYMENT

- A. Submit three copies of each application on AIA Form G702 Application and Certificate for Payment and AIA G703 - Continuation Sheet for G702
- B. Content and Format: Utilize Schedule of Values for listing items in Application for Payment.
- C. Submit updated construction schedule with each Application for Payment.
- D. Payment Period: Once a month.
- E. Submit with transmittal letter as specified for Submittals in Section 013300.
- F. Stored Material: Payment for stored material will be made under the following conditions1. Materials are being stored on site.
  - 2. Materials are being stored off-site within a 60-mile radius of the project site and a certificate of insurance has been provided naming Breathitt County Board of Education as the insured.

G. Substantiating Data: When Architect/Engineer requires substantiating information, submit data justifying dollar amounts in question.

#### 1.4 CHANGE PROCEDURES

- A. Submittals: Submit name of individual authorized to receive change documents, and be responsible for informing others in Contractor's employ or Subcontractors of changes to the Work.
- B. When a change is proposed to the scope of the work impacting the Contract Cost or Contract Time, the Contractor shall submit a complete and thorough breakdown of the additional costs separating material and labor costs. The Contractor shall identify material quantities, and manhour requirements where applicable. The General Contractor shall attach all quotes received from Subcontractors to substantiate the pricing.
- C. The Owner will advise of minor changes in the Work not involving adjustment to Contract Sum/Price or Contract Time by issuing supplemental instructions on AIA Form G710.
- D. The Owner may issue a Proposal Request including a detailed description of proposed change with supplementary or revised Drawings and specifications, and a change in Contract Time for executing the change. Contractor will prepare and submit estimate within the time stipulated within the request.
- E. Contractor may propose changes by submitting a request for change to Owner, describing proposed change and its full effect on the Work. Include a statement describing reason for the change, and effect on Contract Sum/Price and Contract Time with full documentation and a statement describing effect on Work by separate or other Contractors.
- F. Stipulated Sum/Price Change Order: Based on Proposal Request and Contractor's fixed price quotation or Contractor's request for Change Order as approved by Owner.
- G. Change Order Forms: AIA G701 Change Order.
- H. Execution of Change Orders: Architect will issue Change Orders for signatures of parties as provided in Conditions of the Contract.
- I. Correlation Of Contractor Submittals:
  - 1. Promptly revise Schedule of Values and Application for Payment forms to record each authorized Change Order as separate line item and adjust Contract Sum/Price.
  - 2. Promptly revise progress schedules to reflect change in Contract Time, revise subschedules to adjust times for other items of work affected by the change, and resubmit.
  - 3. Promptly enter changes in Project Record Documents.

#### 1.5 DEFECT ASSESSMENT

- A. Replace the Work, or portions of the Work, not conforming to specified requirements.
- B. If, in the opinion of the Owner, it is not practical to remove and replace the Work, the Owner will direct appropriate remedy or adjust payment.
- C. The defective Work may remain, but unit sum/price will be adjusted to new sum/price at discretion of Owner.

- D. Defective Work will be partially repaired to instructions of Owner and unit sum/price will be adjusted to new sum/price at discretion of Architect/Owner.
- E. Authority of Owner to assess defects and identify payment adjustments is final.
- F. Non-Payment For Rejected Products: Payment will not be made for rejected products for any of the following:
  - 1. Products determined as unacceptable before or after placement.
  - 2. Products placed beyond lines and levels of required Work.
  - 3. Loading, hauling, and disposing of rejected products.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

#### SECTION 013000 - ADMINISTRATIVE REQUIREMENTS

#### PART 1 GENERAL

- 1.1 SECTION INCLUDES
  - A. Coordination and Project conditions.
  - B. Preconstruction meeting.
  - C. Hazardous Materials
  - D. Progress meetings.
  - E. Closeout meeting.
  - F. Alteration Procedures.

#### 1.2 COORDINATION AND PROJECT CONDITIONS

- A. Coordinate scheduling, submittals, and Work of Project Manual to ensure efficient and orderly sequence of painting.
- B. Coordination Meetings: In addition to other meetings specified in this Section, hold coordination meetings with personnel and Subcontractors to ensure coordination of Work.
- C. Coordinate completion and clean-up of Work in preparation for Substantial Completion.
- D. After Substantial Completion, coordinate access to Site for correction of defective Work and Work not complying with Contract Documents, to minimize disruption of Owner's activities.

#### 1.3 PRECONSTRUCTION MEETING

- A. Architect will schedule and preside over meeting after Notice of Award.
- B. Attendance Required: Architect, Engineer, Owner, Contractor and major subcontractors.
- C. Minimum Agenda:
  - 1. Execution of Owner-Contractor Agreement if not already executed.
  - 2. Submission of executed bonds and insurance certificates.
  - 3. Submission of Project Directory, Schedule of Values and Progress Schedule/Work Sequence Plan if not already distributed.
  - 4. Designation of personnel representing parties in Contract, and Architect.
  - 5. Communication procedures.
  - 6. Procedures and processing of requests for interpretations, field decisions, submittals, substitutions, Applications for Payments, proposal request, Change Orders, and Contract closeout procedures.
  - 7. Scheduling.
  - 8. Critical Work sequencing.
- D. Architect: Record minutes and distribute copies to participants prior to next meeting date.

#### 1.4 HAZARDOUS MATERIALS

- A. The contractor is hereby advised that it is possible that hazardous materials, including but not limited to asbestos, asbestos products, or other toxic substances may be present in the building. If any workman encounters any material, which he suspects is hazardous or toxic; he shall discontinue work on or near that material and shall immediately advise the Owner.
- B. The architect and architect's consultants shall have no responsibility for the discovery, presence, handling, removal or disposal of or exposure of persons to hazardous materials in any form at the project site, including but not limited to asbestos, asbestos products, polychlorinated biphenyl (PCB) or other toxic substances.
- C. If the work which is to be performed under this contract interfaces in any way with existing components which contain hazardous materials, it shall be the contractor's responsibility to contact the Owner regarding the proper means and methods to be utilized in dealing with the hazardous materials. It is not the intent of this contract for any hazardous materials to be disturbed, removed or disposed.
- D. By execution of the contract for construction, the Contractor hereby agrees to bring no claim for negligence, breach of contract, indemnity or otherwise against the architect, his principals, employees, agents, and consultants if such claim in any way would involve the investigation of or remedial work related to hazardous materials in any form at the project site, including but not limited to asbestos, asbestos products, polychlorinated biphenyl (PCB) or other toxic substances. The contractor further agrees to defend, indemnify, and hold the Architect and his principals, employees, agents and consultant harmless from any such claims related to hazardous material that may be brought by the Contractor's subcontractors, Suppliers or other third parties who may be acting under the direction of the Contractor pursuant to this project.

#### 1.5 PROGRESS MEETINGS

- A. Schedule and administer meetings throughout progress of the Work at maximum weekly intervals.
- B. Architect will make arrangements for meetings, prepare agenda with copies for participants, and preside over meetings.
- C. Attendance Required: Job superintendent, major Subcontractors Contractors and suppliers, Architect, Engineer and Owner representative, as appropriate to agenda topics for each meeting.
- D. Minimum Agenda:
  - 1. Review minutes of previous meetings.
  - 2. Review of Work progress.
  - 3. Field observations, problems, and decisions.
  - 4. Identification of problems impeding planned progress.
  - 5. Review of submittal schedule and status of submittals.
  - 6. Review of off-Site fabrication and delivery schedules.
  - 7. Maintenance of Progress Schedule.
  - 8. Corrective measures to regain projected schedules.
  - 9. Planned progress during succeeding work period.
  - 10. Coordination of projected progress.
  - 11. Maintenance of quality and work standards.
  - 12. Effect of proposed changes on Progress Schedule and coordination.
  - 13. Other business relating to Work.

E. Architect: Record minutes and distribute copies to participants and those affected by decisions in a timely manner and before the next meeting date.

#### 1.6 CLOSEOUT MEETING

- A. Schedule Project closeout meeting with sufficient time to prepare for requesting Substantial Completion. Preside over meeting and be responsible for minutes.
- B. Attendance Required: Contractor, major Subcontractors, Architect, Engineer, Owner's Representative, and others appropriate to agenda.
- C. The Architect will schedule the meeting. The Contractor shall submit written notice not less than three days in advance of desired meeting date.
- D. Minimum Agenda:
  - 1. Start-up of facilities and systems.
  - 2. Operations and maintenance manuals.
  - 3. Testing, adjusting, and balancing.
  - 4. System demonstration and observation.
  - 5. Operation and maintenance instructions for Owner's personnel.
  - 6. Contractor's inspection of Work.
  - 7. Contractor's preparation of an initial "punch list."
  - 8. Procedure to request Architect/Engineer inspection to determine date of Substantial Completion.
  - 9. Completion time for correcting deficiencies.
  - 10. Inspections by authorities having jurisdiction.
  - 11. Certificate of Occupancy and transfer of insurance responsibilities.
  - 12. Partial release of retainage.
  - 13. Final cleaning.
  - 14. Preparation for final inspection.
  - 15. Closeout Submittals:
    - a. Project record documents.
    - b. Operating and maintenance documents.
    - c. Operating and maintenance materials.
    - d. Affidavits.
  - 16. Final Application for Payment.
  - 17. Contractor's demobilization of Site.
  - 18. Maintenance.
- E. Architect will record minutes and distribute to participants and those affected by decisions in a timely manner and not more than two weeks after the meeting.

#### PART 2 PRODUCTS - Not Used

#### PART 3 EXECUTION

- 3.1 ALTERATION PROCEDURES
  - A. Designated areas of existing facilities will be occupied for normal operations during progress of construction. Cooperate with Owner in scheduling operations to minimize conflict and to permit continuous usage.

- 1. Perform Work not to interfere with operations of occupied areas.
- 2. Clean areas daily. Clean spillage, overspray, and heavy collection of dust in Owner-occupied areas immediately.
- B. Materials: Match existing products with new products for patching and extending Work.
- C. Employ skilled and experienced installer to perform alteration and renovation Work.
- D. Prepare surface and remove surface finishes to permit installation of new Work and finishes.
- E. Where new Work abuts or aligns with existing Work, provide smooth and even transition. Patch Work to match existing adjacent Work in texture and appearance.

#### END OF SECTION

#### SECTION 013300 - SUBMITTAL PROCEDURES

#### PART 1 GENERAL

- 1.1 SECTION INCLUDES
  - A. Submittal procedures.
  - B. Construction progress schedules.
  - C. Product Data.
  - D. Electronic CAD Files of Project Drawings
  - E. Shop Drawings.
  - F. Samples.
  - G. Other Submittals.
  - H. Test Reports
  - I. Certificates.
  - J. Manufacturer's Instructions.
  - K. Manufacturer's Field Reports.
  - L. Construction photographs.
  - M. Contractor review.
  - N. Architect/Engineer review.

#### 1.2 SUBMITTAL PROCEDURES

- A. Transmit each submittal with Contractor's standard Cover Letter/Transmittal.
- B. Identify Project, Contractor, subcontractor and supplier; pertinent drawing and detail number, and specification section number, appropriate to submittal.
- C. Apply Contractor's stamp, signed or initialed, certifying that review, approval, verification of products required, field dimensions, adjacent construction Work, and coordination of information is according to requirements of the Work and Contract Documents.
- D. All submittals shall be made electronically.
- E. For each submittal for review, allow 5 days excluding delivery time to and from Contractor.
- F. Identify variations in Contract Documents and product or system limitations that may be detrimental to successful performance of completed Work.

- G. Allow space on submittals for Contractor and Architect/Engineer review stamps.
- H. When revised for resubmission, identify changes made since previous submission.
- I. Distribute copies of reviewed submittals as appropriate. Instruct parties to promptly report inability to comply with requirements.
- J. Submittals not requested will not be recognized nor processed.
- K. Incomplete Submittals: Architect/Engineer will not review. Complete submittals for each item are required. Delays resulting from incomplete submittals are not the responsibility of Architect/Engineer.

#### 1.3 CONSTRUCTION PROGRESS SCHEDULES

- A. Submit initial schedules within 3 days after date of Notice of Award of Contract. After review, resubmit required revised data within 3 days.
- B. Submit revised Progress Schedules with each Application for Payment.
- C. Indicate estimated percentage of completion for each item of Work at each submission.
- D. Revisions To Schedules:
  - 1. Indicate progress of each activity to date of submittal, and projected completion date of each activity.
  - 2. Identify activities modified since previous submittal, major changes in scope, and other identifiable changes.
  - 3. Prepare narrative report to define problem areas, anticipated delays, and impact on Schedule. Report corrective action taken, or proposed, and its effect including effect of changes on schedules of separate contractors.

#### 1.4 PRODUCT DATA

- A. Product Data: Action Submittal: Submit to Architect/Engineer for review for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Submit electronic submittals via email as PDF electronic files.
- C. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.
- D. Indicate product utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 Execution and Closeout Requirements.

#### 1.5 ELECTRONIC CAD FILES OF PROJECT DRAWINGS

- A. Electronic CAD Files of Project Drawings: May only be used to expedite production of Shop Drawings for the Project. Use for other Projects or purposes is not allowed.
- B. Electronic CAD Files of Project Drawings: Distributed only under the following conditions:

- Use of files is solely at receiver's risk. Architect/Engineer does not warrant accuracy of files. Receiving files in electronic form does not relieve receiver of responsibilities for measurements, dimensions, and quantities set forth in Contract Documents. In the event of ambiguity, discrepancy, or conflict between information on electronic media and that in Contract Documents, notify Architect/Engineer of discrepancy and use information in hardcopy Drawings and Specifications.
- 2. CAD files do not necessarily represent the latest Contract Documents, existing conditions, and as-built conditions. Receiver is responsible for determining and complying with these conditions and for incorporating addenda and modifications.
- 3. User is responsible for removing information not normally provided on Shop Drawings and removing references to Contract Documents. Shop Drawings submitted with information associated with other trades or with references to Contract Documents will not be reviewed and will be immediately returned.
- 4. Receiver shall not hold Architect/Engineer responsible for data or file clean-up required to make files usable, nor for error or malfunction in translation, interpretation, or use of this electronic information.
- 5. Receiver shall understand that even though Architect/Engineer has computer virus scanning software to detect presence of computer viruses, there is no guarantee that computer viruses are not present in files or in electronic media.
- 6. Receiver shall not hold Architect/Engineer responsible for such viruses or their consequences, and shall hold Architect/Engineer harmless against costs, losses, or damage caused by presence of computer virus in files or media.

#### 1.6 SHOP DRAWINGS

- A. Shop Drawings: Action Submittal: Submit to Architect/Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Indicate special utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.
- C. When required by individual Specification Sections, provide Shop Drawings signed and sealed by a professional Engineer responsible for designing components shown on Shop Drawings.
  - 1. Include signed and sealed calculations to support design.
  - 2. Submit Shop Drawings and calculations in form suitable for submission to and approval by authorities having jurisdiction.
  - 3. Make revisions and provide additional information when required by authorities having jurisdiction.
- D. Submit electronic submittals via email as PDF electronic files.
- E. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 Execution and Closeout Requirements.

#### 1.7 SAMPLES

- A. Samples: Action Submittal: Submit to Architect/Engineer for assessing conformance with information given and design concept expressed in Contract Documents.
- B. Samples for Selection as Specified in Product Sections:
  - 1. Submit to Architect/Engineer for aesthetic, color, and finish selection.
  - 2. Submit Samples of finishes, textures, and patterns for Architect/Engineer selection.

- C. Submit Samples to illustrate functional and aesthetic characteristics of products, with integral parts and attachment devices. Coordinate Sample submittals for interfacing work.
- D. Include identification on each Sample, with full Project information.
- E. Submit number of Samples specified in individual Specification Sections; Architect/Engineer will retain one Sample.
- F. Reviewed Samples that may be used in the Work are indicated in individual Specification Sections.
- G. Samples will not be used for testing purposes unless specifically stated in Specification Section.
- H. After review, produce copies and distribute according to "Submittal Procedures" Article and for record documents described in Section 017000 Execution and Closeout Requirements.

#### 1.8 OTHER SUBMITTALS

- A. Closeout Submittals: Comply with Section 017000 Execution and Closeout Requirements.
- B. Informational Submittal: Submit data for Architect/Engineer's knowledge as Contract administrator or for Owner.
- C. Submit information for assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.9 TEST REPORTS

- A. Informational Submittal: Submit reports for Architect/Engineer's knowledge as Contract administrator or for Owner.
- B. Submit test reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

#### 1.10 CERTIFICATES

- A. Informational Submittal: Submit certification by manufacturer, installation/application Subcontractor, or Contractor to Architect/Engineer, in quantities specified for Product Data.
- B. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
- C. Certificates may be recent or previous test results on material or product but must be acceptable to Architect/Engineer.

#### 1.11 MANUFACTURER'S INSTRUCTIONS

- A. Informational Submittal: Submit manufacturer's installation instructions for Architect/Engineer's knowledge as Contract administrator or for Owner.
- B. Submit printed instructions for delivery, storage, assembly, installation, startup, adjusting, and finishing, to Architect/Engineer in quantities specified for Product Data.
C. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

## 1.12 MANUFACTURER'S FIELD REPORTS

- A. Informational Submittal: Submit reports for Architect/Engineer's knowledge as Contract administrator or for Owner.
- B. Submit report within 48 hours of observation to Architect/Engineer for information.
- C. Submit reports for information for assessing conformance with information given and design concept expressed in Contract Documents.

## 1.13 CONSTRUCTION PHOTOGRAPHS

- A. When requested by the Architect/Engineer provide photographs of conditions that will become concealed prior to observation by Architect/Engineer and/or to convey specific conditions requiring Architect/Engineer consultation
- B. Digital Images: Deliver digital image electronic files via e-mail.
  1. Digital Images: Uncompressed jpeg format that do not exceed 2 MB per image.

## 1.14 CONTRACTOR REVIEW

- A. Review for compliance with Contract Documents and approve submittals before transmitting to Architect.
- B. Contractor: Responsible for:
  - 1. Determination and verification of materials including manufacturer's catalog numbers.
  - 2. Determination and verification of field measurements and field construction criteria.
  - 3. Checking and coordinating information in submittal with requirements of Work and of Contract Documents.
  - 4. Determination of accuracy and completeness of dimensions and quantities.
  - 5. Confirmation and coordination of dimensions and field conditions at Site.
  - 6. Construction means, techniques, sequences, and procedures.
  - 7. Safety precautions.
  - 8. Coordination and performance of Work of all trades.
- C. Stamp, sign or initial, and date each submittal to certify compliance with requirements of Contract Documents.
- D. Do not fabricate products or begin Work for which submittals are required until approved submittals have been received from Architect/Engineer.

#### 1.15 ARCHITECT/ENGINEER REVIEW

- A. Informational submittals and other similar data are for Architect/Engineer's information, do not require Architect/Engineer's responsive action, and will not be reviewed or returned with comment.
- B. Submittals made by Contractor that are not required by Contract Documents may be returned without action.

C. Submittal approval does not authorize changes to Contract requirements unless accompanied by Change Order, or Architect's Supplemental Instruction.

PART 2 PRODUCTS - Not Used

PART 3 EXECUTION - Not Used

END OF SECTION

## SECTION 014000 - QUALITY REQUIREMENTS

## PART 1 GENERAL

- 1.1 SECTION INCLUDES
  - A. Quality control.
  - B. Tolerances.
  - C. References.
  - D. Examination
  - E. Preparation

#### 1.2 QUALITY CONTROL

- A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.
- B. Comply with manufacturers' instructions, including each step-in sequence.
- C. When manufacturers' instructions conflict with Contract Documents, request clarification from Owner before proceeding.
- D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform Work by persons qualified to produce required and specified quality.
- F. Supervise performance of Work in such manner and by such means to ensure that Work, whether completed or in progress, will not be subjected to harmful, dangerous, damaging, or otherwise deleterious exposure during construction period.

### 1.3 TOLERANCES

- A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.
- B. Comply with manufacturers' tolerances. When manufacturers' tolerances conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Adjust products to appropriate dimensions; position before securing products in place.

## 1.4 REFERENCES

A. For products or workmanship specified by association, trade, or other consensus standards, comply with requirements of standard, except when more rigid requirements are specified or are required by applicable codes.

- B. Conform to reference standard by date of issue current on date of Contract Documents, except where specific date is established by code.
- C. Obtain copies of standards where required by product specification sections.
- D. When specified reference standards conflict with Contract Documents, request clarification from Owner before proceeding.
- E. Neither contractual relationships, duties, nor responsibilities of parties in Contract nor those of Owner shall be altered from Contract Documents by mention or inference otherwise in reference documents.

## PART 2 PRODUCTS

Not Used.

### PART 3 EXECUTION

- 3.1 EXAMINATION
  - A. Verify existing site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
  - B. Verify existing substrate is capable of structural support or attachment of new Work being applied or attached.
  - C. Examine and verify specific conditions described in individual specification sections.
  - D. Verify utility services are available, of correct characteristics, and in correct locations.

#### 3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

## END OF SECTION

## SECTION 014100 - STRUCTURAL SPECIAL INSPECTION

## PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

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

#### 1.02 SUMMARY

- A. This Section includes administrative and procedural requirements for Special Inspection as defined in Chapter 17 of the Kentucky Building Code.
- B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.
- C. Perform Tests & Inspections as specified.

### 1.03 SUBMITTALS

- A. Overall:
  - 1. Prepare and submit certifications:
    - a. Contractor's Statement of Responsibility: Submit before the start of construction, acknowledging the following:
      - 1) Awareness of the special requirements contained in this Statement of Special Inspections.
      - 2) Acknowledgement that control will be exercised by the contractor to ensure conformance with the construction documents.
      - 3) Description of the procedures within the contractor's organization to exercise such control.
      - 4) The method by and frequency of which reports are distributed to the persons in the contractor's organization exercising the control.
      - 5) Identification and qualifications of the persons in the contractor's organization exercising such control and their positions within the organization.
    - b. Inspector's Qualifications: Inspection Agency shall submit before the start of construction.
    - c. Inspector's Final Certification: Inspection Agency shall submit after completion of inspections.
- B. Fabricators:
  - 1. Prepare and submit inspection reports:

- a. Inspection of Fabricator's Quality Control Procedures
- 2. Prepare and submit certifications:
  - a. Quality Control Certification
  - b. Fabrication Quality Control Procedures
  - c. Fabricators Certificate of Compliance: stating that the work was performed in accordance with the approved construction documents (submitted at the completion of such work).
- C. Soils Construction:
  - 1. Prepare and submit test reports:
    - a. Soil bearing capacity at foundations.
    - b. Controlled fill density at controlled fill for the structure.
    - c. Prepare and submit inspection reports:
      - 1) Inspection of Placement of Controlled Fill: Prior to each placement of footing concrete.
- D. Concrete Construction:
  - 1. Prepare and submit test reports:
    - a. Compressive strength, slump, and air content. Concrete shall be tested once per day that concrete is placed plus once for every 100 yards of concrete placed thereafter for each structure.
  - 2. Prepare and submit inspection reports:
    - a. Inspection of forms, installation of reinforcement and delivery tickets prior to each placement of concrete.
  - 3. Prepare and submit certifications:
    - a. Cement
    - b. Aggregate
    - c. Admixtures
    - d. Reinforcement
- E. Masonry Construction:
  - 1. Prepare and submit test reports:
    - a. Mortar aggregate ratio and mortar air content: Test each once at beginning of project and once for each 3,000 s.f. of masonry thereafter.
  - 2. Prepare and submit inspection reports:
    - a. Inspection of mortar proportioning once at beginning of projects and once for each 3,000 s.f. of masonry thereafter.
    - b. Inspection of placement of masonry, reinforcement, and grout prior to and during each placement of grout.

- 3. Prepare and submit certifications:
  - a. Masonry Units
  - b. Cement for Mortar
  - c. Sand for Mortar
  - d. Grout
  - e. Reinforcement
- F. Steel Construction:
  - 1. Prepare and submit inspection reports:
    - a. Inspection of marking and connection details for all members and connections verify all steel members are installed in the correct locations and are connected in accordance with the construction documents and approved erection drawings.
    - b. Inspection of bolt pretensioning for each fully-pretensioned bolted connection.
    - c. Visual inspection of all non-pretensioned bolted connection.
    - d. Visual inspection of all field welds.
  - 2. Prepare and submit certifications:
    - a. Certified Mill Test Reports (MTRs) for steel, bolts, nuts, washers and weld filler metal (for field welds).

#### 1.04 QUALIFICATIONS

- A. Use a qualified Inspector to perform all Inspections required by this Section.
- B. Inspector's qualifications shall include information which provides evidence of the knowledge and experience necessary to qualify a person as an Inspector for the category of work being certified.
- C. The Inspection agency employed by the Owner.
- D. Inspectors perform their duties independent from the construction quality control staff employed by the Contractor.
- E. More than one Inspector may be required to provide the varied knowledge and experience necessary to adequately inspect all of the categories of work requiring Inspection.
- PART 2 PRODUCTS (Not Applicable)

## PART 3 - EXECUTION

## 3.01 DUTIES AND RESPONSIBILITIES OF THE INSPECTOR

A. The Inspector shall observe the Work and review tests performed by the contractor's independent agent to ensure conformance with the design drawings and specifications, and the applicable workmanship provisions of the Kentucky Building Code:

- 1. Reviewed shop drawings may be used only as an aid to inspection.
  - a. The Special Inspector shall observe activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.
  - b. The Special Inspector shall submit timely inspection reports; weekly at a maximum.
- B. The Special Inspector shall obtain from the contractor all certifications required to be submitted as part of the inspection requirements (e.g. Contractor's Statement of Responsibility, Fabricators' Quality Control Plans, Material Certifications, etc.) and submit them along with the field inspections and test review that the Special Inspector performs. Inspection submittals by the Inspector include ALL items included above, not just the ones that the Inspector prepares.
- C. The Inspector shall cooperate with the Contractor and provide timely service, keep records of all inspections, and furnish them in a timely manner to the Architect, and Contractor as construction progresses.
- D. Discrepancies shall be brought to the immediate attention of the Contractor for correction. If discrepancies are not corrected, the discrepancies shall be brought to the attention of the Architect prior to the completion of that phase of work.
- E. Special Inspection Reports shall include the following:
  - 1. Name, address, and telephone number of Inspector performing the inspection and making the report.
  - 2. Qualifications and Certifications of the Inspector performing the inspection and making the report.
  - 3. Dates and locations of samples and tests or inspections, date of report.
  - 4. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
  - 5. Description of the Work, identification of products, Specification Section, tests reviewed, and inspection methods.
  - 6. Complete test or inspection data results.
  - 7. Test review and inspection results and an interpretation of test results.
  - 8. Statement on condition of substrates and their acceptability for installation of the the next phase of work according to the Construction Documents.
  - 9. Statement that products being installed at site comply with requirements.
  - 10. Comments and professional opinion on whether tested, inspected, or installed Work complies with the Contract Document requirements.
  - 11. Statement whether conditions, products, and installation may affect warranty of any products installed, according to the Construction Documents.
  - 12. Other required inspections and/or tests indicated in individual Specification Sections.
- F. Special Inspector's Final Certificates shall state that all items requiring Inspection and Testing were fulfilled and are in conformance with the approved design and shop drawings, specifications, approved change orders, and the applicable provisions of the Kentucky Building Code.
  - 1. Items that were not in conformance and any unresolved discrepancies shall be itemized in the report.
    - a. Final report shall be bound, divided by construction type, and in chronological order.

b. Final Report shall be prepared by, sealed, and signed by the Licensed Kentucky Professional Engineer employed by the Special Inspection and Testing Agency under whose supervision the inspection and testing work was performed.

## 3.02 DUTIES AND RESPONSIBILITIES OF THE CONTRACTOR

- A. Notify the Inspector with adequate advance notice when construction is ready to be inspected.
- B. Provide Inspector access to plans, specifications, shop drawings, and change orders at the jobsite.
- C. Submit required certifications (e.g. Contractor's Statement of Responsibility, Fabricators' Quality Control Plans, Material Certifications, etc.) to Inspector.
- D. Provide Inspector access to work, including equipment with operator when necessary. Access to equipment includes, but is not limited to, man lifts, excavation equipment, etc.
- E. Provide and make samples of materials to be tested in required quantities.
- F. Engage an independent, qualified testing laboratory to perform required tests.
- G. Provide storage space for Structural Testing/Inspection Agency's exclusive use, such as for storing and curing concrete testing samples. If required by the Inspector, Contractor shall provide cure box with electricity, water, and blankets for curing concrete specimens.
- H. Provide labor to assist the Structural Testing/Inspection Agency in performing tests/inspections.
- I. Retain at the jobsite all Inspection records submitted by the Inspector and provide these records for review by the Architect and Building Inspector upon request.
- J. Maintain a discrepancy log on site. Log shall list each discrepancy documented by the Inspector, state the date of discovery and Inspector's report number. Provide room for the Inspector to sign and date when said discrepancy is corrected. No work containing discrepancy shall be covered prior to having reinspection and approval by the Inspector.
- K. Cooperate with the Inspector, Architect, and Building Inspector in resolving any Inspection related coordination or quality problems.
- L. Resolve non-conforming work before additional work is done that would make it difficult to resolve non-conforming work.
- M. Costs of additional retesting that are required due to non-conforming work may be charged to the Contractor.
- N. Neither the observation of the Architect in the administration of the contract, nor tests/inspections by the Testing/Inspection Agency, nor approvals by persons other than the Architect shall relieve the Contractor from his obligation to perform the work in accordance with the Contract Documents.

END OF SECTION 01453

## SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

## PART 1 GENERAL

### 1.1 SECTION INCLUDES

- A. Temporary Utilities:
  - 1. Temporary electricity.
  - 2. Temporary lighting for construction purposes.
  - 3. Temporary heating
  - 4. Temporary cooling.
  - 5. Temporary ventilation.
  - 6. Communication services.
  - 7. Temporary water service.
  - 8. Temporary sanitary facilities.
- B. Construction Facilities:
  - 1. Field Offices & sheds
  - 2. Vehicular access.
  - 3. Parking.
  - 4. Progress cleaning and waste removal.
  - 5. Fire-prevention facilities.
  - 6. Worker Conduct & Quality Assurance

## C. Temporary Controls:

- 1. Barriers.
- 2. Enclosures and fencing.
- 3. Security.
- 4. Water Control.
- 5. Dust control.
- 6. Erosion & Sediment Control
- 7. Noise control.
- 8. Pest and rodent control.
- 9. Pollution control.
- D. Removal of utilities, facilities, and controls.

#### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E 90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
  - 3. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- B. Temporary Provisions Provided by the Contractor:
  - 1. Temporary barriers and barricades.
  - 2. Cleaning during construction.
  - 3. Temporary sanitary facilities.
- C. Coordinate and provide the following items as necessary for execution of the Work including associated costs:
  - 1. Construction aids.

- 2. Temporary fire protection, dust control, erosion and sediment control, water control, noise control, and other necessary temporary controls.
- 3. Temporary barriers, barricades, and similar devices as necessary for safety and protection of construction personnel and public.
- 4. Temporary tree and plant protection.
- 5. Temporary provisions for protection of installed Work.

## 1.3 TEMPORARY ELECTRICITY

- A. Provide & pay for power service required from utility source as needed for construction operation.
- B. Provide temporary electric feeder from electrical service. Do not disrupt Owner's use of service.
- C. Provide power outlets with branch wiring and distribution boxes located as required for construction operations. Provide suitable, flexible power cords as required for portable construction tools and equipment.
- D. Provide main service disconnect and overcurrent protection at convenient location.
- E. Permanent convenience receptacles shall not be used during construction.

## 1.4 TEMPORARY LIGHTING FOR CONSTRUCTION PURPOSES

- A. Provide and maintain lighting for construction operations.
- B. Provide and maintain 1 watt/sq ft lighting to exterior staging and storage areas after dark for security purposes.
- C. Provide and maintain 0.25 watt/sq ft HID lighting to interior work areas after dark for security purposes.
- D. Provide branch wiring from power source to distribution boxes with lighting conductors, pigtails, lamps, and the like, for specified lighting levels.
- E. Maintain lighting and provide routine repairs.
- F. Permanent building lighting may be used during construction.

## 1.5 TEMPORARY HEATING

- A. Provide and pay for heating devices and heat as needed to maintain specified conditions for construction operations.
- B. Before operating permanent equipment for temporary heating purposes, verify installation is approved for operation, equipment is lubricated, and filters are in place. Provide and pay for replacement of filters and worn or consumed parts. Replace filters at Substantial Completion.
- C. Maintain minimum ambient temperature of 50 degrees F in areas where construction is in progress unless indicated otherwise in individual product Sections.

#### 1.6 TEMPORARY COOLING

A. Existing cooling systems shall not be used during construction.

- B. Provide and pay for cooling devices and cooling as needed to maintain specified conditions for construction operations.
- C. Before operating permanent equipment for temporary cooling purposes, verify installation is approved for operation, equipment is lubricated, and filters are in place. Provide and pay for maintenance, and regular replacement of filters and worn or consumed parts. Replace filters at Substantial Completion.
- D. Maintain maximum ambient temperature of 80 degrees F in areas where construction is in progress unless indicated otherwise in individual product Sections.

### 1.7 TEMPORARY VENTILATION

- A. Ventilate enclosed areas to achieve curing of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.
- 1.8 COMMUNICATION SERVICES
  - A. Telephone Service: Provide telecommunication services to the site and site foreman at all times. Use of cellular phones is acceptable.
  - B. Facsimile Service: not required.
  - C. Internet Service: Provide and maintain broadband internet service to contractor's home office at all times.
- 1.9 TEMPORARY WATER SERVICE
  - A. Owner will pay cost of temporary water. Exercise measures to conserve energy. Use Owner's existing water system, extended and supplemented with temporary devices, provided by contractor, as needed to maintain specified conditions for construction operations.
- 1.10 TEMPORARY SANITARY FACILITIES
  - A. Provide and maintain required facilities and enclosures. Existing facility use is not permitted. Provide facilities at time of Project mobilization. Location to be defined by Owner at Pre-Construction Meeting.

## 1.11 FIELD OFFICES AND SHEDS

- A. Office: Weather tight, with lighting, electrical outlets, heating, cooling and ventilating equipment, and equipped with sturdy furniture.
- B. Provide space for Project meetings, with table and chairs to accommodate 15 persons.
- C. Locate offices and sheds as defined by Owner at Pre-Construction Meeting.
- D. Do not use permanent facilities for field offices or for storage.
- E. Construction: Portable or mobile buildings, or buildings constructed with floors raised above ground, securely fixed to foundations with steps and landings at entrance doors.
  - 1. Construction: Structurally sound, secure, weather tight enclosures for office and storage spaces. Maintain during progress of Work; remove at completion of Work.
  - 2. Temperature Transmission Resistance of Floors, Walls, and Ceilings: Compatible with occupancy and storage requirements.

- 3. Exterior Materials: Weather resistant.
- 4. Lighting for Offices: 50 ft C at desk top height, exterior lighting at entrance doors.
- 5. Fire Extinguishers: Appropriate type fire extinguisher at each office and each storage area.
- 6. Interior Materials in Storage Sheds: As required to provide specified conditions for storage of products.
- F. Environmental Control:
  - 1. Heating, Cooling, and Ventilating for Offices: Automatic equipment to maintain comfort conditions.
  - 2. Storage Spaces: Heating and ventilation as needed to maintain products in accordance with Contract Documents; lighting for maintenance and inspection of products.
- G. Storage Areas and Sheds: Size to storage requirements for products of individual Sections, allowing for access and orderly provision for maintenance and for inspection of products to requirements of Section 016000.
- H. Preparation: Fill and grade sites for temporary structures sloped for drainage away from buildings.
- I. Installation:
  - 1. Install office spaces ready for occupancy 15 days after date fixed in Notice to Proceed.
- J. Maintenance And Cleaning:
  - 1. Weekly janitorial services for offices; periodic cleaning and maintenance for office and storage areas.
  - 2. Maintain approach walks free of mud, water, and snow.

### 1.12 VEHICULAR ACCESS

- A. Utilize existing paved surfaces for access to the site. Do not block drives or other vehicular access ways. Maintain drives unobstructed and for Owners continuous use.
- B. Provide unimpeded access for emergency vehicles. Maintain 20 foot-wide driveways with turning space between and around combustible materials.
- C. Provide and maintain access to fire hydrants and control valves free of obstructions.
- D. Provide means of removing mud from vehicle wheels before entering streets.
- E. Use designated existing on-Site roads for construction traffic.

#### 1.13 PARKING

- A. On-Site Construction Parking areas will be defined at the Pre-Construction meeting.
- B. Use of existing on-site streets and driveways used for light weight construction traffic is permitted. Tracked vehicles not allowed on paved areas.
- C. Parking facilities located outside of the Construction limits shall not be utilized by construction personnel.
- D. Do not allow heavy vehicles or construction equipment in parking areas.
- E. Maintenance:

- 1. Maintain traffic and parking areas in sound condition free of excavated material, construction equipment, products, mud, snow, and ice.
- 2. Maintain existing and permanent paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.
- F. Repair:
  - 1. Repair existing facilities damaged by use, to "like new" condition.
- G. Mud from Site Vehicles: Provide means of removing mud from vehicle wheels before entering streets; set up wheel wash stations with provisions for drainage if necessary.
- 1.14 PROGRESS CLEANING AND WASTE REMOVAL
  - A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in clean and orderly condition.
  - B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing spaces.
  - C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.
  - D. Clean site daily. Collect and remove waste materials, debris, and rubbish from site weekly and dispose off-site.

### 1.15 FIRE-PREVENTION FACILITIES

- A. Prohibit the use of any/all tobacco products, including smoking of any substance on Owner's Property.
- B. Establish fire watch for cutting, welding, and other hazardous operations capable of starting fires. Maintain fire watch before, during, and after hazardous operations until threat of fire does not exist.
- C. Portable Fire Extinguishers: NFPA 10; 10-pound capacity, 4A-60B: C UL rating.
  1. Provide fire extinguisher on site and inside contractor's office.

## 1.16 WORKER CONDUCT & QUALITY ASSURANCE

- A. Workers shall be fully clothed at all times including shirts, full length pants, and shoes.
- B. Use and/or the presence of alcohol, tobacco products, drugs and/or firearms is strictly prohibited.
- C. Workers shall not socialize with staff or students.
- D. The Contractor shall prevent any worker convicted of a felony sex crime from performing work at the site.
- E. The Contractor shall prevent any worker from performing work on the site until certification has been provided by the KY Cabinet of Health & Family Services stating there are no findings of substantiated child abuse or neglect on record. (KRS 160.380)
  - 1. Applications shall be filed with the KARES Helpdesk. A copy of the application is included at the end of this specification section.

- 2. Applications shall be filed for all workers, including subcontractors, upon notice of contract award.
- For Additional information contact: KARES Helpdesk National Background Check Program Phone: (502) 564-2159 Fax: (502) 564-6546 KARES.Helpdesk@ky.gov https://chfs.ky.gov/agencies/os/oig/Pages/kares-public.aspx

## 1.17 BARRIERS

- A. Provide barriers to prevent unauthorized entry to construction areas, to allow for Owner's use of site, and to protect existing facilities and adjacent properties from damage from construction operations and demolition and as specified on the site drawings.
- B. Provide barricades required by authorities having jurisdiction for public rights-of-way.
- C. Provide protection for plants designated to remain. Replace damaged plants.
- D. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

## 1.18 ENCLOSURES AND FENCING

- A. Construction: Height and material as appropriate to fully define separation of construction and Owner-occupied zones during the work.
- B. Exterior Enclosures:
  - 1. Provide temporary weather tight closure of exterior openings to accommodate acceptable working conditions and protection for products, to allow for maintenance of required ambient temperatures and to prevent entry of unauthorized persons.
- C. Interior Enclosures:
  - 1. Provide temporary barriers and protective coverings as necessary to separate work areas from Owner occupied areas, to prevent penetration of dust and moisture into Owner occupied areas, and to prevent damage to existing materials and equipment.

## 1.19 SECURITY

- A. Security Program:
  - 1. Protect Work on existing premises and Owner's operations from theft, vandalism, and unauthorized entry.
  - 2. Initiate program in coordination with Owner's existing security system at project mobilization.
  - 3. Maintain program throughout construction period until Owner acceptance precludes need for Contractor security.
- B. Entry Control:
  - 1. Restrict entrance of persons and vehicles into Project site and existing facilities.
  - 2. Allow entrance only to authorized persons.
  - 3. Maintain log of workers and visitors, make available to Owner on request.
  - 4. Coordinate access of Owner's personnel to site in coordination with Owner's security forces.

## 1.20 WATER CONTROL

A. Protect Site from puddles or running water. Provide temporary drainage devices as appropriate.

## 1.21 DUST CONTROL

- A. Execute Work by methods to minimize raising dust from construction operations.
- B. Provide positive means to prevent air-borne dust from dispersing into atmosphere.

### 1.22 EROSION & SEDIMENT CONTROL

- A. Plan and execute construction by methods to control surface drainage from cuts and fills from borrow and waste disposal areas. Prevent erosion and sedimentation.
- B. Minimize surface area of bare soil exposed at one time.
- C. Provide temporary measures including berms, dikes, drains, and other devices to prevent water flow.
- D. Construct fill and waste areas by selective placement to avoid erosive surface silts and clays.
- E. Periodically inspect earthwork to detect evidence of erosion and sedimentation. Promptly apply corrective measures.

## 1.23 NOISE CONTROL

- A. Provide methods, means, and facilities to minimize noise produced by construction operations.
- B. Refrain from use of radios, power actuated and pneumatic tools, sawing, hammering and other noisy activities to the greatest degree possible to accommodate Owner occupancy during the work.
- 1.24 PEST CONTROL
  - A. Provide methods, means, and facilities to prevent pests and insects from entering facility.
- 1.25 POLLUTION CONTROL
  - A. Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations.
  - B. Comply with pollution and environmental control requirements of authorities having jurisdiction.

### 1.26 RODENT CONTROL

- A. Provide methods, means, and facilities to prevent rodents from accessing or invading premises.
- 1.27 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS
  - A. Remove temporary utilities, equipment, facilities, materials, prior to Substantial Completion inspection.
  - B. Remove underground installations to minimum depth of 2 feet. Grade site as indicated on Drawings.

- C. Clean and repair damage caused by installation or use of temporary work.
- D. Restore existing and permanent facilities used during construction to "like new" condition.

PART 2 PRODUCTS

Not Used.

## PART 3 EXECUTION

Not Used.

END OF SECTION

# **CENTRAL REGISTRY CHECK**

## FOR THE FOLLOWING TYPES OF EMPLOYMENT OR VOLUNTEERISM, STATE LAW OR KENTUCKY ADMINISTRATIVE REGULATION AUTHORIZES A CHILD ABUSE/NEGLECT (CAN) CHECK AS A CONDITION OF EMPLOYMENT OR VOLUNTEERISM. PLEASE CHECK THE CATEGORY LISTED BELOW THAT APPLIES TO YOU FOR WHICH THE CHILD ABUSE OR NEGLECT CHECK IS BEING REQUESTED:

Child-Placing Agency (Foster/Adoption/Independent Living) Employee or Volunteer (Required by 922 KAR 1:310)

Residential Child-Caring Facility Employee or Volunteer	(Required by 922 KAR 1:300)
(Institution/Group Home/Emergency/Wilderness)	
Public School Employee, Student Teacher, Contractor, or School-Based	Decision-Making Council Member
	(Required by KRS 160.380)
Private, Parochial, or Church School Employee or Student Teacher	(Permitted by KRS 160.151)
Vouth Camp Employee, Contractor, or Volunteer (Required by KRS	194A.380-194A.383)
Power of Attorney Regarding the Care and Custody of a Child	(Required by KRS 403.352)
Supports for Community Living (SCL) Employee	(Required by 907 KAR 1:145)

**Other** (If none of the above categories is applicable, please explain the reason for requesting a child abuse or neglect check, including the statutory or regulatory authority for the request):

PERSONAL INFORMATION REGARDING THE INDIVIDUAL SUBMITTING TO A CHILD ABUSE OR NEGLECT CHECK (Please print and submit identifying information such as a copy of your driver's license, social security card, or birth certificate):

NAME	:				
	(first)	(middle)	(maiden/nic	kname)	(last)
Sex: Race:		Date of Birth:	Social Security #:		
Date of	Initial Hire:				
Present	t Address:				
n •			City	State	Zip Code
Previot	is Address:		City	State	Zip Code
Previou	ıs Address: _				
<b>.</b> .			City	State	Zip Code
Previou	is Address:		City	State	Zin Code
Previou	is Address:		City	State	Zip Code
			City	State	Zip Code

Please list your addresses for the last five years. Use another sheet of paper, if necessary.

## SECTION 016000 - PRODUCT REQUIREMENTS

## PART 1 GENERAL

## 1.1 SECTION INCLUDES

- A. Products.
- B. Product delivery requirements.
- C. Product storage and handling requirements.
- D. Product options.

### 1.2 PRODUCTS

- A. At minimum, comply with specified requirements and reference standards.
- B. Specified products define standard of quality, type, function, dimension, appearance, and performance required.
- C. Furnish products of qualified manufacturers that are suitable for intended use. Furnish products of each type by single manufacturer unless specified otherwise. Confirm that manufacturer's production capacity can provide sufficient product, on time, to meet Project requirements.

## 1.3 PRODUCT DELIVERY REQUIREMENTS

- A. Transport and handle products according to manufacturer's instructions.
- B. Promptly inspect shipments to ensure products comply with requirements, quantities are correct, and products are undamaged.
- C. Provide equipment and personnel to handle products; use methods to prevent soiling, disfigurement, or damage.

#### 1.4 PRODUCT STORAGE AND HANDLING REQUIREMENTS

- A. Store and protect products according to manufacturer's instructions.
- B. Store products with seals and labels intact and legible.
- C. Store sensitive products in weathertight, climate-controlled enclosures in an environment suitable to product.

#### 1.5 PRODUCT OPTIONS

A. Except where substitutions are specifically identified as "not permitted", manufactured products, devices or materials specified under particular brand names or name of manufacturer shall not be construed to mean that these are closed specifications, whether the clause "or equal" is included or not. Other products comparable in type, quality, utility

and price are acceptable if approved by the Architect and the Owner. The burden of proof of quality shall, in all cases, rest with the Contractor. The Owner shall be the final judge of parallel equality and reserves the right to require that the product or material specified by name be furnished at no increase in contract amount. If the materials listed within the proposal form are accepted by the Owner, then no deviations from those listings will be permitted except at the discretion of the Owner in the interest of expediting construction or overall standardization.

## 1.6 PRODUCT SUBSTITUTION PROCEDURES

- A. All requests for Substitutions must be submitted a minimum of 7 days prior to Bid Date.
- B. Document each request with complete data substantiating compliance of proposed Substitution with Contract Documents.
- C. A request constitutes a representation that Bidder:
  - 1. Has investigated proposed product and determined that it meets or exceeds quality level of specified product.
  - 2. Will provide same warranty for Substitution as for specified product.
  - 3. Will coordinate installation and make changes to other Work, which may be required for the Work to be complete with no additional cost to Owner.
  - 4. Waives claims for additional costs or time extension, which may subsequently become apparent.
  - 5. Will reimburse Owner and Architect/Engineer for review or redesign services associated with re-approval by authorities having jurisdiction.
- D. Substitutions will not be considered when they are indicated or implied on Shop Drawing or Product Data submittals, without separate written request prior to Bid Date, or when acceptance will require revision to Contract Documents.
- E. Substitution Submittal Procedure
  - 1. Submit three copies of request for Substitution for consideration. Limit each request to one proposed Substitution.
  - 2. Complete the attached form and use as a "Cover Sheet". Additionally, submit Product Data, and certified test results attesting to proposed product equivalence. Burden of proof is on proposer.
  - 3. The owner shall be the final judge of parallel quality and reserves the right to require that the product or material specified by name be furnished at no increase to the contract.
  - 4. Architect/Engineer will notify Contractor in writing of decision to accept or reject request.

## PART 2 PRODUCTS – not used

## PART 3 EXECUTION

A. Substitution Form as follows:

KENTUCKY DEPARTMENT OF EDUCATION DIVISION OF FACILITIES MANAGEMENT	RTMENT OF EDUCATIONCERTIFICATE OF PRODUCT COMPLIANCELITIES MANAGEMENTFOR PROPOSED SUBSTITUTED PROJECTS702 KAR 4:160MAY 1993			
TO:				
I,(name)	, being a duly authorized representative of			
	the manufacturer, and/or			
(company name)				
distributor and/or sales representative of				
	(product name)			
do hereby certify that the above named product of	complies in strict accordance with the Contract			
	, and that the product is			
compatible (project address)				
and fit for the intended use and incorporation inte	o this project.			
Further, I understand that the Architect and Own	er may rely on this certification.			
(Signed)				
(Date)				
Attached is supporting information.				
EN	ID OF SECTION			

## SECTION 017000 - EXECUTION AND CLOSEOUT REQUIREMENTS

## PART 1 GENERAL

- 1.1 SECTION INCLUDES
  - A. Closeout procedures.
  - B. Starting of systems.
  - C. Demonstration and instructions.
  - D. Testing, Adjusting, And Balancing
  - E. Project Record Documents
  - F. Operation and maintenance data.
  - G. Manual for Equipment and Systems
  - H. Spare parts and maintenance products.
  - I. Product warranties and product bonds.
  - J. Examination.
  - K. Preparation.
  - L. Execution.
  - M. Cutting and patching.
  - N. Protecting installed construction.
  - O. Final cleaning.

## 1.2 CLOSEOUT PROCEDURES

- A. Prerequisites to Substantial Completion: Complete following items before requesting Certification of Substantial Completion, either for entire Work or for portions of Work:
  - 1. Submit maintenance manuals, Project record documents, and other similar final record data in compliance with this Section.
  - Conduct inspection to establish basis for request that Work is substantially complete. Create comprehensive list (initial punch list) indicating items to be completed or corrected, value of incomplete or nonconforming Work, reason for being incomplete, and date of anticipated completion for each item. Include copy of list with request for Certificate of Substantial Completion.
  - 3. Discontinue or change over and remove temporary facilities and services from Project Site, along with construction tools, and similar elements.
  - 4. Perform final cleaning according to this Section.

- B. Substantial Completion Inspection:
  - 1. When Contractor considers Work to be substantially complete, submit to Architect/Engineer:
    - a. Written certificate that Work, or designated portion, is substantially complete.
      - b. List of items to be completed or corrected (initial punch list).
  - 2. Within seven days after receipt of request for Substantial Completion, Architect/Engineer will make inspection to determine whether Work or designated portion is substantially complete.
  - 3. Should Architect/Engineer determine that Work is not substantially complete:
    - a. Architect/Engineer will promptly notify Contractor in writing, stating reasons for its opinion.
    - b. Contractor shall remedy deficiencies in Work and send second written request for Substantial Completion to Architect/Engineer.
    - c. Architect/Engineer will reinspect Work.
    - d. Redo and Inspection of Deficient Work: Repeated until Work passes Architect/Engineer's inspection.
  - 4. When Architect/Engineer finds that Work is substantially complete, Architect/Engineer will:
    - a. Prepare Certificate of Substantial Completion on AIA G704 Certificate of Substantial Completion, accompanied by Contractor's list of items to be completed or corrected as verified and amended by Architect/Engineer and Owner (final punch list).
    - b. Submit Certificate to Owner and Contractor for their written acceptance of responsibilities assigned to them in Certificate.
  - 5. After Work is substantially complete, Contractor shall:
    - a. Allow Owner occupancy of Project under provisions stated in Certificate of Substantial Completion.
    - b. Complete Work listed for completion or correction within time period stipulated.
  - 6. Owner will occupy all portions of building as specified in Section 01 10 00 Summary.
- C. Prerequisites for Final Completion: Complete following items before requesting final acceptance and final payment.
  - 1. When Contractor considers Work to be complete, submit written certification that:
    - a. Contract Documents have been reviewed.
    - b. Work has been examined for compliance with Contract Documents.
    - c. Work has been completed according to Contract Documents.
    - d. Work is completed and ready for final inspection.
  - 2. Submittals: Submit following:
    - a. Final punch list indicating all items have been completed or corrected.
    - b. Final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.
    - c. Specified warranties, workmanship/maintenance bonds, maintenance agreements, and other similar documents.
    - d. Accounting statement for final changes to Contract Sum.
    - e. Contractor's affidavit of payment of debts and claims on AIA G706 Contractor's Affidavit of Payment of Debts and Claims.
    - f. Contractor affidavit of release of liens on AIA G706A Contractor's Affidavit of Release of Liens.
    - g. Consent of surety to final payment on AIA G707 Consent of Surety to Final Payment Form.
  - 3. Perform final cleaning for Contractor-soiled areas according to this Section.
- D. Final Completion Inspection:
  - 1. Within seven days after receipt of request for final inspection, Architect/Engineer will make inspection to determine whether Work or designated portion is complete.
  - 2. Should Architect/Engineer consider Work to be incomplete or defective:

- a. Architect/Engineer will promptly notify Contractor in writing, listing incomplete or defective Work.
- b. Contractor shall remedy stated deficiencies and send second written request to Architect/Engineer that Work is complete.
- c. Architect/Engineer will reinspect Work.
- d. Redo and Inspection of Deficient Work: Repeated until Work passes Architect/Engineer's inspection.

## 1.3 STARTING OF SYSTEMS

- A. Coordinate schedule for startup of emergency generator.
- B. Notify Architect/Engineer seven days prior to startup of generator.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions which may cause damage.
- D. Verify that tests, meter readings, and electrical characteristics agree with those required by equipment or system manufacturer.
- E. Verify that wiring and support components for equipment are complete and tested.
- F. Execute startup under supervision of manufacturer's representative or Contractors' personnel according to manufacturer's instructions.
- G. When specified in individual Specification Sections, require manufacturer to provide authorized representative who will be present at Site to inspect, check, and approve equipment or system installation prior to startup and will supervise placing equipment or system in operation.
- H. Submit a written report according to Section 013300 Submittal Procedures that equipment or system has been properly installed and is functioning correctly.

## 1.4 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel one week prior to date of Substantial Completion.
- B. Demonstrate Project equipment by qualified representative who is knowledgeable about the Project.
- C. Use operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.
- D. Demonstrate startup, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at agreed time and location.
- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- F. Required instruction time for each item of equipment and system is specified in individual Specification Sections.

## 1.5 TESTING, ADJUSTING, AND BALANCING

- A. Testing, adjusting and balancing of HVAC systems shall be performed in compliance with requirements enumerated in specification section 203100 Testing.
- B. Reports will be submitted by independent firm to Architect/Engineer indicating observations and results of tests and indicating compliance or noncompliance with requirements of Contract Documents.

### 1.6 PROJECT RECORD DOCUMENTS

- A. Maintain on Site one set of the following record documents; record actual revisions to the Work:
  - 1. Drawings.
  - 2. Specifications.
  - 3. Addenda.
  - 4. Change Orders and other modifications to the Contract.
  - 5. Reviewed Shop Drawings, product data, and Samples.
  - 6. Manufacturer's instruction for assembly, installation, and adjusting.
- B. Ensure entries are complete and accurate, enabling future reference by Owner.
- C. Store record documents separate from documents used for construction.
- D. Record information concurrent with construction progress, not less than weekly.
- E. Specifications: Legibly mark and record, at each product Section, description of actual products installed, including the following:
  - 1. Manufacturer's name and product model and number.
  - 2. Product substitutions or alternates used.
  - 3. Changes made by Addenda and modifications.
- F. Record Drawings and Shop Drawings: Legibly mark each item to record actual construction as follows:
  - 1. Include Contract modifications such as Addenda, supplementary instructions, change directives, field orders, minor changes in the Work, and change orders.
  - 2. Include locations of concealed elements of the Work.
  - 3. Identify depth of buried utility lines and provide dimensions showing distances from permanent facility components that are parallel to utilities.
  - 4. Dimension ends, corners, and junctions of buried utilities to permanent facility components using triangulation.
  - 5. Identify and locate existing buried or concealed items encountered during Project.
  - 6. Measured horizontal and vertical locations of underground utilities and appurtenances, referenced to permanent surface improvements.
  - 7. Measured locations of internal utilities and appurtenances concealed in construction, referenced to visible and accessible features of the Work.
  - 8. Field changes of dimension and detail.
  - 9. Details not on original Drawings.
- G. Submit marked-up paper copy documents to Architect/Engineer before Substantial Completion with claim for final Application for Payment.

## 1.7 OPERATION AND MAINTENANCE DATA

- A. Submit data in PDF composite electronic indexed file.
- B. Contents: Prepare table of contents with each product or system description identified, typed on white paper, in three parts as follows:
  - 1. Part 1: Directory, listing names, addresses, and telephone numbers of Architect/Engineer, Contractor, Subcontractors, and major equipment suppliers.
  - 2. Part 2: Operation and maintenance instructions, arranged by Specification Section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Include the following:
    - a. Significant design criteria.
    - b. Maintenance instructions for new work
    - Part 3: Project documents and certificates, including the following:
      - a. Shop Drawings and product data.
      - b. Certificates.

3.

c. Originals of warranties.

### 1.8 MANUAL FOR EQUIPMENT AND SYSTEMS

- A. Submit preliminary draft or proposed formats and outlines of contents before start of Work. Architect/Engineer will review draft and return one copy with comments.
- B. For equipment, or component parts of equipment put into service during construction and operated by Owner, submit documents within ten days after acceptance.
- C. Submit before Substantial Completion. Draft copy will be reviewed and returned after Substantial Completion, with Architect/Engineer comments. Revise content of document sets as required prior to final submission.
- D. Submit in PDF composite electronic indexed file of final manual within seven days after final inspection.
- E. Each Item of Equipment and Each System: Include description of unit or system and component parts. Identify function, normal operating characteristics, and limiting conditions. Include performance curves, with engineering data and tests, and complete nomenclature and model number of replaceable parts.
- F. Panelboard Circuit Directories: Provide electrical service characteristics, controls, and communications; typed.
- G. Include color-coded wiring diagrams as installed.
- H. Operating Procedures: Include startup, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shutdown, and emergency instructions. Include summer, winter, and special operating instructions.
- I. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and troubleshooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
- J. Include servicing and lubrication schedule and list of lubricants required.

- K. Include manufacturer's printed operation and maintenance instructions.
- L. Include sequence of operation by controls manufacturer.
- M. Include original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
- N. Include control diagrams by controls manufacturer as installed.
- O. Include Contractor's coordination drawings with color-coded piping diagrams as installed.
- P. Include charts of valve tag numbers, with location and function of each valve, keyed to flow and control diagrams.
- Q. Include list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
- R. Additional Requirements: As specified in individual product Specification Sections.
- S. Include listing in table of contents for design data with tabbed dividers and space for insertion of data.
- 1.9 SPARE PARTS AND MAINTENANCE PRODUCTS
  - A. Furnish spare parts, maintenance, and extra products in quantities specified in individual Specification Sections.
  - B. Deliver to Project Site and place in location as directed by Owner; obtain receipt prior to final payment.
- 1.10 PRODUCT WARRANTIES AND PRODUCT BONDS
  - A. Obtain warranties and bonds executed in duplicate by responsible Subcontractors, suppliers, and manufacturers within ten days after completion of applicable item of Work.
  - B. Execute and assemble transferable warranty documents and bonds from Subcontractors, suppliers, and manufacturers.
  - C. Verify documents are in proper form, contain full information, and are notarized.
  - D. Co-execute submittals when required.
  - E. Include table of contents and assemble in three D side ring binder with durable plastic cover.
  - F. Submit prior to final Application for Payment.
  - G. Time of Submittals:
    - 1. For equipment or component parts of equipment put into service during construction with Owner's permission, submit documents within ten days after acceptance.
    - 2. Make other submittals within ten days after date of Substantial Completion, prior to final Application for Payment.

3. For items of Work for which acceptance is delayed beyond Substantial Completion, submit within ten days after acceptance, listing date of acceptance as beginning of warranty or bond period.

## PART 2 PRODUCTS - Not Used

### PART 3 EXECUTION

### 3.1 EXAMINATION

- A. Verify that existing Site conditions and substrate surfaces are acceptable for subsequent Work. Beginning new Work means acceptance of existing conditions.
- B. Verify that existing substrate is capable of structural support or attachment of new Work being applied or attached.
- C. Examine and verify specific conditions described in individual Specification Sections.
- D. Verify that utility services are available with correct characteristics and in correct locations.

### 3.2 PREPARATION

- A. Clean substrate surfaces prior to applying next material or substance according to manufacturer's instructions.
- B. Seal cracks or openings of substrate prior to applying next material or substance.
- C. Apply manufacturer-required or -recommended substrate primer, sealer, or conditioner prior to applying new material or substance in contact or bond.

## 3.3 EXECUTION

- A. Comply with manufacturer's installation instructions, performing each step in sequence. Maintain one set of manufacturer's installation instructions at Project Site during installation and until completion of construction.
- B. When manufacturer's installation instructions conflict with Contract Documents, request clarification from Architect/Engineer before proceeding.
- C. Verify that field measurements are as indicated on approved Shop Drawings or as instructed by manufacturer.
- D. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, or disfigurement.
  - 1. Secure Work true to line and level and within specified tolerances, or if not specified, industry-recognized tolerances.
  - 2. Physically separate products in place, provide electrical insulation, or provide protective coatings to prevent galvanic action or corrosion between dissimilar metals.
  - 3. Exposed Joints: Provide uniform joint width and arrange to obtain best visual effect. Refer questionable visual-effect choices to Architect/Engineer for final decision.

- E. Allow for expansion of materials and building movement.
- F. Climatic Conditions and Project Status: Install each unit of Work under conditions to ensure best possible results in coordination with entire Project.
  - 1. Isolate each unit of Work from incompatible Work as necessary to prevent deterioration.
  - 2. Coordinate enclosure of Work with required inspections and tests to minimize necessity of uncovering Work for those purposes.
- G. Mounting Heights: Where not indicated, mount individual units of Work at industry recognized standard mounting heights for particular application indicated.
  - 1. Refer questionable mounting heights choices to Architect/Engineer for final decision.
  - 2. Elements Identified as Accessible to Handicapped: Comply with applicable codes and regulations.
- H. Adjust operating products and equipment to ensure smooth and unhindered operation.
- I. Clean and perform maintenance on installed Work as frequently as necessary through remainder of construction period. Lubricate operable components as recommended by manufacturer.

### 3.4 CUTTING AND PATCHING

- A. Employ skilled and experienced installers to perform cutting and patching.
- B. Submit written request in advance of cutting or altering elements affecting:
  - 1. Structural integrity of element.
  - 2. Integrity of weather-exposed or moisture-resistant elements.
  - 3. Efficiency, maintenance, or safety of element.
  - 4. Visual qualities of sight-exposed elements.
  - 5. Work of Owner or separate contractor.
- C. Execute cutting, fitting, and patching including excavation and fill to complete Work and to:
  - 1. Fit the several parts together, to integrate with other Work.
  - 2. Uncover Work to install or correct ill-timed Work.
  - 3. Remove and replace defective and nonconforming Work.
  - 4. Remove samples of installed Work for testing.
  - 5. Provide openings in elements of Work for penetrations of mechanical and electrical Work.
- D. Execute Work by methods to avoid damage to other Work and to provide proper surfaces to receive patching and finishing.
- E. Cut masonry and concrete materials using masonry saw or core drill.
- F. Restore Work with new products according to requirements of Contract Documents.
- G. Refinish surfaces to match adjacent finishes. For continuous surfaces, refinish to nearest intersection; for assembly, refinish entire unit.

## 3.5 PROTECTING INSTALLED CONSTRUCTION

A. Protect installed Work and provide special protection where specified in individual Specification Sections.

- B. Provide temporary and removable protection for installed products. Control activity in immediate Work area to prevent damage.
- C. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.
- D. Use durable sheet materials to protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects.
- E. Prohibit traffic or storage upon waterproofed or roofed surfaces. When traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.
- F. Prohibit traffic from landscaped areas.

## 3.6 FINAL CLEANING

- A. Execute final cleaning prior to final Project assessment.
- B. Clean Site; sweep paved areas, rake clean landscaped surfaces.
- C. Remove waste and surplus materials, rubbish, and construction facilities from Site.

# END OF SECTION

# SECTION 024119 - SELECTIVE BUILDING DEMOLITION

### PART 1 - GENERAL

#### 1.1 SUMMARY

#### A. Section Includes:

- 1. Demolishing designated construction.
- 2. Demolishing designated building equipment and fixtures.
- 3. Cutting and alterations for completion of the Work.
- 4. Protecting items designated to remain.
- 5. Removing demolished materials.
- B. Related Sections:
  - 1. Section 011000 Summary: Project Description, Owner's occupancy of building during construction, and phasing requirements of the work.
  - 2. Section 015000 Temporary Facilities and Controls: Barriers and Enclosures, cleaning and waste removal.
  - 3. Divisions 20-25 Mechanical: demolition requirements for mechanical work
  - 4. Divisions 26-28 Electrical: demolition requirements for electrical work.

### 1.2 CLOSEOUT SUBMITTALS

- A. Section 017000 Execution and Closeout Requirements: Requirements for submittals.
- B. Project Record Documents: Accurately record actual locations of capped utilities, concealed utilities discovered during demolition, and subsurface obstructions.

#### 1.3 QUALITY ASSURANCE

- A. Conform to all applicable codes for demolition work, dust control, products requiring electrical disconnection and re-connection.
- B. Conform to all applicable codes and Section 013000 for procedures when hazardous or contaminated materials are discovered.
- C. Obtain required permits from authorities having jurisdiction.

## 1.4 SEQUENCING

- A. Section 011000 Summary: Requirements for sequencing.
- B. Owner will conduct salvage operations before demolition begins to remove materials Owner chooses to retain.

## 1.5 SCHEDULING

- A. Section 013000 Administrative Requirements: Requirements for scheduling.
- B. Schedule Work to coincide with new construction.
- C. Cooperate with Owner in scheduling noisy operations and waste removal that may impact Owners operation.
- D. Coordinate utility and building service interruptions with Owner.
  - 1. Do not disable or disrupt building fire or life safety systems without three days prior written notice to Owner.
  - 2. Schedule tie-ins to existing systems to minimize disruption.
  - 3. Coordinate Work to ensure fire alarms, smoke detectors, emergency lighting, exit signs and other life safety systems remain in operation in areas not schedule for renovation.
- E. Maintain all utility services including, but not limited to, power, water, gas, phone, data and cable TV to the Bradley Building, Bus Garage including power to site lighting and bus engine heaters at all times during construction.

## 1.6 PROJECT CONDITIONS

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Cease operations immediately if structure appears to be in danger and notify Architect/Engineer. Do not resume operations until directed.

## 1.7 DEMOLITION of PCB's

- A. Due to the likely presence of ballast containing PCB's in existing light fixtures that are to be demolished, as well as mercury content in the fluorescent lamps and thermostats, contractor is to assume that all existing-to-be-removed fluorescent fixtures contain such material, and is to perform the following abatement procedures in accordance with all applicable Federal PCB and Mercury Abatement regulations. Thermostats containing mercury-containing contact tubes are to be dealt with in the same manner.
- B. Electrician is to completely remove and properly dispose of all light fixtures/thermostats that are scheduled to be demolished.
- C. Electrical contractor is to supply, at the site, separate drums to contain the removed ballast and removed fluorescent lamps.
- D. Electrical contractor is to remove the ballast from the light fixtures while wearing gloves and deposit the ballast into the drums.
- E. In the unlikely event that a ballast is found to be leaking, the electrical contractor has the option of going ahead and removing it and depositing it in the drums or refusing to remove it by contacting the Owner and requesting that some other qualified person handle the leaking ballast, at which point, the Owner will handle the removal of that specific leaking ballast.
- F. Mercury tubes may be removed from thermostats in order to reduce waste. Thermostats/mercury-containing tubes must be properly handled and packaged to avoid

breakage. Follow proper cleanup procedures as dictated by the Kentucky Department of Environmental Protection in the event of breakage.

G. Once all ballast, fluorescent lamps and thermostats are removed and deposited into the drums, the electrical contractor will be responsible for picking up the drums and removing them from the site to be incinerated or recycled as required. Electrical contractor shall provide, to the Owner, copies of manifests showing that the materials have been properly disposed.

## PART 2 - PRODUCTS

2.1 Not Used.

## PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Notify affected utility companies before starting work and comply with their requirements.
- B. Mark location and termination of utilities.
- C. Erect, and maintain temporary barriers and security devices at locations indicated, necessary, or as directed by the Architect, including warning signs and lights, and similar measures, for protection of the Owner, and existing improvements indicated to remain.
- D. Erect and maintain weatherproof closures for exterior openings.
- E. Erect and maintain temporary partitions to prevent spread of dust, odors, and noise to permit continued Owner occupancy.
- F. Prevent movement of structure; provide temporary bracing and shoring required to ensure safety of existing structure.
- G. Provide appropriate temporary signage including signage for exit or building egress.
- H. Do not close or obstruct building egress path.
- I. Do not disable or disrupt building fire or life safety systems without 3 days prior written notice to Owner.

## 3.2 SALVAGE REQUIREMENTS

- A. Coordinate with Owner to identify building components and equipment required to be removed and delivered to Owner.
- B. Tag components and equipment Owner designates for salvage.
- C. Protect designated salvage items from demolition operations until items can be removed.
- D. Carefully remove building components and equipment indicated to be salvaged.

- E. Disassemble as required to permit removal from building.
- F. Package small and loose parts to avoid loss.
- G. Mark equipment and packaged parts to permit identification and consolidation of components of each salvaged item.
- H. Prepare assembly instructions consistent with disassembled parts. Package assembly instructions in protective envelope and securely attach to each disassembled salvaged item.
- I. Deliver salvaged items to Owner. Obtain signed receipt from Owner.

### 3.3 DEMOLITION

- A. Conduct demolition to minimize interference with adjacent and occupied building areas.
- B. Maintain protected egress from and access to adjacent existing buildings at all times.
- C. Do not close or obstruct roadways, bus access drives or sidewalks without permits &/or Owner's written permission, as appropriate.
- D. Cease operations immediately when structure appears to be in danger and notify Architect/Engineer.
- E. Disconnect and remove designated utilities within demolition areas.
- F. Cap and identify abandoned utilities at termination points when utility is not completely removed. Annotate Record Drawings indicating location and type of service for capped utilities remaining after demolition.
- G. Demolish in orderly and careful manner. Protect existing improvements, supporting structural members.
- H. Carefully remove building components indicated to be reused.
  - 1. Disassemble components as required to permit removal.
  - 2. Package small and loose parts to avoid loss.
  - 3. Mark components and packaged parts to permit reinstallation.
  - 4. Store components, protected from construction operations, until reinstalled.
- I. Remove demolished materials from site except where specifically noted otherwise. Do not burn or bury materials on site.
- J. Remove materials as Work progresses. Upon completion of Work, leave areas in clean condition.
- K. Remove temporary Work.

### 3.4 SCHEDULES

- A. Remove, store and protect the following materials and equipment:
  1. Items identified by Owner at the Pre-construction meeting.
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- B. Remove the following equipment and materials for Owner's retention. Deliver to location designated by Owner
  - 1. Items identified by Owner at the Pre-construction meeting.
- C. Owner will remove the following material and equipment before start of demolition:
  1. Items identified by Owner at the Pre-construction meeting.
- D. Protect all existing construction assemblies, systems and finishes scheduled to remain.
- E. Demolish the following materials and equipment:
  - 1. Demolition Work to include all work noted on the Demolition Plans on sheet D1.1 of the Construction Documents, and all other incidental demolition required for the successful completion of the New Work called for in the entirety of the Documents.
  - 2. Refer to Structural, Mechanical, Plumbing, Fire Protection and Electric drawings for additional demolition requirements.
  - 3. Contractor is required to provide temporary shoring and bracing of existing structure necessary to complete installation of New Work and to prevent damage to the existing structure. Shoring design to be submitted to the Structural Engineer of record for approval prior to installation.
  - 4. Carefully remove, clean and store existing brick veneer units during demolition of existing exterior wall, where new masonry openings are cut, for use in patching/filling of brick veneer in New Work.

END OF SECTION 024119

## SECTION 03300 - CAST-IN-PLACE CONCRETE

## PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
  - 1. Footings.
  - 2. Slabs-on-grade.
- B. Related Sections:
  - 1. Section "Special Inspection"
  - 2. Section "Earthwork"
  - 3. Section "Vapor Barrier"

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Design Mixtures: For each concrete mixture. Submit alternate design mixtures when characteristics of materials, Project conditions, weather, test results, or other circumstances warrant adjustments.
  - 1. Indicate amounts of mixing water to be withheld for later addition at Project site.
- C. Steel Reinforcement Shop Drawings: Placing drawings that detail fabrication, bending, and placement. Include bar sizes, lengths, material, grade, bar schedules, stirrup spacing, bent bar diagrams, bar arrangement, splices and laps, mechanical connections, tie spacing, hoop spacing, and supports for concrete reinforcement.
- D. Construction Joint Layout: Indicate proposed construction joints required to construct the structure.
  - 1. Location of construction joints is subject to approval of the Architect.

## 1.4 INFORMATIONAL SUBMITTALS

- A. See Specification Section "Special Inspection" for informational submittals required.
- B. Temperature logs of cold weather concreting operations.
# 1.5 QUALITY ASSURANCE

- A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACIcertified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.
- B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.
  - 1. Manufacturer certified according to NRMCA's "Certification of Ready Mixed Concrete Production Facilities."
- C. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- D. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
  - 1. ACI 301, "Specifications for Structural Concrete."
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

#### PART 2 - PRODUCTS

#### 2.1 STEEL REINFORCEMENT

- A. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 deformed.
- B. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

#### 2.2 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut true to length with ends square and free of burrs.
- B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
  - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

### 2.3 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
  - 1. Portland Cement: ASTM C 150, Type I/II
    - a. Fly Ash: ASTM C 618, Class F.
- B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source with documented service record data of at least 10 years' satisfactory service in similar applications and service conditions using similar aggregates and cementitious materials.
  - 1. Maximum Coarse-Aggregate Size: 3/4 inch nominal.
  - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

#### 2.4 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
  - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
  - 2. Retarding Admixture: ASTM C 494/C 494M, Type B.
  - 3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
  - 4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
  - 5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
  - 6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

# 2.5 LIQUID FLOOR TREATMENTS

- A. Liquid Floor Treatment: Clear, chemically reactive, waterborne solution of inorganic silicate or siliconate materials and proprietary components; odorless; that penetrates, hardens, and densifies concrete surfaces.
- B. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
- C. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately when dry.
- D. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- E. Water: Potable.

F. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, nondissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

## 2.6 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips:
  - 1. Semi-Rigid, Closed-Cell, Cross-linked Polyethylene foam conforming to ASTM D8139, with removable top strip for application of sealant.
- B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:

#### 2.7 CONCRETE MIXTURES, GENERAL

- A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
  - 1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.
- B. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
  - 1. Fly Ash: 25 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.06 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
  - 1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
  - 2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
  - 3. Use water-reducing admixture in pumped concrete, concrete for heavy-use industrial slabs and parking structure slabs, concrete required to be watertight, and concrete with a water-cementitious materials ratio below 0.50.
  - 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.

# 2.8 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 3500 psi at 28 days.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.50.

- 3. Slump Limit: 5 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
- 4. Air Content: zero percent, plus or minus 1.5 percent at point of delivery.
- B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
  - 1. Minimum Compressive Strength: 4000 psi at 28 days.
  - 2. Maximum Water-Cementitious Materials Ratio: 0.50.
  - 3. Slump Limit: 5 inches, 8 inches for concrete with verified slump of 2 to 4 inches before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch.
  - 4. Air Content: zero percent, plus or minus 1.5 percent at point of delivery.

# 2.9 FABRICATING REINFORCEMENT

A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

# 2.10 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M and furnish batch ticket information.
  - When air temperature is between 85 and 90 deg F , reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F , reduce mixing and delivery time to 60 minutes.
- B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.
  - 1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
  - 2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd..
  - 3. Provide batch ticket for each batch discharged and used in the Work to Special Inspector, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

# PART 3 - EXECUTION

# 3.1 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
  - 1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."

### 3.2 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
  - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
- E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

### 3.3 JOINTS

- A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.
- B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.
  - 1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.
  - 2. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
  - 3. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
  - 1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch-wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint. Use proprietary dowels where indicated on drawings.

# 3.4 CONCRETE PLACEMENT

- A. Before placing concrete, verify that installation of formwork, reinforcement, and embedded items is complete and that required inspections have been performed.
- B. Do not add water to concrete during delivery, at Project site, or during placement unless approved by Architect.
- C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
  - 1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
  - 1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
  - 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
  - 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.
- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
  - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
  - 2. Maintain reinforcement in position on chairs during concrete placement.
  - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
  - 4. Slope surfaces uniformly to drains where required.
  - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
  - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
  - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
  - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
  - 4. Monitor and record temperature during cold weather placement and curing by use of electronic temperature probes, in quantities and at places indicated by Architect, capable of being monitored by the contractor and Architect in real-time via the internet.

- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
  - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water.
  - 2. Maximum transport time when ambient temperature is above 85 deg F is one hour.
  - 3. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

#### 3.5 VAPOR-RETARDER INSTALLATION

- A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to ASTM E 1643 and manufacturer's written instructions.
  - 1. Lap joints 6 inches and seal with manufacturer's recommended tape.
  - 2. See Specification Section "Vapor Barrier" for additional information.

### 3.6 FINISHING FORMED SURFACES

A. Related Unformed Surfaces: At tops of footings and similar unformed surfaces, strike off smooth and finish with a smooth floated finish.

#### 3.7 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bullfloated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
  - 1. Apply scratch finish to surfaces where required for tile floors and other similar finishes.
- C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
  - 1. Apply a trowel finish to surfaces interior floor surfaces where other finish is not required.
  - 2. Finish surfaces to the following tolerances, according to ASTM E 1155, for a randomly trafficked floor surface:
    - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
- D. Trowel and Fine-Broom Finish: Apply a first trowel finish to exterior slab and walkway surfaces and/or where a non-slip finish is required. While concrete is still plastic, slightly scarify surface with a fine broom.
  - 1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

# 3.8 CONCRETE PROTECTING AND CURING

- A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.
- B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.
- C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.
- D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
- E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
  - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
    - a. Water.
    - b. Continuous water-fog spray.
    - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
  - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
    - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
    - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
    - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
  - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
    - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

# 3.9 LIQUID FLOOR TREATMENTS

- A. Penetrating Liquid Floor Treatment: Prepare, apply, and finish penetrating liquid floor treatment according to manufacturer's written instructions.
  - 1. Remove curing compounds, sealers, oil, dirt, laitance, and other contaminants and complete surface repairs.
  - 2. Do not apply to concrete that is less than seven days old.
  - 3. Apply liquid until surface is saturated, scrubbing into surface until a gel forms; rewet; and repeat brooming or scrubbing. Rinse with water; remove excess material until surface is dry. Apply a second coat in a similar manner if surface is rough or porous.

# 3.10 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
  - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
  - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
  - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
  - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
  - 2. After concrete has cured at least 14 days, correct high areas by grinding.
  - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
  - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's

written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.

- 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.
- 6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
- 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

# 3.11 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. See specification Section "Structural Special Inspection" for more information.

# 3.12 PROTECTION OF LIQUID FLOOR TREATMENTS

A. Protect liquid floor treatment from damage and wear during the remainder of construction period. Use protective methods and materials, including temporary covering, recommended in writing by liquid floor treatments installer.

END OF SECTION 03300

# SECTION 040513 - MASONRY MORTARING AND GROUTING

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes: Mortar for masonry.
- B. Related Requirements:
  - 1. Section 014100 Structural Special Inspection
  - 2. Section 042000 Unit Masonry: Installation of mortar.
  - 3. Section 081214 Standard Steel Frames: Grouting steel door frames.

# 1.2 REFERENCE STANDARDS

- A. American Concrete Institute:
  - 1. ACI 530/530.1 Building Code Requirements and Specification for Masonry Structures.

# B. ASTM International:

- 1. ASTM C5 Standard Specification for Quicklime for Structural Purposes.
- 2. ASTM C91 Standard Specification for Masonry Cement.
- 3. ASTM C91M Standard Specification for Masonry Cement.
- 4. ASTM C144 Standard Specification for Aggregate for Masonry Mortar.
- 5. ASTM C150 Standard Specification for Portland Cement.
- 6. ASTM C150M Standard Specification for Portland Cement.
- 7. ASTM C199 Standard Test Method for Pier Test for Refractory Mortars.
- 8. ASTM C206 Standard Specification for Finishing Hydrated Line.
- 9. ASTM C270 Standard Specification for Mortar for Unit Masonry.
- 10. ASTM C387 Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar.
- 11. ASTM C387M Standard Specification for Packaged, Dry, Combined Materials for Concrete and High Strength Mortar.
- 12. ASTM C595 Standard Specification for Blended Hydraulic Cements.
- 13. ASTM C595M Standard Specification for Blended Hydraulic Cements.
- 14. ASTM C780 Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry.
- 15. ASTM C1142 Standard Specification for Extended Life Mortar for Unit Masonry.
- 16. ASTM C1314 Standard Test Method for Compressive Strength of Masonry Prisms.
- 17. ASTM C1329 Standard Specification for Mortar Cement.
- 18. ASTM C1329M Standard Specification for Mortar Cement.
- 19. ASTM C1357 Standard Test Methods for Evaluating Masonry Bond Strength.

#### 1.3 SUBMITTALS

- A. Section 013300 Submittal Procedures: Requirements for submittals.
- B. Samples: Submit two samples of mortar, illustrating mortar color and color range.

- C. Design Data: Submit required environmental conditions, admixture limitations, and design mix if property specification of ASTM C270 is to be used.
- D. Manufacturer Instructions: Submit premixed mortar installation instructions.

### 1.4 QUALITY ASSURANCE

A. Comply with ACI 530/530.1.

#### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

# 1.6 AMBIENT CONDITIONS

- A. Section 015000 Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Cold Weather Requirements: Comply with ACI 530/530.1 if ambient temperature or temperature of masonry units is less than 40 degrees F.
- C. Hot Weather Requirements: Comply with ACI 530/530.1 if ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

# PART 2 - PRODUCTS

# 2.1 MORTAR AND MASONRY GROUT

- A. Manufacturers:
  - 1. Brixment
  - 2. Kosmortar
  - 3. Medusa
  - 4. Glen-Gery
  - 5. LaFarge Corp.
  - 6. The Quikrete Companies
  - 7. Substitutions: Section 016000 Product Requirements

# B. COMPONENTS

- 1. Premix Mortar: ASTM C387, Type S and N, using gray color cement.
- 2. Mortar Aggregate: ASTM C144, standard masonry type.
- 3. Grout Aggregate: ASTM C404, fine.
- 4. Water: Clean and potable.
- 5. Mortar Color: match existing colored mortar.
- 6. Calcium chloride is not permitted.
- 7. Bonding Agent: Latex type.

#### 2.2 MIXES

- A. Mortar Mixes:
  - 1. Mortar For Structural Masonry: ASTM C270, Type S using Property specification.
  - 2. Mortar For Non-Structural Masonry: ASTM C270, Type N using Property specification.
  - 3. Pointing Mortar: ASTM C270, Type N using Property specification.
- B. Mortar Mixing:
  - 1. Thoroughly mix mortar ingredients in accordance with ASTM C270 in quantities needed for immediate use.
  - 2. Achieve uniformly damp sand immediately before mixing process.
  - 3. Add admixtures to achieve uniformity of mix and coloration.
  - 4. Re-temper only within two hours of mixing.
- C. Grout Mixes:
  - 1. Grout: 3,000 psi strength at 28 days; 8-10 inches slump; mixed in accordance with ASTM C476 Fine grout.
- D. Grout Mixing:
  - 1. Thoroughly mix grout ingredients in quantities needed for immediate use in accordance with ASTM C476.
  - 2. Add admixtures; mix uniformly.
  - 3. Do not use anti-freeze compounds to lower the freezing point of grout.

# PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Section 017000 Execution and Closeout Requirements: Requirements for installation preparation.
- B. Apply bonding agent to existing concrete surfaces.
- C. Mortar Mixing:
  - 1. Thoroughly mix mortar ingredients according to ASTM C270 in quantities needed for immediate use.
  - 2. Achieve uniformly damp sand immediately before mixing process.
  - 3. Add mortar color and admixtures to achieve uniform mix and coloration.
  - 4. Retemper only within two hours of mixing.

# 3.2 INSTALLATION

A. According to ACI 530/530.1.

# 3.3 SCHEDULE

- A. Exterior Cavity Wall: CMU with Type S mortar and Brick Veneer with Type N mortar
- B. Interior CMU Load-bearing walls: Type S mortar
- C. Interior CMU Non-load bearing walls: Type N mortar

END OF SECTION 040513

SECTION 042000 - UNIT MASONRY

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Concrete masonry units.
  - 2. Masonry reinforcement, anchorage, and accessories.
  - 3. Dampproofing.
  - 4. Through Wall Flashing
  - 5. Air Barrier
  - 6. Cutting and patching of existing masonry assemblies
    - a. Tooth new masonry units into existing where exposed to view.
    - b. Salvaged, cleaned existing brick veneer units are to be used to patch/infill of existing exterior masonry veneer wall.
    - c. New brick veneer units are to be provided as required to complete the work if adequate supply of salvaged brick units is not available. New units are to match the existing in color, size and texture.
  - 7. Cleaning of new masonry.
- B. Related Requirements:
  - 1. Section 014100 Structural Special Inspection.
  - 2. Section 040514 Masonry Mortaring and Grouting: Mortar and grout.
  - 3. Section 052100 Structural Steel
  - 4. Section 055000 Metal Fabrications: Product requirements for loose steel lintels, and fabricated steel items, for placement by this section.
  - 5. Section 072600 Bituminous Waterproofing: asphalt waterproofing on exterior side of CMU in exterior cavity
  - 6. Section 072113 Board Insulation: Insulation for cavity spaces.
  - 7. Section 079000 Joint Protection: Rod and sealant at control and expansion joints.
  - 8. Section 081214 Standard Steel Frames: Steel frames for placement by this section.
  - 9. Section 099000 Painting: Paint finish of designated CMU
  - 10. condensate discharge.
  - 11. Division 23 Mechanical: Cutting and patching of existing masonry assemblies as needed to complete the mechanical work.
  - 12. Division 27 Electrical: Cutting and patching of existing masonry assemblies as needed to complete the electrical work.

## 1.2 REFERENCE STANDARDS

- A. American Concrete Institute:
  - 1. ACI 530/530.1 Building Code Requirements and Specification for Masonry Structures and Related Commentaries.
- B. ASTM International:
  - 1. ASTM A82 Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.
  - 2. ASTM A82M Standard Specification for Steel Wire, Plain, for Concrete Reinforcement.

- 3. ASTM A153- Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- 4. ASTM A153M- Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware.
- 5. ASTM A240 Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- 6. ASTM A240M Standard Specification for Chromium and Chromium-Nickel Stainless Steel Plate, Sheet, and Strip for Pressure Vessels and for General Applications.
- 7. ASTM A307 Standard Specification for Carbon Steel Bolts and Studs, 60 000 PSI Tensile Strength.
- 8. ASTM A580 Standard Specification for Stainless Steel Wire.
- 9. ASTM A580M Standard Specification for Stainless Steel Wire.
- 10. ASTM A615 Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
- 11. ASTM A615M Standard Specification for Deformed and Plain Carbon Steel Bars for Concrete Reinforcement.
- 12. ASTM A653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 13. ASTM A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- 14. ASTM A951 Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- 15. ASTM A951M Standard Specification for Steel Wire for Masonry Joint Reinforcement.
- 16. ASTM B370 Standard Specification for Copper Sheet and Strip for Building Construction.
- 17. ASTM B695 Standard Specification for Coatings of Zinc Mechanically Deposited on Iron and Steel.
- 18. ASTM C27 Standard Classification of Fireclay and High-Alumina Refractory Brick.
- 19. ASTM C55 Standard Specification for Concrete Building Brick.
- 20. ASTM C62 Standard Specification for Building Brick (Solid Masonry Units Made From Clay or Shale).
- 21. ASTM C67 Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile.
- 22. ASTM C73 Standard Specification for Calcium Silicate Brick (Sand-Lime Brick).
- 23. ASTM C90 Standard Specification for Loadbearing Concrete Masonry Units.
- 24. ASTM C129 Standard Specification for Nonloadbearing Concrete Masonry Units.
- 25. ASTM C140 Standard Test Methods for Sampling and Testing Concrete Masonry Units and Related Units.
- 26. ASTM C216 Standard Specification for Facing Brick (Solid Masonry Units Made from Clay or Shale).
- 27. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
- 28. ASTM C652 Standard Specification for Hollow Brick (Hollow Masonry Units Made From Clay or Shale).
- 29. ASTM C1314 Standard Test Method for Compressive Strength of Masonry Prisms.
- 30. ASTM D226 Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- 31. ASTM D226M Standard Specification for Asphalt-Saturated Organic Felt Used in Roofing and Waterproofing.
- 32. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- 33. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.

### 1.3 COORDINATION

- A. Section 013000 Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with brick veneer installation of door frames, window blocking, installation of structural framing supported by masonry, and air barriers.
- 1.4 SUBMITTALS
  - A. Section 013300 Submittal Procedures: Submittal requirements.
  - B. Product Data: Submit data for concrete masonry units, brick and <u>ALL</u> specified accessories.
  - C. CMU Fabricator's Test Reports & Certificate: Submit Independent test results demonstrating mfr's compliance with ASTM standards for maximum weight and strength characteristics associated with Light Weight CMU.
  - D. Submit certified test results for brick efflorescence in accordance with ASTM C67. Brick rated greater than "slightly effloresced" is not acceptable.

# 1.5 QUALITY ASSURANCE

- A. Perform Work according to ACI 530/530.1.
- 1.6 QUALIFICATIONS
  - A. Installer: Company specializing in performing Work of this Section with minimum five years' documented experience.
- 1.7 MOCKUPS
  - A. Section 014000 Quality Requirements: Requirements for mockups.
  - B. Mockup of new masonry is not required.

#### 1.8 SEQUENCING

- A. Section 011000 Summary: Requirements for sequencing.
- B. Sequence activities in phases; refer to Article 1.4 TIMES OF COMPLETION AND LIQUIDATED DAMAGES for a detailed description of phasing requirements.
- 1.9 DELIVERY, STORAGE, AND HANDLING
  - A. Section 016000 Product Requirements: Requirements for transporting, handling, storing, and protecting products.

B. Accept CMU units on site. Inspect for damage. Inspect CMU surfaces; do not install material with excessive pitting, irregular face texture or chips.

### 1.10 AMBIENT CONDITIONS

- A. Section 015000 Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Do not store reinforcing material directly on ground. Utilize blocking and other methods to prevent rust on accessories prior to installation.
- C. Cold Weather Requirements: According to ACI 530.1 when ambient temperature or temperature of masonry units is less than 40 degrees F.
- D. Hot Weather Requirements: According to ACI 530.1 when ambient temperature is greater than 100 degrees F or ambient temperature is greater than 90 degrees F with wind velocity greater than 8 mph.

#### 1.11 EXISTING CONDITIONS

A. Field Measurements: Verify elevations, dimensions, and alignment of foundations and other supporting construction prior to beginning Work. Align bed joints of new masonry with existing.

# PART 2 - PRODUCTS

# 2.1 UNIT MASONRY ASSEMBLIES: CONCRETE BLOCK

- A. Manufacturers:
  - 1. Lee Block
  - 2. Boyle Block
  - 3. Reading Rock
  - 4. Ready Mix Concrete
  - 5. Substitutions: Section 016000 Product Requirements

# 2.2 UNIT MASONRY ASSEMBLIES: BRICK

- A. Manufacturers:
  - 1. Salvaged and cleaned existing brick veneer units are to be used as available for patching and infilling of new exterior masonry wall work.
  - 2. Match Existing
    - a. When adequate salvaged units are not available, contractor is to provide new brick units to match the existing brick veneer units in color, size and texture. Samples to be provided to Architect for review.
  - 3. Substitutions: Section 016000

### 2.3 COMPONENTS

A. Face Brick: ASTM C216, Type FBX, Grade SW; color and texture to match existing.

- B. Brick Size and Shape: Match existing
- C. Hollow Load Bearing Concrete Masonry Units (CMU): ASTM C90, Type II Non-moisture Controlled; light weight.
- D. Solid Load-Bearing Concrete Masonry Units (CMU): ASTM C90, Type II Non-moisture Controlled; light weight.
- E. Hollow Non-Load Bearing Concrete Masonry Units (CMU): ASTM C129, Type II Non-moisture Controlled; light weight.
- F. Concrete Masonry Unit Size and Shape: Nominal modular size as indicated on the drawings and as required to complete the work. Furnish special units for 90 degree corners, bond beams, and lintels. Base shapes to be straight. All corners to be bullnosed unless otherwise indicated.

#### 2.4 ACCESSORIES

- A. Single Wythe Joint Reinforcement: Ladder type; steel wire, hot dip galvanized to ASTM A641 Class 1 after fabrication, cold drawn steel wire conforming to ASTM A951, 9 gauge rods with 9 gauge cross ties. D/A 320 Ladur as manufactured by DUR-O-Wal, Inc. or approved equal.
- B. Multiple Wythe Masonry Unit Joint Reinforcement: Ladder type; with adjustable wall ties; hot dip galvanized after fabrication (1.5 oz or better zinc coating) cold drawn steel conforming to ASTM A951, No. 9 side rods with No. 9 cross ties. D/A 360 Ladur Eye as manufactured by DUR-O-Wal, Inc. or approved equal.
- C. Reinforcing Steel: ASTM A615 60 ksi yield grade, deformed billet bars, uncoated finish.
- D. Strap Anchors: Bent steel shape, 2 inch size x 1/4 inch thick, hot dip galvanized to ASTM A153, B2 finish.
- E. Anchor Bolts: Headed, J-shaped or L-shaped.
- F. Through Wall Flashing: Flexible stainless steel self-adhering flashing with a type 304, ASTM A240 stainless steel core and one uncoated stainless steel face and a butyl block co-polymer adhesive. Product shall be York 304 SS as manufactured by York Manufacturing, Inc. or approved equal.
  - 1. Accessories:
    - a. Polyether sealant, by same mfr. as flashing.
    - b. Splice Tape, by same mfr. as flashing.
    - c. Corner & End Dams: formed using flashing product or 26 gauge stainless steel manufactured products.
    - d. Termination bar: rigid PVC or stainless steel termination bar with sealant catch lip, by same mfr as flashing.
- G. Air Barrier: Flexible air barrier that is self-adhering with a rubberized asphalt core & cross laminated ply facer with a thickness of 40 mils. Product shall be York Seal as manufactured by York Manufacturing or approve equal.
  - 1. Accessories:
    - a. Mastic/Sealant: One part 100% solids, solvent free formulated sily1-terminated polyether (STPE), ASTM C920-11, Type S, Grade NS, Class 50 by same mfr as air barrier.
    - b. Primer / Contact Adhesive
      - 1) 3M Super 77 spray adhesive

- 2) Primer: water based industry standard primers
- c. Outside & Inside Corners & End Dams: 26 gauge preformed stainless steel
- d. Termination Bar: rigid PVC or stainless steel termination bar with sealant catch lip, by same mfr as flashing.
- e. Fastners: Domestic manufactured fastener types & sizes recommended by flashing mfr for intended use.
- H. Preformed Control Joints: Rubber material. Furnish with corner and tee accessories, cement fused joints.
- I. Joint Filler: Closed cell rubber; oversized 50 percent to joint width; self expanding.
- J. Mortar and Grout: As specified in Section 040503.
- K. Nailing Strips: Softwood, preservative treated for moisture resistance, dovetail shape, sized to masonry joints.
- L. Cavity Vents: Molded polyvinyl chloride grilles; insect resistant.
- M. Cavity Weeps: 100% cotton rope x 1/4" diameter. Mason Pro 100% Cotton Tiger Sash or equal.
- N. Cavity Netting: MortarNet by Mortar Net Solutions or approved equal.
- O. Cleaning Solution: Non-acidic, not harmful to masonry Work of adjacent materials.
- P. Dampproofing: Cold applied asphalt emulsion and accessories. Sonneborn Hydrocide Mastic 700 or 700B and associated primers & cements. Equivalent products by Pecora or Tremco are acceptable.
- Q. Sand: Clean, dry, washed properly graded fine masonry sand.

# PART 3 - EXECUTION

### 3.1 EXAMINATION

- A. Section 017000 Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that field conditions are acceptable and ready to receive Work.
- C. Verify that items provided by other Sections of Work are properly sized and located.
- D. Verify that built-in items are in proper location and ready for roughing into masonry Work.

# 3.2 PREPARATION

- A. Section 017000 Execution and Closeout Requirements: Requirements for installation preparation.
- B. Direct and coordinate placement of metal anchors supplied to other Sections.

- C. Furnish temporary bracing during installation of masonry Work. Maintain in place until building structure provides permanent support.
- D. Wet clay and shale brick before laying when initial rate of absorption is greater than 30 g per min./30 sq. in. when tested according to ASTM C67.

# 3.3 INSTALLATION

- A. Establish lines, levels, and coursing indicated. Protect from displacement.
- B. Maintain masonry courses to uniform dimension. Form bed and head joints of uniform thickness.
- C. Coursing of CMU:
  - 1. Bond: Stacked Bond (to match existing).
  - 2. Coursing: One unit and one mortar joint to equal 8 inches.
  - 3. Mortar Joints: Concave.
- D. Coursing of Brick Units:
  - 1. Bond: Running Bond (to match existing).
  - 2. Coursing: Match existing.
  - 3. Mortar Joints: Match existing.
- E. Placing and Bonding:
  - 1. Lay solid masonry units in full bed of mortar, with full head joints.
  - 2. Lay hollow masonry units with face shell bedding on head and bed joints.
  - 3. Buttering corners of joints or excessive furrowing of mortar joints are not permitted.
  - 4. Remove excess mortar as Work progresses.
  - 5. Interlock intersections and external corners except where interior walls abut exterior walls. At these locations provide interlocking ladder type joint reinforcement in every other bed joint to provide lateral stability between the two walls; but do not interlock masonry. Rake head joint continuously to a depth of 3/8" where walls meet and fill joint with sealant.
  - 6. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment is required, remove mortar and replace.
  - 7. Perform Project Site cutting of masonry units with proper tools to assure straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.
  - 8. Cut mortar joints flush where wall tile is scheduled, resilient base is scheduled, cavity insulation is applied, or bitumen dampproofing is applied.
  - 9. Isolate masonry from vertical structural framing members with movement joint.
  - 10. Isolate top of masonry from horizontal structural framing members and slabs or decks with compressible joint filler.
- F. Weeps and Vents: Provide cotton weeps in outer wythe of brick veneer at 48 inches on center horizontally above all through-wall flashing, shelf angles, and lintels. Provide vents in outer wythe of brick veneer at 48" on center horizontally above all through-wall flashing, shelf angles, lintels AND 24" on center continuously at the top of the wall.
- G. Cavity Wall: Do not permit mortar to drop or accumulate into cavity air space or to plug weeps. Build inner wythe ahead of outer wythe to receive cavity insulation and air/vapor retarder adhesive.
- H. Cavity Netting: Install mortar netting at base of walls above through wall flashing to a height of 16 inches.

- I. Joint Reinforcement and Anchorage Single-Wythe Masonry:
  - 1. Install horizontal joint reinforcement 16 inches o.c. for running bond and 8 inches on center for stacked bond.
  - 2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
  - 3. Place joint reinforcement continuous in first and second joint below top of walls.
  - 4. Lap joint reinforcement ends minimum 6 inches.
  - 5. Reinforce stack-bonded unit joint corners and intersections with strap anchors 16 inches o.c.
- J. Joint Reinforcement and Anchorage Masonry Veneer:
  - 1. Install horizontal joint reinforcement 16 inches on center for running bond and 8 inches on center for stacked bond.
  - 2. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches each side of opening.
  - 3. Place joint reinforcement continuous in first and second joint below top of walls.
  - 4. Lap joint reinforcement ends minimum 6 inches.
  - 5. Embed wall ties in masonry backing to bond veneer at maximum 16 inches o.c. vertically and 16 inches o.c. horizontally. Place wall ties at maximum 8 inches o.c. vertically within 8 inches of jamb of wall openings.
  - 6. Reinforce stack-bonded unit joint corners and intersections with strap anchors 16 inches o.c.
- K. Masonry Flashings:
  - 1. Extend flashings horizontally through outer wythe at foundation walls, above ledge or shelf angles and lintels, under parapet caps, at bottom of walls, and cut flush with face of brick.
  - 2. Turn flashing up minimum 8 inches and bed into mortar joint of masonry backing.
  - 3. Lap end joints minimum 6 inches and seal watertight.
  - 4. Turn flashing, fold, and seal at corners, bends, and interruptions.
- L. Lintels:
  - 1. Install loose steel or concrete masonry bond beam lintels over openings.
  - 2. Install reinforced unit masonry lintels over miscellaneous openings less than 24 inches wide where lintels are not scheduled or indicated.
  - 3. Do not splice reinforcing bars.
  - 4. Support and secure reinforcing bars from displacement.
  - 5. Place and consolidate grout fill without displacing reinforcing.
  - 6. Allow masonry lintels to attain specified strength before removing temporary supports.
  - 7. Maintain minimum 8-inch bearing on each side of opening.
- M. Dampproofing
  - 1. Apply dampproofing to concealed face of concrete masonry units associated with exterior cavity walls in accordance with manufacturers written instructions.
- N. Grouted Components:
  - 1. Reinforce bond beams and pilasters as indicated on Drawings. Maintain minimum of 1 inch clearance from bottom web.
  - 2. Lap splices bar diameters as required by code.
  - 3. Support and secure reinforcing bars from displacement.
  - 4. Place and consolidate grout fill without displacing reinforcing.
  - 5. At bearing locations, fill masonry cores with grout for minimum 12 inches both sides of opening.

- O. Reinforced Masonry:
  - 1. Lay masonry units with cells vertically aligned and cavities between wythes clear of mortar and unobstructed.
  - 2. Place reinforcement bars as indicated on Drawings.
  - 3. Splice reinforcement as specified in Section 033000 Cast-In-Place Concrete.
  - 4. Support and secure reinforcement from displacement.
  - 5. Place and consolidate grout fill without displacing reinforcing.
  - 6. Place grout according to ACI 530.1.
- P. Control and Expansion Joints:
  - 1. Install control joints at the following maximum spacings, unless otherwise indicated on Drawings:
    - a. Exterior Walls: 20 feet o.c. and within 24 inches on one side of each interior and exterior corner.
    - b. Interior Walls: 30 feet o.c.
    - c. At changes in wall height.
  - 2. Do not continue horizontal joint reinforcement through control joints.
  - 3. Install preformed control joint device in continuous lengths. Seal butt and corner joints.
  - 4. Size control joint as specified in Section 079000 Joint Protection for sealant performance.
- Q. Built-in Work:
  - 1. As Work progresses, install fabricated metal frames wood nailing strips anchor bolts plates and other items to be built in the Work and furnished by other Sections.
  - 2. Install built-in items plumb and level.
  - 3. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout or mortar. Fill adjacent masonry cores with grout minimum 12 inches from framed openings.
  - 4. Do not build in materials subject to deterioration.
- R. Cutting and Fitting:
  - 1. Cut and fit for chases, pipes, conduit, sleeves, and grounds. Coordinate with other Sections of Work to provide correct size, shape, and location.
  - 2. Obtain Architect/Engineer's approval prior to cutting or fitting masonry Work not indicated or where appearance or strength of masonry Work may be impaired.

# 3.4 TOLERANCES

- A. Section 014000 Quality Requirements: Requirements for tolerances.
- B. Maximum Variation from Alignment of Columns and/or Pilasters: 1/4 inch.
- C. Maximum Variation from Unit to Adjacent Unit: 1/16 inch.
- D. Maximum Variation from Plane of Wall: 1/4 inch in 10 feet and 1/2 inch in 20 feet or more.
- E. Maximum Variation from Plumb: 1/4 inch per story non-cumulative; 1/2 inch in two stories or more.
- F. Maximum Variation from Level Coursing: 1/8 inch in 3 feet and 1/4 inch in 10 feet; 1/2 inch in 30 feet.

- G. Maximum Variation of Joint Thickness: 1/8 inch in 3 feet.
- H. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch.
- I. Maximum Variation for Steel Reinforcement:
  - 1. Install reinforcement within the tolerances specified in ACI 530.1 for foundation walls.
  - 2. Plus or minus 1/2 inch when distance from centerline of steel to opposite face of masonry is 8 inches or less.
  - 3. Plus or minus 1 inch when distance is between 8 and 24 inches.
  - 4. Plus or minus 1-1/4 inch when distance is greater than 24 inches.
  - 5. Plus or minus 2 inches from location along face of wall.

#### 3.5 CLEANING

- A. Section 017000 Execution and Closeout Requirements: Requirements for cleaning.
- B. Remove excess mortar and mortar smears as Work progresses.
- C. Replace defective mortar. Match adjacent Work.
- D. Clean soiled surfaces with cleaning solution.
- E. Use non-metallic tools in cleaning operations.

#### 3.6 PROTECTION

- A. Section 017000 Execution and Closeout Requirements: Requirements for protecting finished Work.
- B. Protect exposed external corners subject to damage.
- C. Protect base of walls from mud and mortar splatter.
- D. Protect masonry and other items built into masonry walls from mortar droppings and staining caused by mortar.
- E. Protect tops of masonry Work with waterproof coverings secured in place without damaging masonry. Provide coverings where masonry is exposed to weather when Work is not in progress. Maintain protection on tops of completed exterior walls until installation of permanent waterproof cap materials.

# 3.7 SCHEDULE

- A. Unit Masonry Assemblies include, but are not necessarily limited to:
  - 1. Interior Partitions: Single wythe concrete masonry units. Stacked Bond.
  - 2. Masonry infill and repair of new or existing openings in masonry wall assemblies. Infill openings to match existing; tooth-in new work with existing unless otherwise noted on the drawings
  - 3. Cutting and patching of existing masonry as required to conceal new plumbing &/or electrical raceways.

4. New openings in existing masonry assemblies: Provide new steel support as appropriate for the size of the new opening. Cut and patch masonry as required to install new steel. Provide flashing and vents in exterior walls where new lintels are installed.

END OF SECTION 042000

SECTION 051200 - STRUCTURAL STEEL

# PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Structural steel framing.
  - 2. Grout.
- B. Section does NOT include:
  - 1. Anchor bolts and miscellaneous metals, e.g. handrails, brick lintels, and other nonstructural metal fabrications.
- C. Provide all labor, materials, equipment and services required to furnish and install all structural steel framing as indicated on the Drawings and specified herein.

#### 1.3 ACTION SUBMITTALS

- A. The Contractor shall submit the following data for Engineer's review.
- B. Product Data: For each type of product indicated.
- C. Show fabrication of structural-steel components.
  - 1. Submit drawings including plans, elevations, and details showing sizes, profiles, and locations of special shapes, and attachments to other work.
  - 2. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
  - 3. Include embedment drawings.
  - 4. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld.
  - 5. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
  - 6. Fabrication drawings shall not be reproductions of Contract Drawings.

# 1.4 QUALITY ASSURANCE

A. Fabricator Qualifications: Fabricator shall have minimum 3 years of successful past performance of contracts for similar structures or shall be subject to approval by the Owner and Engineer based on successful past performance of contracts on similar structures.

- B. Installer Qualifications: Installer shall have minimum 3 years of successful past performance of contracts for similar structures or shall be subject to approval by the Owner and Engineer based on successful past performance of contracts on similar structures.
- C. Welding Procedure Qualifications: Must be in accordance with AWS D1.4/D1.4M.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code Steel."
- E. Comply with applicable provisions of the following specifications and documents:
  - 1. AISC 303 "Code of Standard Practice for Steel Buildings and Bridges".
  - 2. AISC 360 "Specification for Structural Steel Buildings".
  - 3. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."

# 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
  - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
  - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
  - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
  - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

# PART 2 - PRODUCTS

- 2.1 STRUCTURAL-STEEL MATERIALS
  - A. Structural Steel Shapes shall conform to the ASTM specifications indicated on the drawings.
  - B. Welding Electrodes: Comply with AWS requirements.
- 2.2 BOLTS, CONNECTORS, AND ANCHORS
  - A. High-strength structural bolts, nuts and washers shall conform to the requirements indicated on the drawings.

# 2.3 PRIMER

A. Primer: Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.

# 2.4 BELOW SLAB PROTECTIVE COATING

A. Coating: Coal Tar Mastic conforming to ASTM D490 and SPC SPCC 33.

# 2.5 GROUT

A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

# 2.6 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
  - 1. Camber structural-steel members where indicated.
  - 2. Fabricate beams with rolling camber up.
  - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
  - 4. Mark and match-mark materials for field assembly.
  - 5. Complete structural-steel assemblies, including welding of units, before starting shoppriming operations.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
  - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
  - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not thermally cut bolt holes or enlarge holes by burning.
  - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
  - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

### 2.7 SHOP CONNECTIONS

A. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.

#### 2.8 SHOP PRIMING

- A. Shop prime steel surfaces except the following:
  - 1. Surfaces embedded in concrete or mortar
  - 2. Surfaces to be field welded.
  - 3. Galvanized surfaces.
- B. Surface Preparation: Clean surfaces to be painted. Remove loose rust and mill scale and spatter, slag, or flux deposits. Prepare surfaces according to the following specifications and standards:
  - 1. SSPC-SP 3, "Power Tool Cleaning."
- C. Priming: Immediately after surface preparation, apply primer according to manufacturer's written instructions and at rate recommended by SSPC to provide a minimum dry film thickness of 1.5 mils. Use priming methods that result in full coverage of joints, corners, edges, and exposed surfaces.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
  - 2. Apply two coats of shop paint to surfaces that are inaccessible after assembly or erection.

#### 2.9 GALVANIZING

- A. Galvanize steel where indicated on plans.
- B. Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123 or ASTM A 153, as applicable.
- C. Galvanize after fabrication where practicable. Do not substitute electrogalvanizing for material that is indicated to be hot-dipped galvanized.
- D. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC Paint 20.

#### 2.10 FIELD COATING BELOW SLAB:

A. Coat structural steel below slab level where indicated after erection with one coat of Coal Tar Mastic conforming.

#### 2.11 SOURCE QUALITY CONTROL

A. Testing Agency: Owner may engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.

- 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

# PART 3 - EXECUTION

### 3.1 FABRICATION

- A. Structural material shall be fabricated and assembled in the shop to the greatest extent possible.
- B. Shearing, flame cuttings, and chipping shall be done carefully and accurately. Sheared and flame cut edges shall be finished smooth by grinding, chipping, or planing.
- C. The radii of reentrant flame cut fillets shall be not less than one inch and as much larger as practicable.
- D. Sole plates of beams and girders shall have full contact with the flanges.
- E. Where shown or required, stiffeners shall be fitted neatly between the flanges of beams and girders and, where tight fits are required to transmit bearing, the ends of stiffeners shall be milled or ground to secure an even bearing against the flanges or shall be grooved and fully buttwelded to the flanges. The corners of stiffener plates shall be cut to clear fillets of beams.
- F. The clearance between the ends of spliced web plates shall not exceed ¼ inch.
- G. Assembled pieces shall be taken apart, if necessary, for the removal of burrs and shavings produced by the reaming operation.
- H. Steel work to be encased in concrete, including surfaces of top flanges of members supporting concrete slabs shall, after fabrication, be cleaned of all oil or grease by solvent cleaners and, after erection, be cleaned of dirt and foreign material by thoroughly sweeping with a stiff fiber brush or other approved method.

# 3.2 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

# 3.3 PREPARATION

A. Templates shall be furnished, together with instructions for the setting of anchors, anchor bolts, and bearing plates. The Contractor shall ascertain that the items are properly set during the progress of the work.

- B. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
  - 1. Do not remove temporary shoring supporting composite deck construction until cast-inplace concrete has attained its design compressive strength.

### 3.4 ERECTION

- A. Prior to erection, members shall be identified by a painted erection mark. Connecting parts assembled in the shop for reaming holes in field connections shall be match marked with scratch and notch marks. Do not locate erection markings on areas to be welded (or on surfaces of weathering steels that will be exposed in the completed structure). Do not locate match markings in areas that will decrease member strength or cause stress concentrations
- B. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- C. Base Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials and roughen surfaces prior to setting plates. Clean bottom surface of plates.
  - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
  - 2. Weld plate washers to top of baseplate.
  - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
  - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- D. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- E. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
  - 1. Level and plumb individual members of structure.
- F. Splice members only where indicated.
- G. Do not use thermal cutting during erection unless approved by Structural Engineer. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- H. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.

# 3.5 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
  - 1. Joint Type: As-indicated on drawings.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
  - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.

#### 3.6 FIELD QUALITY CONTROL

- A. Inspection Agency: Owner will engage a qualified independent testing and inspecting agency to inspect steel construction, high-strength bolt connections and welded connections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents or with requirements.

#### 3.7 REPAIRS AND PROTECTION

- A. Touchup Painting: Immediately after erection, clean exposed areas where primer is damaged or missing and paint with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Clean and prepare surfaces by SSPC-SP 2 hand-tool cleaning or SSPC-SP 3 power-tool cleaning.
- B. Touchup Painting:
  - 1. Cleaning and touchup painting are specified in Division 09 painting Sections.
  - 2. Repair damaged galvanized coatings in accordance with ASTM A 780.

END OF SECTION 05120

### SECTION 055000 - METAL FABRICATIONS

# PART 1 - GENERAL

## 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Steel tube reinforcement for low partitions.
  - 2. Steel framing and supports for mechanical and electrical equipment.
  - 3. Steel framing and supports for applications where framing and supports are not specified in other Sections.
- B. Products furnished, but not installed, under this Section include the following:
  - 1. Loose steel lintels.
  - 2. Anchor rods / bolts
- C. Related Requirements:
  - 1. Section "Structural Special Inspection"
  - 2. Section "Cast-in-Place Concrete"
  - 3. Section "Unit Masonry"
  - 4. Section "Structural Steel Framing."

### 1.3 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' written recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of metal fabrications that are anchored to or that receive other work. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

#### 1.4 ACTION SUBMITTALS

- A. Product Data: For all manufactured items:
- B. Shop Drawings: Show fabrication and installation details. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide Shop Drawings for all fabricated items:

### 1.5 INFORMATIONAL SUBMITTALS

- A. See Specification Section "Structural Special Inspection" for informational submittals required by that section.
- 1.6 QUALITY ASSURANCE
  - A. See Specification Section "Structural Special Inspection" for fabricator qualification certification requirements.

#### 1.7 FIELD CONDITIONS

A. Field Measurements: Verify actual locations of walls and other construction contiguous with metal fabrications by field measurements before fabrication.

#### PART 2 - PRODUCTS

# 2.1 METALS

- A. Metal Surfaces, General: Provide materials with smooth, flat surfaces unless otherwise indicated. For metal fabrications exposed to view in the completed Work, provide materials without seam marks, roller marks, rolled trade names, or blemishes.
- B. Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- C. Steel Tubing: ASTM A 500/A 500M, Grade B hollow structural sections.

# 2.2 FASTENERS

- A. Steel Bolts and Nuts: Regular hexagon-head bolts, ASTM A 325, Type 3; with hex nuts, ASTM A 563, Grade C3; and, where indicated, flat washers.
- B. Anchor Bolts: ASTM F 1554, Grade 36, of dimensions indicated; with nuts, ASTM A 563; and, where indicated, flat washers.
  - 1. Hot-dip galvanize or provide mechanically deposited, zinc coating where item being fastened is indicated to be galvanized.
- C. Anchors, General: Anchors capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488/E 488M, conducted by a qualified independent testing agency.
- D. Cast-in-Place Anchors in Concrete: Either threaded type or wedge type unless otherwise indicated; galvanized ferrous castings, either ASTM A 47/A 47M malleable iron or ASTM A 27/A 27M cast steel. Provide bolts, washers, and shims as needed, all hot-dip galvanized per ASTM F 2329.
- E. Post-Installed Anchors: chemical anchors.

1. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941, Class Fe/Zn 5, unless otherwise indicated.

# 2.3 MISCELLANEOUS MATERIALS

- A. Universal Shop Primer: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with MPI#79 and compatible with topcoat.
  - 1. Use primer containing pigments that make it easily distinguishable from zinc-rich primer.
- B. Shop Primer for Galvanized Steel: Primer formulated for exterior use over zinc-coated metal and compatible with finish paint systems indicated.
- C. Galvanizing Repair Paint: High-zinc-dust-content paint complying with SSPC-Paint 20 and compatible with paints specified to be used over it.
- D. Bituminous Paint: Cold-applied asphalt emulsion complying with ASTM D 1187/D 1187M.
- E. Nonshrink, Nonmetallic Grout: Factory-packaged, nonstaining, noncorrosive, nongaseous grout complying with ASTM C 1107/C 1107M. Provide grout specifically recommended by manufacturer for interior and exterior applications.

#### 2.4 FABRICATION, GENERAL

- A. Shop Assembly: Preassemble items in the shop to greatest extent possible. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- B. Cut, drill, and punch metals cleanly and accurately. Remove burrs and ease edges to a radius of approximately 1/32 inch unless otherwise indicated. Remove sharp or rough areas on exposed surfaces.
- C. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
- D. Form exposed work with accurate angles and surfaces and straight edges.
- E. Weld corners and seams continuously to comply with the following:
  - 1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
  - 2. Obtain fusion without undercut or overlap.
  - 3. Remove welding flux immediately.
  - 4. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- F. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners or welds where possible. Where exposed fasteners are required, use Phillips flat-head (countersunk) fasteners unless otherwise indicated. Locate joints where least conspicuous.

- G. Fabricate seams and other connections that are exposed to weather in a manner to exclude water. Provide weep holes where water may accumulate.
- H. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.

#### 2.5 MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Provide steel framing and supports not specified in other Sections as needed to complete the Work.
- B. Fabricate units from steel shapes, plates, and bars of welded construction unless otherwise indicated. Fabricate to sizes, shapes, and profiles indicated and as necessary to receive adjacent construction.
- C. Galvanize miscellaneous framing and supports where indicated.

# 2.6 LOOSE STEEL LINTELS

- A. Fabricate loose steel lintels from steel angles and shapes of size indicated for openings and recesses in masonry walls and partitions at locations indicated. Fabricate in single lengths for each opening unless otherwise indicated. Weld adjoining members together to form a single unit where indicated.
- B. Size loose lintels to provide bearing length at each side of openings equal to 1/12 of clear span, but not less than 6 inches unless otherwise indicated.
- C. Galvanize (and prime if indicated) loose steel lintels located in exterior walls.

### 2.7 FINISHES, GENERAL

- A. Finish metal fabrications after assembly.
- B. Finish exposed surfaces to remove tool and die marks and stretch lines, and to blend into surrounding surface.

#### 2.8 STEEL AND IRON FINISHES

- A. Galvanizing: Hot-dip galvanize items as indicated to comply with ASTM A 153/A 153M for steel and iron hardware and with ASTM A 123/A 123M for other steel and iron products.
  - 1. Do not quench or apply post galvanizing treatments that might interfere with paint adhesion.
- B. Preparation for Shop Priming Galvanized Items: After galvanizing, thoroughly clean railings of grease, dirt, oil, flux, and other foreign matter, and treat with metallic phosphate process.
- C. Shop prime iron and steel items not indicated to be galvanized unless they are to be embedded in concrete, sprayed-on fireproofing, or masonry, or unless otherwise indicated.
- D. Shop prime with:
  - 1. Fabricator's standard lead- and chromate-free, nonasphaltic, rust-inhibiting primer complying with MPI#79 and compatible with topcoat.
- E. Preparation for Shop Priming: Prepare surfaces to comply with SSPC-SP 3, "Power Tool Cleaning."
- F. Shop Priming: Apply shop primer to comply with SSPC-PA 1, "Paint Application Specification No. 1: Shop, Field, and Maintenance Painting of Steel," for shop painting.
  - 1. Stripe paint corners, crevices, bolts, welds, and sharp edges.
- G. Field Coating Below Slab:
  - 1. Coat structural steel below slab level where indicated after erection with one coat of Coal Tar Mastic conforming to ASTM D490 and SPC SPCC 33.

#### PART 3 - EXECUTION

#### 3.1 INSTALLATION, GENERAL

- A. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing metal fabrications. Set metal fabrications accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- B. Fit exposed connections accurately together to form hairline joints. Weld connections that are not to be left as exposed joints but cannot be shop welded because of shipping size limitations. Do not weld, cut, or abrade surfaces of exterior units that have been hot-dip galvanized after fabrication and are for bolted or screwed field connections.
- C. Field Welding: Comply with the following requirements:
  - 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. At exposed connections, finish exposed welds and surfaces smooth and blended so no roughness shows after finishing and contour of welded surface matches that of adjacent surface.
- D. Fastening to In-Place Construction: Provide anchorage devices and fasteners where metal fabrications are required to be fastened to in-place construction. Provide threaded fasteners for use with concrete and masonry inserts, toggle bolts, through bolts, lag screws, wood screws, and other connectors.
- E. Provide temporary bracing or anchors in formwork for items that are to be built into concrete, masonry, or similar construction.

### 3.2 INSTALLING MISCELLANEOUS FRAMING AND SUPPORTS

- A. General: Install framing and supports to comply with requirements of items being supported, including manufacturers' written instructions and requirements indicated on Shop Drawings.
- B. Anchor supports for miscellaneous framing securely to, and rigidly brace from, building structure.

#### 3.3 FIELD QUALITY CONTROL

A. Testing and Inspecting: Owner will engage a special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports. See specification Section "Structural Special Inspection" for more information.

#### 3.4 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas. Paint uncoated and abraded areas with the same material as used for shop painting to comply with SSPC-PA 1 for touching up shop-painted surfaces.
  - 1. Apply by brush or spray to provide a minimum 2.0-mil dry film thickness.
- B. Galvanized Surfaces: Clean field welds, bolted connections, and abraded areas and repair galvanizing to comply with ASTM A 780/A 780M.

SECTION 06 10 00 - CARPENTRY

# PART 1 GENERAL

- 1.1 SUMMARY
  - A. Section includes miscellaneous concealed wood blocking for support of corner guards in gypsum board/metal framed walls.
  - B. Related Sections:
    - 1. Section 092116 Gypsum Board Assemblies.
    - 2. Section 109000 Miscellaneous Specialties Corner Guards.

# 1.2 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI A135.4 Basic Hardboard.
  - 2. ANSI A208.1 Mat-Formed Wood Particleboard.
- B. APA-The Engineered Wood Association:
  - 1. APA/EWA PS 1 Voluntary Product Standard for Construction and Industrial Plywood.
- C. Architectural Woodwork Institute:
  - 1. AWI Quality Standards Illustrated.
- D. Hardwood Plywood and Veneer Association:
  - 1. HPVA HP-1 American National Standard for Hardwood and Decorative Plywood.
- E. American Wood-Preservers' Association:
  - 1. AWPA C1 All Timber Products Preservative Treatment by Pressure Process.
  - 2. AWPA C20 Structural Lumber Fire-Retardant Treatment by Pressure Processes.
- F. National Institute of Standards and Technology:
  - 1. NIST PS 20 American Softwood Lumber Standard.
- G. Northeastern Lumber Manufacturers Association:
  - 1. NELMA Standard Grading Rules for Northeastern Lumber.
- H. National Lumber Grades Authority:
  - 1. NLGA Standard Grading Rules for Canadian Lumber.
- I. The Redwood Inspection Service:
  - 1. RIS Standard Specifications for Grades of California Redwood Lumber.
- J. Southern Pine Inspection Bureau:
  - 1. SPIB Standard Grading Rules for Southern Pine Lumber.
- K. West Coast Lumber Inspection Bureau:1. WCLIB Standard Grading Rules for West Coast Lumber.
- L. Western Wood Products Association:

1. WWPA G-5 - Western Lumber Grading Rules.

#### 1.3 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Submittal procedures.
- B. Product Data: Submit technical data on all manufactured items.

#### 1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with the following:
  - 1. Lumber Grading Agency: Certified by NIST PS 20.
  - 2. Wood Structural Panel Grading Agency: Certified by EWA The Engineered Wood Association.
  - 3. Plywood Grading Agency: Certified by APA/EWA.
- B. Perform finish carpentry work in accordance with AWI (Architectural Woodwork Institute) Architectural Woodwork Quality Standards Illustrated, Custom Grade.
- 1.5 DELIVERY, STORAGE, AND HANDLING
  - A. Section 01 60 00 Product Requirements: Product storage and handling requirements.
  - B. Store finish carpentry items indoors, in ventilated areas with constant, minimum temperature of 60 degrees F, maximum relative humidity of 25 to 55 percent.

# PART 2 PRODUCTS

#### 2.1 LUMBER MATERIALS

- A. Lumber Grading Rules: PS 20; graded in accordance with established grading rules; maximum moisture content of 13 percent; of following species and grade:
  - 1. Structural Light Framing: Stress group S4S; select structural; No. 2 grade.
  - 2. Non-structural Light Framing: Stress group S4S; structural grade.
  - 3. Studding: Stress group S4S; stud grade.
  - 4. Structural Joists: Stress group S4S; select structural; No. 2 grade.
  - 5. Beams and Stringers: Stress group S4S; structural; No. 1 grade.

# 2.2 ACCESSORIES

- A. Fasteners and Anchors:
  - 1. Fasteners: Hot dipped galvanized steel for high humidity and treated wood locations, unfinished steel elsewhere.
  - 2. Anchors: Toggle bolt type for anchorage to hollow masonry. Expansion shield and lag bolt type for anchorage to solid masonry or concrete. Bolt or ballistic fastener for anchorages to steel.
- B. Fire Retardant Treatment: Pressure treatment, AWPA C20 for lumber and AWPA C27 for plywood, chemically treated and pressure impregnated; capable of providing a maximum flame spread/smoke development rating of 25/450.

# PART 3 EXECUTION

#### 3.1 FRAMING

- A. Set structural members level and plumb, in correct position.
- B. Make provisions for erection loads, and for sufficient temporary bracing to maintain structure safe, plumb, and in alignment until completion of erection and installation of permanent bracing.
- C. Place horizontal members, crown side up.
- D. Construct load bearing framing members full length without splices.
- E. Double members at openings over 24 inches wide. Space short studs over and under opening to stud spacing.
- F. Construct double joist headers at floor and ceiling openings and under wall stud partitions parallel to floor joists. Frame rigidly into joists.
- G. Bridge framing in excess of 8 feet span. Fit solid blocking at ends of members.

# 3.2 TOLERANCES

- A. Section 01 40 00 Quality Requirements: Tolerances.
- B. Framing Members: 1/4 inch from indicated position, maximum.
- C. Surface Flatness of Floor: 1/4 inch in 10 feet maximum, and 1/2 inch in 30 feet maximum.

# 3.3 SCHEDULES

- A. The following schedule is a list of principal items only. Refer to the drawings for a detailed description of carpentry requirements.
  - 1. Wall Blocking: All locations where wall mounted fixtures or products are specified to be mounted on framed wall construction including, but not necessarily limited to corner guards.

# SECTION 064100 - ARCHITECTURAL WOOD CASEWORK

### PART 1 GENERAL

- 1.1 SUMMARY
  - A. Section includes custom-fabricated laminate cabinet units; solid surface counter tops; cabinet hardware, and preparation for installing utilities in cabinets.
  - B. Related Sections:
    - 1. Section 042000 Unit Masonry
    - 2. Section 081214 Standard Steel Frames: Window frame installed in adjacent opening.

#### 1.2 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI A156.9 Cabinet Hardware.
  - 2. ANSI A208.1 Mat-Formed Wood Particleboard.
- B. Architectural Woodwork Institute:
  - 1. AWI Quality Standards Illustrated.
- C. ASTM International:
  - 1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM F1667 Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- D. Federal Specification Unit:
  - 1. FS A-A-1936 Adhesive, Contact, Neoprene Rubber.
- E. Forest Stewardship Council:
  - 1. FSC Guidelines Forest Stewardship Council Guidelines.
- F. Green Seal: 1. GS-36 - Aerosol Adhesives.
- G. Hardwood Plywood and Veneer Association:
  1. HPVA HP-1 American National Standard for Hardwood and Decorative Plywood.
- H. National Electrical Manufacturers Association:
  - 1. NEMA LD 3 High Pressure Decorative Laminates.
- I. National Fire Protection Association:
  - 1. NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
- J. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168 Adhesive and Sealant Applications.

- K. Woodwork Institute:
  - 1. WI Manual of Millwork.

# 1.3 SUBMITTALS

- A. Section 013300 Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate materials, component profiles and elevations, assembly methods, joint details, fastening methods, accessory listings, hardware location and schedule of finishes.
- C. Product Data: Submit data for <u>ALL</u> hardware and accessories.
- D. Samples: Submit full range of color options available for all plastic laminate and solid surfacing items.
- E. Certification: Submit copy of fabricator's AWI Quality Certification Program license.

# 1.4 QUALITY ASSURANCE

- A. Perform work in accordance with AWI AWS, Section 10 and Section 11; Custom Grade.
- B. Surface Burning Characteristics: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.

### 1.5 QUALIFICATIONS

- A. Fabricator: Company licensed by Architectural Woodwork Institute Quality Certification Program and specializing in fabricating products specified in this section with minimum five years experience.
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A. Section 016000 Product Requirements: Product storage and handling requirements.
  - B. Protect units from moisture damage.

#### 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 Product Requirements.
- B. During and after installation of Work of this section, maintain same temperature and humidity conditions in building spaces as will occur after occupancy.

#### 1.8 FIELD MEASUREMENTS

A. Verify field measurements prior to fabrication.

# 1.9 MOCKUP

A. Section 014000 - Quality Requirements: Mockup requirements.

B. Casework Mockup is not required.

# PART 2 PRODUCTS

- 2.1 COMPONENTS
  - A. Softwood Lumber: PS 20; graded in accordance with AWI Custom Grade; average moisture content of 6 percent; species and grade as follows:
    - 1. Cabinet Blocking/Frame: Poplar or White Pine, Clear
  - B. Hardwood Lumber: Graded in accordance with AWI Custom; average moisture content of 6 percent; species and grade as follows:
    - 1. Cabinet Blocking/Frame: Birch, Clear. Countertop and/or panel edging where identified on the drawings to be oak, quarter sawn.
  - C. Wood Particleboard: ANSI A208.1, 48 lb. Density composed of western fir wood chips made with high resins, waterproof binders; water resistant adhesive; grade to suit application; sanded faces. 3/4 inch thickness, typical. Exceptions: <u>Use 1 inch thick for shelves that exceed 32" in length</u> and 1 1/2 inch composite for countertops if they are not continuously supported by base cabinets.
    - 1. Door and Drawer Fronts, Cabinet and Countertop construction: Plastic laminate on all exposed surfaces.
    - 2. Shelving: Plastic laminate all sides.
  - D. Hardwood Plywood: PS 1; graded in accordance with AWI, core materials of veneer; species and cut as follows:
    - 1. Drawer Box Construction: Birch, A-B Grade, 1/2 inch thick, staples not acceptable.
    - 2. Where oak finish panels are specified on the drawings, provide 3/4 inch thick plywood with rift cut oak veneer and clear finish.
  - E. Hardboard: ANSI A135.4; pressed wood fiber with resin binder, tempered grade, 1/4 inch thick, smooth one side, thermofused melamine on exposed side.
    - 1. Drawer Bottoms: 1/4 inch thick thermofused melamine, dado into drawer sides.
    - 2. Gables and Backs: Thermofused melamine on cabinet interior.
  - F. High Pressure Decorative Laminate: NEMA LD 3, GP50 for horizontal surfaces, GP28 for vertical surfaces, CL20 for cabinet liner surfaces. Matte surface texture. Color and pattern as selected.
  - G. Synthetic Surfacing: Solid, non-porous surfacing material homogeneously composed of a blend of high performance acrylic, polyester, or composite material as manufactured by DuPont, Wilsonart, Formica, Avonite, Pionite or approved equal.

# 2.2 ACCESSORIES

- A. Adhesive for High Pressure Decorative Laminates: FS A-A-1936 contact adhesive. Type recommended by laminate manufacturer to suit application.
- B. Plastic Edge Trim: 3 mil vinyl as by Thermoweb or equal; width to match component thickness; color as selected by Architect.

- C. Fasteners: Size and type to suit application; concealed.
- D. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; economy finish in concealed locations and stainless steel finish in exposed locations.
- E. Concealed Joint Fasteners: Threaded steel.
- F. Grommets: round nylon type, color to be determined.
- G. Shelf Standards and Rests: Pre-drilled 5 mm holes at 32 mm OC with steel pin shelf supports for adjustable shelving.
- H. Drawer and Door Pulls: 4" brushed stainless steel wire pulls.
- I. Cabinet Locks: Keyed cylinder, two keys for each lock, master keyed, by National or approved equal. Key locks located in the same room alike.
- J. Catches: Magnetic.
- K. Drawer Slides: Galvanized steel construction, ball bearings separating tracks, full extension type, Accuride C 3800 or approved equal.
- L. Hinges: Five knuckle, epoxy powder coated institutional grade, 2 3/4" overlay with hospital tip. 0.095 inch thick. ANSI-BHMA standard A156.9, Grade 1. Doors under 36" in height shall be equipped with (2) hinges; doors between 36 and 72 inches in height shall be equipped with (3) hinges; doors over 72 inches in height shall be equipped with (4) hinges.

### 2.3 FABRICATION

- A. Shop assemble casework for delivery to site in units easily handled and to permit passage through building openings.
- B. Fit shelves edges with matching veneer edging. Use one piece for full length only.
- C. Cap exposed high pressure decorative laminate finish edges, including doors and drawer fronts with 3mm PVC edge banding, machine applied with melt adhesive and radiused by automatic trimmers. Hand tool application and trimming is not acceptable except at corners.
- D. Door and Drawer Fronts: 3/4 inch thick; overlay style unless otherwise indicated on drawings.
- E. When necessary to cut and fit on site, fabricate materials with ample allowance for cutting. Furnish trim for scribing and site cutting.
- F. All drawer construction shall be 1/2 inch plywood sides, clear finish, bottom to be tempered hardboard with melamine finish. Finish front shall have interior side of 1/2 inch plywood finished clear on 3/4 inch MDF board with plastic laminate all sides.
- G. Apply high pressure decorative laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners.

- H. Mechanically fasten back splash to counter tops with steel brackets at 16 inches on center.
- I. Fabricate cabinets and counter tops with cutouts for plumbing fixtures, grommets, and outlet boxes. Verify locations of cutouts from on-site dimensions. Seal cut edges.
- J. Provide filler strips of same material and finish as adjacent cabinet components as required to make allowances for all door and drawer clearances, including hardware and pulls. Identify clearance requirements on shop drawings.

# 2.4 SHOP FINISHING

- A. Sand work smooth and set exposed nails and screws.
- B. Apply wood filler in exposed nail and screw indentations.
- C. On items to receive transparent finishes, use wood filler matching surrounding surfaces and of types recommended for applied finishes.
- D. Seal and varnish exposed to view surfaces and semi-concealed surfaces with not less than two coats of polyurethane. Brush apply only.
- E. Seal surfaces in contact with cementitious materials.
- F. Finish work in accordance with AWI Section 1500: System #7.

# PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Section 013000 Administrative Requirements: Coordination and project conditions.
- B. Verify adequacy of backing and support framing.
- C. Verify location and sizes of utility rough-in associated with work of this section.

#### 3.2 INSTALLATION

- A. Set and secure casework in place; rigid, plumb, and level.
- B. Use fixture attachments in concealed locations for wall mounted components.
- C. Use concealed joint fasteners to align and secure adjoining cabinet units and counter tops.
- D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch. Do not use additional overlay trim for this purpose.
- E. Secure cabinet and counter bases to floor using appropriate angles and anchorages.

- F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.
- G. Apply caulk to fill voids between cabinets/backsplash and walls. Caulk to match cabinet laminate or veneer color.

# 3.3 ADJUSTING

- A. Section 017000 Execution Requirements: Testing, adjusting and balancing.
- B. Adjust moving or operating parts to function smoothly and correctly.

# 3.4 CLEANING

- A. Section 017000 Execution Requirements: Final cleaning.
- B. Clean casework, counters, shelves, hardware, fittings, and fixtures.

# 3.5 SCHEDULE

- A. Refer to the Sheet A3.1 for casework drawings.
- B. Provide new laminate base cabinets with solid surface countertop and backsplash in new Reception 103.

# SECTION 071200 - BITUMINOUS WATERPROOFING

# PART 1 GENERAL

# 1.1 SUMMARY

- A. Section includes cold applied asphalt bituminous waterproofing.
- B. Related Sections:
  - 1. Section 04 20 00 Unit Masonry
  - 2. Section 07 21 00 Board Insulation

#### 1.2 REFERENCES

- A. American Society for Testing and Materials:
  - 1. ASTM D41 Standard Specification for Asphalt Primer Used in Roofing, Dampproofing, and Waterproofing.
  - 2. ASTM D43 Standard Specification for Coal Tar Primer Used in Roofing, Dampproofing, and Waterproofing.
  - 3. ASTM D449 Standard Specification for Asphalt Used in Dampproofing and Waterproofing.
  - 4. ASTM D450 Standard Specification for Coal-Tar Pitch Used in Roofing, Dampproofing, and Waterproofing.
  - 5. ASTM D1227 Standard Specification for Emulsified Asphalt Used as a Protective Coating for Roofing.
  - 6. ASTM D3747 Standard Specification for Emulsified Asphalt Adhesive for Adhering Roof Insulation.
  - 7. ASTM D4586 Asphalt Roof Cement, Asbestos-Free.
  - 8. ASTM D5643 Coal Tar Roof Cement, Asbestos Free.
- B. National Roofing Contractors Association:
  - 1. NRCA The NRCA Waterproofing and Dampproofing Manual.

#### 1.3 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Submittal procedures.
- B. Product Data: Submit properties of primer, bitumen, and mastics.
- C. Manufacturer's Installation Instructions: Submit special procedures and perimeter conditions requiring special attention.

### 1.4 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 Product Requirements.
- B. Maintain ambient temperatures above 40 degrees F for 24 hours before and during application until membrane has cured.

# PART 2 PRODUCTS

- 2.1 BITUMINOUS WATERPROOFING
  - A. Sonneborn Hydrocide Mastic 700 or 700B.
  - B. Other Acceptable Manufacturers:
    - 1. Pecora.
    - 2. Tremco.
    - 3. Substitutions: Under provisions of Instructions to Bidders Article 3.3.1.

#### 2.2 COMPONENTS

- A. Cold Asphaltic Materials:
  - 1. Asphalt Emulsion: Conforming to ASTM D3747.
  - 2. Asphalt Primer: ASTM D41, compatible with substrate.
  - 3. Asphalt Cement: ASTM D2822 Type 1.

# 2.3 ACCESSORIES

A. Protection Board: Rigid insulation specified in Section 072113.

# **PART 3 EXECUTION**

- 3.1 EXAMINATION
  - A. Section 013000 Administrative Requirements: Coordination and project conditions.
  - B. Verify substrate surfaces are durable, free of matter detrimental to adhesion or application of waterproofing system.
  - C. Verify items penetrating surfaces to receive waterproofing are securely installed.

#### 3.2 PREPARATION

- A. Protect adjacent surfaces not designated to receive waterproofing.
- B. Clean and prepare surfaces to receive waterproofing.
- C. Do not apply waterproofing to surfaces unacceptable to manufacturer or applicator.
- D. Apply mastic to seal penetrations, small cracks, or minor honeycomb in substrate.

# 3.3 INSTALLATION

- A. Prime surfaces in accordance with manufacturer's instructions.
- B. Apply cold bitumen by spray application.
- C. Apply bitumen at temperature limited by equiviscous temperature (EVT) plus or minus 25 degrees F; do not exceed finish blowing temperature for four hours.
- D. Apply bitumen in one coat, continuous and uniform, at rate of 8-9 gal/100 sq ft.

- E. Seal items projecting through waterproofing surface with mastic. Seal watertight.
- F. Place protection board directly against membrane; butt joints.
- G. Adhere protection board to substrate to tacky waterproofing surface. Scribe and cut boards around Projections, penetrations, and interruptions.

# 3.4 SCHEDULES

A. New Exterior Building Walls Infill: One coating of asphalt waterproofing on exterior side of CMU cavity infill walls with brick veneer and board insulation.

### SECTION 072113 - BOARD INSULATION

#### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section Includes:
  - 1. Rigid board insulation for masonry cavity walls
- B. Related Requirements:
  - 1. Section 042000 Unit Masonry: cavity wall insulation.
  - 2. Section 071200 Bituminous Waterproofing.

# 1.2 REFERENCE STANDARDS

- A. ASTM International:
  - 1. ASTM C240 Standard Test Methods of Testing Cellular Glass Insulation Block.
  - 2. ASTM C552 Standard Specification for Cellular Glass Thermal Insulation.
  - 3. ASTM C578 Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation.
  - 4. ASTM C612 Standard Specification for Mineral Fiber Block and Board Thermal Insulation.
  - 5. ASTM C1289 Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board.
  - 6. ASTM D2842 Standard Test Method for Water Absorption of Rigid Cellular Plastics.
  - 7. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 8. ASTM E970 Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source.
- B. California Department of Health Care Services:
  - 1. CA/DHS/EHLB/R-174 Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.
- C. Green Seal:
  - 1. GS-36 Green Seal Standard for Adhesives for Commercial Use.
- D. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168 Adhesive and Sealant Applications.

### 1.3 COORDINATION

- A. Section 013000 Administrative Requirements: Requirements for coordination.
- B. Coordinate Work of this Section with Sections 042000 Unit Masonry.

# 1.4 SUBMITTALS

- A. Section 013300 Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on product characteristics, performance criteria, limitations, adhesives.
- C. Manufacturer's Installation Instructions: Submit special environmental conditions required for installation, installation techniques.
- D. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

# 1.5 QUALITY ASSURANCE

- A. Insulation Installed in Concealed Locations Surface Burning Characteristics:
  - 1. Foam Plastic Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
  - 2. Other Insulation: Maximum 25/450 flame spread/smoke developed index when tested in accordance with ASTM E84.
- B. Apply label from agency approved by authority having jurisdiction to identify each foam plastic insulation board.

#### 1.6 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store according to manufacturer instructions.
- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

# 1.7 AMBIENT CONDITIONS

- A. Section 015000 Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Minimum Conditions: Do not install adhesives when temperature or weather conditions are detrimental to successful installation.

# PART 2 - PRODUCTS

### 2.1 MASONRY CAVITY WALL BOARD INSULATION

- A. Manufacturers:
  - 1. Dow Chemical Co. Midland, Michigan
  - a. Product: Styrofoam
  - 2. Owens Corning. Toledo, Ohio
  - a. Product: Foamular 3. DiversiFoam Products
    - DiversiFoam Products
      - a. Product: Certifoam
  - 4. Substitutions: Section 016000 Product Requirements.

# 2.2 MASONRY CAVITY WALL COMPONENTS

- A. Extruded Polystyrene Insulation: ASTM C578 Type IV; cellular type, conforming to the following:
  - 1. Board Size: 16" x 8' for cavity walls and 2' x 8' for foundations unless otherwise indicated on the drawings
  - 2. Board Thickness: 1" for cavity walls (to match existing).
  - 3. Thermal Resistance: R of 5.0 per inch.
  - 4. Water Absorption: In accordance with ASTM D2842 0.3 percent by volume maximum.
  - 5. Compressive Strength: Minimum 30 psi.
  - 6. Board Edges: Square edges.

#### 2.3 ACCESSORIES

- A. Adhesive: Type recommended by insulation manufacturer for application.
- B. Bituminous Waterproofing: Specified in Section 071200.
- C. Insulation Fasteners: Impaling clip of galvanized steel, to be adhered to surface to receive board insulation, length to suit insulation thickness and substrate, capable of securely and rigidly fastening insulation in place.

# PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Section 017000 Execution and Closeout Requirements: Requirements for application examination.
- B. Verify that substrate, adjacent materials, and insulation boards are dry and ready to receive insulation and adhesive.
- C. Verify that substrate surface is flat, free of irregularities, and materials or substances affecting adhesive bond.
- D. Verify that masonry dampproofing has been installed prior to installation of insulation.

# 3.2 INSTALLATION – EXTERIOR WALLS

- A. Masonry Cavity Walls: Apply adhesive in three continuous beads per board length to full bed 1/8" thick. Daub adhesive tight to protrusions.
- B. Install board over concrete masonry unit back-up horizontally between masonry wall ties.
- C. Place boards in method to maximize contact bedding. Stagger end joints. Butt edges and ends tight to adjacent board and to protrusions.
- D. Cut and fit insulation tight to protrusions or interruptions to insulation plane.

# 3.3 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 017000 Execution and Closeout Requirements: Protecting installed construction.
- B. Do not permit damage to insulation prior to covering.

### 3.4 SCHEDULE

A. Cavity Wall Insulation (at all new infill masonry of existing masonry openings): extruded polystyrene, bead adhesive application, 1 inch thick 16" x 96 inches long.

# SECTION 072600 - VAPOR BARRIER

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section includes sheet materials for controlling vapor diffusion under new concrete slabs.
- B. Related Sections:
  - 1. Section 03 30 00 Cast in Place Concrete
  - 2. Section 07 90 00 Joint Sealers.

#### 1.2 REFERENCES

- A. American Society for Testing and Materials:
  - 1. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
  - 2. ASTM E96 Standard Test Methods for Water Vapor Transmission of Materials.
- B. Sealant, Waterproofing and Restoration Institute:
  - 1. SWRI Sealant Specification.

# 1.3 PERFORMANCE REQUIREMENTS

- A. Maximum Vapor Permeability (Perm): 1 ng/S/m/Pa measured in accordance with ASTM E96 Method E.
- 1.4 SUBMITTALS
  - A. Section 01 33 00 Submittal Procedures: Submittal procedures.
  - B. Product Data: Submit data indicating material characteristics, performance criteria, limitations.
  - C. Manufacturer's Installation Instructions: Submit preparation and installation requirements, techniques.

#### 1.5 QUALITY ASSURANCE

- A. Perform Work in accordance with SWRI Sealant and Caulking Guide Specification requirements for materials and installation.
- 1.6 SEQUENCING
  - A. Section 01 10 00 Summary: Work sequence.
  - B. Sequence Work to permit installation of materials in conjunction with other retardant materials and seals.
  - C. Do not install vapor retarder until items penetrating vapor retarder are in place.

# PART 2 PRODUCTS

# 2.1 COMPONENTS

- A. Sheet Type 1: for <u>below grade application</u>, as defined by ASTM F 1249. Products shall provide less than 0.01 Perms as well as meet the requirements for strength under ASTM E 1745 Class A. Acceptable manufacturers include:
  - 1. Stego Industries "Stego Wrap Vapor Barrier".
  - 2. W.R. Meadows "Perminator"
  - 3. Raven Industries "VaporBlock VB15".
- B. Sealant: ASTM C920, FS TT-S-230, Type II, Class A, Use acrylic base, single component, solvent release, non-skinning.
  - 1. Elongation Capability: 5 percent.
  - 2. Service Temperature Range: -40 to 180 degrees F.
  - 3. Shore A Hardness Range: 15 to 35.
- D. Primer: Recommended by sealant manufacturer to suit application. Non-staining.
- E. Cleaner: Non-corrosive and non-staining type; recommended by sealant manufacturer; compatible with adjacent materials.
- F. Mastic Adhesive: ASTM D491, asphalt type, compatible with sheet retarder and substrate, thick mastic of uniform consistency.
- G. Adhesive: Gun grade mastic type. Compatible with sheet retarder and substrate, permanently non-curing; manufactured by Pecora or equal.

### 2.2 ACCESSORIES

- A. Thinner and Cleaner for Polyethylene Sheet: As recommended by sheet material manufacturer.
- B. Tape: Bright aluminum polyester self-adhering type, mesh reinforced, 2 inch wide, compatible with sheet material.
- C. Attachments: Galvanized steel bars and anchors.

# PART 3 EXECUTION

#### 3.1 PREPARATION

- A. Remove loose or foreign matter capable of impairing adhesion.
- B. Clean and prime substrate surfaces to receive adhesive and sealants.

#### 3.2 EXISTING WORK

A. Clean and repair existing construction to provide positive and continuous seal for vapor retarders.

# 3.3 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Vapor Retarder For Solid Substrate: Secure sheet retarder to solid construction with adhesive and/or tape. Lap edges and ends 6 inches and adhesive seal to ensure complete and continuous seal.
- C. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges or where compatibility with adjacent materials may be in doubt.

### 3.4 SCHEDULES

A. Concrete Slabs: Lap sheet barrier Type 1 under all new concrete floor slabs. Seal with sealant specified by manufacturer.

# SECTION 079000 - JOINT PROTECTION

### PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section includes cleaning and preparation of surfaces to receive sealants and joint backing, sealants, pre-compressed foam sealers, and accessories in all locations where two different materials meet, or where there is a gap in a common material that creates a potential for water or air infiltration, or creates a visual concern.
- B. Related Sections:
  - 1. Section 042000 Unit Masonry.
  - 2. Section 088000 Glazing: Glazing sealants and accessories.
  - 3. Section 099000 Painting and Coating.

# 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM C834 Standard Specification for Latex Sealants.
  - 2. ASTM C919 Standard Practice for Use of Sealants in Acoustical Applications.
  - 3. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
  - 4. ASTM C1193 Standard Guide for Use of Joint Sealants.
  - 5. ASTM D1056 Standard Specification for Flexible Cellular Materials-Sponge or Expanded Rubber.
  - 6. ASTM D1667 Standard Specification for Flexible Cellular Materials-Vinyl Chloride Polymers and Copolymers (Closed-Cell Foam).
  - 7. ASTM D2628 Standard Specification for Preformed Polychloroprene Elastomeric Joint Seals for Concrete Pavements.
- B. California Department of Health Services:
  - 1. CA/DHS/EHLB/R-174 Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
- C. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168[-January 7, 2005] Adhesive and Sealant Applications.

# 1.3 SUBMITTALS

- A. Section 013300 Submittal Procedures: Submittal procedures.
- B. Products Data: Submit data indicating sealant chemical characteristics, performance criteria, substrate preparation, limitations, and color availability.
- C. Manufacturer's Installation Instructions: Submit special procedures, surface preparation, and perimeter conditions requiring special attention.
- D. Warranty: Include coverage for installed sealants and accessories failing to achieve airtight seal, watertight seal, exhibit loss of adhesion or cohesion, and sealants which do not cure.

E. Warranty: The installer shall agree to replace or repair joint sealants that do not comply with specified performance criteria for a period of five years.

# 1.4 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Applicator: Company specializing in performing Work of this section with minimum five years documented experience.

#### 1.5 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 Product Requirements.
- B. Maintain temperature and humidity recommended by sealant manufacturer during and after installation.

#### 1.6 COORDINATION

- A. Section 013000 Administrative Requirements: Coordination. Project conditions.
- B. Coordinate Work with sections referencing this section.

### PART 2 PRODUCTS

- 2.1 JOINT SEALERS
  - A. Exterior Sealant, for high-movement expansion and control joints shall be a one-part, non-sag, neutral cure, low-modulus / ultra-low modulus, UV resistant, high performance silicone sealer, as by Sonneborn, Tremco, Pecora or approved equal.
  - B. Interior sealant shall be a single component acrylic latex type, suitable for application of paint. Pecora AC-20 Acrylic, Sonolac by Sonneborn or approved equal.
  - C. Color of sealants shall be selected from manufacturers' standards by Architect.

# 2.2 ACCESSORIES

- A. Primer: Non-staining type, recommended by sealant manufacturer to suit application.
- B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.
- C. Joint Backing: Round foam rod compatible with sealant; ASTM D1056, sponge or expanded rubber; oversized 30 to 50 percent larger than joint width.
- D. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application.

# PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Section 013000 Administrative Requirements: Coordination and project conditions.
- B. Verify substrate surfaces and joint openings are ready to receive work.
- C. Verify joint backing and release tapes are compatible with sealant.

#### 3.2 PREPARATION

- A. Remove loose materials and foreign matter impairing adhesion of sealant.
- B. Clean and prime joints.
- C. Perform preparation in accordance with ASTM C1193.
- D. Protect elements surrounding Work of this section from damage or disfiguration.

### 3.3 INSTALLATION

- A. Perform installation in accordance with ASTM C1193.
- B. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.
- C. Install bond breaker where joint backing is not used.
- D. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.
- E. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.
- F. Tool joints concave.
- G. Pre-compressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face 1/8 to 1/4 inch below adjoining surface.
- H. Field-Adhesive testing shall be performed by the installer to ensure proper quality control of sealant installations.

#### 3.4 CLEANING

- A. Section 017000 Execution and Closeout Requirements: Final cleaning.
- B. Clean adjacent soiled surfaces.

# 3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 017000 Execution and Closeout Requirements: Protecting installed construction.
- B. Protect sealants until cured.

# 3.6 SCHEDULE

- A. Caulk and seal all joints where different materials join. The exterior is to be water and weather tight.
- B. Caulk around all door and window frames.
- C. Provide compressible foam pad sealants at all exterior door and window frame installation, placed full perimeter of opening PRIOR to installing frame components.
- D. Caulk all gaps in exterior and interior construction, which are not sealed by prime painting.
- E. Seal all expansion and control joints.

# SECTION 081213 - STANDARD HOLLOW METAL FRAMES

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Section includes non-rated, exterior and interior steel frames.
- B. Related Sections:
  - 1. Section 042000 Unit Masonry: Masonry grout fill of metal frames and placement of anchors into masonry wall construction.
  - 2. Section 081314 Standard Steel Doors
  - 3. Section 081416 Flush Wood Doors
  - 4. Section 087100 Door Hardware: Hardware, and weatherstripping.
  - 5. Section 088000 Glazing.
  - 6. Section 099000 Painting and Coating: Field painting of frames.

### 1.2 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI A250.8 Recommended Specifications for Standard Steel Doors and Frames.
- B. ASTM International:
  - 1. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
- C. Steel Door Institute
  - 1. SDI 128 Guidelines for Acoustical Performance for Standard Steel Doors and Frames
- D. National Fire Protection Association:
  - 1. NFPA 80 Standard for Fire Doors, Fire Windows.
  - 2. NFPA 105 Standard for the Installation of Smoke Door Assemblies and other Opening Protectives.
  - 3. NFPA 252 Standard Methods of Fire Tests of Door Assemblies.
- E. Underwriters Laboratories Inc.:
  - 1. UL 10B Fire Tests of Door Assemblies.
  - 2. UL 10C Positive Pressure Fire Tests of Door Assemblies.
  - 3. UL 1784 Air Leakage Tests of Door Assemblies.

#### 1.3 SUBMITTALS

- A. Section 013300 Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate frame elevations, reinforcement, anchor types and spacing, location of cut-outs for hardware, and finish.
- C. Product Data: Submit frame configuration and finishes.

D. Manufacturer's Installation Instructions: Submit special installation instructions.

#### 1.4 QUALITY ASSURANCE

A. Conform to requirements of ANSI A250.8.

#### 1.5 QUALIFICATIONS

A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.

# 1.6 SEQUENCING

- A. Section 011000 Summary: Requirements for sequencing.
- B. Sequence activities in phases; refer to Article 1.4 TIMES OF COMPLETION AND LIQUIDATED DAMAGES for a detailed description of phasing requirements.

#### 1.7 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 Product Requirements: Product storage and handling requirements.
- B. Accept frames on site in manufacturer's packaging. Inspect for damage.
- C. Break seal on-site to permit ventilation.

#### 1.8 COORDINATION

- A. Section 013000 Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work with frame opening construction, door, and hardware installation.
- C. Sequence installation to accommodate required door hardware electric wire connections.

# PART 2 - PRODUCTS

# 2.1 STANDARD STEEL FRAMES

- A. Manufacturers:
  - 1. Steelcraft
  - 2. Ceco Door Products
  - 3. Republic Builders Products
  - 4. Curries Manufacturing
  - 5. Hollow Metal Metal Products
  - 6. Substitutions: Section 016000 Product Requirements
- B. Product Description: Standard shop fabricated steel frames, non-rated types.

- 1. Exterior Frames:
  - a. Nominal 16 gage / 0.053 inch thick material, base metal thickness.
  - b. Zinc coating applied by the hot-dip process conforming to ASTM A653 (A60).
  - c. Thermally broken.
- 2. Interior Frames:
  - a. Non-Rated, Nominal 16 gage / 0.053 inch thick material, base metal thickness.
  - b. Shop prime finish.

#### 2.2 ACCESSORIES

- A. Removable Stops: Rolled steel, channel shape, butted corners; prepared for countersink style screws.
- B. Bituminous Coating: Non-asbestos fibered asphalt emulsion.
- C. Primer: ANSI A250.10 rust inhibitive type.
- D. Silencers: Resilient rubber fitted into drilled hole.
- E. Weatherstripping: Specified in Section 087100.

#### 2.3 FABRICATION

- A. Fabricate frames as welded unit.
- B. Mullions for Double Doors: Fixed or Removable type, of same profiles as jambs; refer to drawings.
- C. Transom Bars for Glazed Lights: Fixed type, of same profiles as jamb and head.
- D. Fabricate frames with hardware reinforcement plates welded in place. Provide mortar guard boxes.
- E. Reinforce frames wider than 48 inches with roll formed steel channels fitted tightly into frame head, flush with top.
- F. Prepare frames for silencers. Provide three single silencers for single doors and mullions of double doors on strike side. Provide two single silencers on frame head at double doors without mullions.
- G. Configure exterior frames with special profile to receive recessed weatherstripping.

#### 2.4 SHOP FINISHING

- A. Steel Sheet: Galvanized to ASTM A653/A653M A60.
- B. Primer: Baked.
- C. Coat inside of frame profile with bituminous coating to minimum thickness of 1/16 inch.

# PART 3 - EXECUTION

# 3.1 EXAMINATION

- A. Section 013000 Administrative Requirements: Coordination and project conditions.
- B. Verify opening sizes and tolerances are acceptable.

### 3.2 INSTALLATION

- A. Install frames in accordance with ANSI A250.8.
- B. Coordinate with masonry wall construction for anchor placement.
- C. Fill jambs of all hollow metal door frames installed in CMU wall with grout after application of bituminous coating.
- D. Coordinate installation of glass and glazing specified in Section 088000.
- E. Coordinate installation of frames with installation of hardware specified in Section 087100 and doors in Section 081313.
- F. Install roll formed steel reinforcement channels between two abutting frames. Anchor to structure and floor.

# 3.3 ERECTION TOLERANCES

- A. Section 014000 Quality Requirements: Tolerances.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edges, crossed corner to corner.

# 3.4 SCHEDULE

A. Refer to Door and Frame Schedule in the Contract Drawings, Sheet A3.1.

# SECTION 081314 - STANDARD STEEL DOORS

# PART 1 GENERAL

#### 1.1 SUMMARY

- A. Section includes non-rated, fire rated, thermally insulated and galvanized steel doors.
- B. Related Sections:
  - 1. Section 081213 Standard Steel Frames.
  - 2. Section 087100 Door Hardware.
  - 3. Section 088000 Glazing: Glass for doors.
  - 4. Section 099000 Painting and Coating: Field painting of doors.

#### 1.2 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI A250.8 Recommended Specifications for Standard Steel Doors and Frames.
- B. ASTM International:
  - 1. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 2. ASTM C1363 Standard Test Method for the Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
  - 3. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 4. ASTM E413 Classification for Rating Sound Insulation.
- C. Hollow Metal Manufacturers Association:
  - 1. HMMA 810 Hollow Metal Doors.
- D. National Fire Protection Association:
  - 1. NFPA 80 Standard for Fire Doors, Fire Windows.
  - 2. NFPA 105 Standard for the Installation of Smoke Door Assemblies and other Opening Protectives.
  - 3. NFPA 252 Standard Methods of Fire Tests of Door Assemblies.
- E. Steel Door Institute:
  - 1. SDI 108 Recommended Selection and Usage Guide for Standard Steel Doors.
- F. Underwriters Laboratories Inc.:
  - 1. UL 10B Fire Tests of Door Assemblies.
  - 2. UL 10C Positive Pressure Fire Tests of Door Assemblies.
  - 3. UL 1784 Air Leakage Tests of Door Assemblies.
- 1.3 SUBMITTALS
  - A. Section 013300 Submittal Procedures: Requirements for submittals.

- B. Shop Drawings: Indicate door elevations, internal reinforcement, closure method, and cut-outs for glazing, and finishes.
- C. Product Data: Submit door configurations, location of cut-outs for hardware reinforcement.
- D. Manufacturer's Installation Instructions: Submit special installation instructions.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

# 1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with ANSI A250.8.
- B. Fire Rated Door Construction: Conform to NFPA 252.
- C. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class as indicated on Drawings.
- D. Smoke and Draft Control Doors: Tested in accordance with UL 1784.
  - 1. Air Leakage: Maximum 3.0 cfm/sf of door opening with 0.10 inch water gage pressure differential.
- E. Attach label from agency approved by authority having jurisdiction to identify each fire rated door.
  - 1. Indicate temperature rise rating for stair doors.
  - 2. Attach smoke label to smoke and draft control doors.
- F. Surface Burning Characteristics:
  - 1. Foam Insulation: Maximum 75/450 flame spread/smoke developed index when tested in accordance with NFPA 255.

# 1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing Products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing work of this section with minimum three years documented experience approved by manufacturer.
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A. Section 016000 Product Requirements: Requirements for transporting, handling, storing, and protecting products.
  - B. Accept doors on site in manufacturer's packaging. Inspect for damage.
  - C. Break seal on site to permit ventilation.

# 1.7 COORDINATION

A. Section 013000 - Administrative Requirements: Requirements for coordination.

- B. Coordinate Work with door opening construction, door frame, and door hardware installation.
- C. Coordinate installation to accommodate door hardware electric wire connections.

# PART 2 PRODUCTS

- 2.1 STANDARD STEEL DOORS
  - A. Manufacturers:
    - 1. Steelcraft
    - 2. Fenestra
    - 3. Metal Products Inc.
    - 4. Ceco Door Products
    - 5. Substitutions: Section 016000 Product Requirements.
  - B. Product Description:
    - 1. Exterior Doors (Thermally Isolated, Insulated with polystyrene core material): ANSI A250.8-2003 standards, 1-3/4 inch thick.
      - a. Level 3 Extra heavy Duty, Physical Performance Level A, Model 2 full flush seamless design. 16 Gage, galvanized.
    - 2. Interior Doors (Non-Rated): ANSI A250.8-2003, 1-3/4 inch thick.
      - a. Level 2 Heavy Duty and Physical Performance Level A, Model 2 full flush design. 18 Gage, galvanized.

# 2.2 COMPONENTS

- A. Face: Steel sheet in accordance with ANSI A250.8-2003 and SDI 108.
- B. End Closure: Channel, 0.04 inches thick, flush.
- C. Core: polystyrene foam (exterior doors) steel channel grid (interior doors).
- D. Thermal Insulated Door: Total insulation R-Value of 7, measured in accordance with ASTM C236.

# 2.3 ACCESSORIES

- A. Removable Stops: Rolled steel, channel shape, butted corners; prepared for countersink style screws.
- B. Astragals for Double Doors: refer to Section 087100 Door Hardware.
- C. Primer: ANSI A250.10 rust inhibitive type.

# 2.4 FABRICATION

- A. Fabricate doors with hardware reinforcement welded in place.
  - 1. Doors shall be mortised, reinforced, drilled and tapped at the factory for fully templated hardware only in accord with the approved hardware schedule and templates provided by the hardware supplier. Where surface-mounted hardware

(or hardware, the interrelation of which is to be adjusted upon installation – such as door closers, etc.) is to be applied, doors shall have reinforcing plates.

- 2. Minimum gauges for hardware reinforcing plates shall be as follows:
  - a. Hinge and pivot reinforcement seven (7) gauge.
  - b. Reinforcement for lock face, flush bolts, concealed holders, concealed or surface mounted closers twelve (12) gauge.
  - c. Reinforcement for all other surface mounted hardware sixteen (16) gauge.
- B. Configure exterior doors with edge profile to receive recessed weatherstripping.

# 2.5 SHOP FINISHING

- A. Steel Sheet: Galvanized to ASTM A653/A653M A60.
- B. Primer: Baked.
- C. Finish: Site Applied under work of Section 099000.

# PART 3 EXECUTION

- 3.1 EXAMINATION
  - A. Section 013000 Administrative Requirements: Verification of existing conditions before starting work.
  - B. Verify opening sizes and tolerances are acceptable.

### 3.2 INSTALLATION

- A. Install doors in accordance with ANSI A250.8-2003.
- B. Coordinate installation of glass and glazing specified in Section 088000.
- C. Coordinate installation of doors with installation of frames specified in Section 081214 and hardware specified in Section 087100.
- D. Touch-up damaged shop finishes.

# 3.3 ERECTION TOLERANCES

- A. Section 014000 Quality Requirements: Tolerances.
- B. Maximum Diagonal Distortion: 1/16 inch measured with straight edge, corner to corner.
- 3.4 ADJUSTING
  - A. Section 017000 Execution and Closeout Requirements: Requirements for adjusting.
  - B. Adjust door for smooth and balanced door movement.

# 3.5 SCHEDULE

A. Refer to Door & Frame Schedule on Drawing Sheet A3.1.

# SECTION 081416 - FLUSH WOOD DOORS

### PART 1 GENERAL

- 1.1 SUMMARY
  - A. Section includes factory finished, flush wood doors; non-rated.
  - B. Related Sections:
    - 1. Section 081213 Standard Steel Frames.
    - 2. Section 087100 Finish Hardware.
    - 3. Section 088000 Glazing.

#### 1.2 REFERENCES

- A. American National Standards Institute:1. ANSI A135.4 Basic Hardboard.
- B. American Society for Testing and Materials:
  1. ASTM E413 Standard Classification for Rating Sound Insulation.
- C. Architectural Woodwork Institute:
  - 1. AWI Quality Standards Illustrated.
- D. Hardwood Plywood and Veneer Association:
  - 1. HPVA HP-1 American National Standard for Hardwood and Decorative Plywood.
- E. National Electrical Manufacturers Association:
  - 1. NEMA LD 3 High Pressure Decorative Laminates.
- F. National Fire Protection Association:
  - 1. NFPA 80 Standard for Fire Doors, Fire Windows.
  - 2. NFPA 252 Standard Methods of Fire Tests of Door Assemblies.
- G. Underwriters Laboratories Inc.:
  - 1. UL 10C Fire Tests of Door Assemblies.
  - 2. UL Building Materials Directory.
- H. Uniform Building Code:
  - 1. UBC Standard 7-2 Fire Tests of Door Assemblies.
- I. Warnock Hersey:
  - 1. WH Certification Listings.

# 1.3 SUBMITTALS

A. Section 013300 - Submittal Procedures: Submittal procedures.

- B. Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, factory machining criteria, factory finishing criteria, identify cutouts for glazing.
- C. Product Data: Submit information on door core materials and construction, and on veneer species, type and characteristics.
- D. Samples:
  - 1. Submit two samples of door veneer, 8 x 8 inch in size illustrating wood grain, color, and sheen.
- E. Manufacturer's Installation Instructions: Submit special installation instructions.

# 1.4 QUALITY ASSURANCE

- A. Perform Work in accordance with AWI Quality Standard Section 1300, Custom Grade.
- B. Finish doors in accordance with AWI Quality Standard Section 1500.
- C. Fire Door Construction: Conform to NFPA 252 & UL 10C
- D. Fire Rated Door Construction: Rate of rise of 450 degrees F across door thickness for stair doors.
- E. Installed Fire Rated Door Assembly: Conform to NFPA 80 for fire rated class specified.

### 1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A. Section 016000 Product Requirements: Product storage and handling requirements.
  - B. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer when stored more than one week.
    - 1. Break seal on site to permit ventilation.

# 1.7 COORDINATION

- A. Section 013000 Administrative Requirements: Coordination and project conditions.
- B. Coordinate Work with door opening construction, door frame and door hardware installation.
- 1.8 WARRANTY
  - A. Section 017000 Execution Requirements: Product warranties and product bonds.
- B. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.
- C. Furnish manufacturer's "Life of Installation" warranty for interior doors.

# PART 2 PRODUCTS

- 2.1 FLUSH WOOD DOORS
  - A. Manufacturers:
    - 1. Algoma Hardwoods Inc.
    - 2. Eggers Industries
    - 3. Marshfield Door systems
    - 4. OshKosh Architectural Door Company
    - 5. Substitutions: Section 016000 Product Requirements
  - B. Product Description: Solid core flush wood doors; wood veneer facing material; non-rated types; flush and glazed design; without louvers; shop finished wood doors.
    - 1. Flush Interior Doors: 1-3/4 inches thick; solid core, five ply construction, as indicated on Drawings.

## 2.2 COMPONENTS

- A. Solid Core, Non-Rated: AWI Section 1300, Type PC Particleboard.
- B. Interior Veneer Facing: AWI Custom quality wood, <u>rift cut</u> with matched grain, for transparent finish. Pair match multiple door leaves in single opening.
  1. <u>Wood: Rift Cut Oak</u>
- C. Facing Adhesive: Type II water resistant.

#### 2.3 ACCESSORIES

A. Glazing Stops: Wood, of same species as door facing, mitered corners; prepared for countersink style screws.

# 2.4 FABRICATION

- A. Fabricate non-rated doors in accordance with AWI Quality Standards requirements.
- B. Astragals for Double Doors: as specified in Section 087100 Finish Hardware.
- C. Furnish lock blocks at lock edge and top of door for closer for hardware reinforcement.
- D. Vertical Exposed Edge of Stiles: Of same species as veneer facing for transparent finish.
- E. Fit door edge trim to edge of stiles after applying veneer facing.
- F. Bond edge banding to cores.

- G. Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware. Furnish solid blocking for through bolted hardware.
- H. Factory fit doors for frame opening dimensions identified on shop drawings.
- I. Cut and configure exterior door edge to receive recessed weatherstripping devices.
- J. Provide edge clearances in accordance with AWI 1300.

# 2.5 SHOP FINISHING

- A. Factory finish doors in accordance with AWI Quality Standard Section 1500 to the following finish designations; color as selected:
  - 1. Transparent Finish TR-4: Conversion varnish, Custom quality, satin sheen.
- B. Seal door top edge with clear sealer to match door facing.

# PART 3 EXECUTION

# 3.1 EXAMINATION

- A. Section 013000 Administrative Requirements: Coordination and project conditions.
- B. Verify opening sizes and tolerances are acceptable.
- C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

# 3.2 INSTALLATION

- A. Install non-rated doors in accordance with AWI Quality Standards requirements.
- B. Install fire-rated doors in accordance with AWI Quality Standards, NFPA 80, and to requirements for fire rating label by UL.
- C. Trim non-rated door width by cutting equally on both jamb edges.
- D. Trim door height by cutting bottom edges to maximum of 3/4 inch.
- E. Machine cut doors for hardware installation.
- F. Coordinate installation of doors with installation of frames specified in Section 081213 and hardware specified in Section 087100.
- G. Install door louvers plumb and level.
- H. Coordinate installation of glass and glazing specified in Section 088000.

# 3.3 INSTALLATION TOLERANCES

- A. Section 014000 Quality Requirements: Tolerances.
- B. Conform to AWI requirements for fit and clearance tolerances.
- C. Maximum Diagonal Distortion (Warp): 1/8 inch measured with straight edge or taut string, corner to corner, over imaginary 36 x 84 inches surface area.
- D. Maximum Vertical Distortion (Bow): 1/8 inch measured with straight edge or taut string, top to bottom, over imaginary 36 x 84 inches surface area.
- E. Maximum Width Distortion (Cup): 1/8 inch measured with straight edge or taut string, edge to edge, over imaginary 36 x 84 inches surface area.

# 3.4 ADJUSTING

- A. Section 017000 Execution Requirements: Testing, adjusting, and balancing.
- B. Adjust door for smooth and balanced door movement.
- C. Adjust closer for full closure.

# 3.5 SCHEDULE

A. Refer to Door and Frame Schedule in Contract Drawings.

END OF SECTION

# SECTION 084113 - ALUMINUM-FRAMED ENTRANCES AND STOREFRONTS

# PART 1 GENERAL

# 1.1 SUMMARY

- A. Section includes aluminum-framed storefronts, including integral project out vent units.
- B. Related Sections:
  - 1. Section 04 20 00 Unit Masonry: openings to receive aluminum framing
  - 2. Section 07 90 00 Joint Protection: System perimeter sealant and back-up materials.
  - 3. Section 08 80 00 Glazing.

## 1.2 REFERENCES

- A. Aluminum Association:
  - 1. AA ADM 1 Aluminum Design Manual.
- B. American Architectural Manufacturers Association/Window & Door Manufacturers Association:
  - 1. AAMA/WDMA 101/I.S.2 Specification for Windows, Doors and Unit Skylights.
  - 2. AAMA 502 Voluntary Specification for Field Testing of Windows and Sliding Glass Doors.
  - 3. AAMA 503 Voluntary Specification for Field Testing of Metal Storefronts. Curtain Wall and Sloped Glazing Systems.
  - 4. AAMA 611 Voluntary Specification for Anodized Architectural Aluminum.
  - 5. AAMA 1503 Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections.
  - 6. AAMA 2603 Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels.
  - 7. AAMA 2604 Voluntary specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels.
  - 8. AAMA 2605 Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels.
  - 9. AAMA CW-10 Care and Handling of Architectural Aluminum from Shop to Site.
  - 10. AAMA MCWM-1 Metal Curtain Wall Manual.
  - 11. AAMA SFM-1 Aluminum Store Front and Entrance Manual.
- C. American Society of Civil Engineers:
  - 1. ASCE 7 Minimum Design Loads for Buildings and Other Structures.
- D. ASTM International:
  - 1. ASTM A36/A36M Standard Specification for Carbon Structural Steel.
  - ASTM A123/A123M Standard Specification for Zinc (Hot-Dip Galvanized) Coatings on Iron and Steel Products.
  - 3. ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
  - 4. ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
  - 5. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
  - 6. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.

- 7. ASTM E283 Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- 8. ASTM E330 Standard Test Method for Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- 9. ASTM E331 Standard Test Method for Water Penetration of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- 10. ASTM E547 Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Differential.
- 11. ASTM E1105 Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Curtain Walls, and Doors by Uniform or Cyclic Static Air Pressure Difference.
- 12. ASTM E1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- ASTM E1996 Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- E. California Department of Health Services:
  - 1. CA/DHS/EHLB/R-174 Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
- F. National Fenestration Rating Council Incorporated:
  - 1. NFRC 100 Procedures for Determining Fenestration Product U-Factors.
- G. SSPC: The Society for Protective Coatings:
  - 1. SSPC Paint 20 Zinc-Rich Primers (Type I Inorganic and Type II Organic).
  - 2. SSPC Paint 25 Red Iron Oxide, Zinc Oxide, Raw Linseed Oil, and Alkyd Primer.

# 1.3 SYSTEM DESCRIPTION

- A. Aluminum-framed storefront system includes tubular aluminum sections with supplementary internal support framing, aluminum and glass assemblies, with aluminum project out window sash vent unit, shop fabricated, factory finished, glass and glazing, related flashings, anchorage and attachment devices.
- B. System Assembly: Shop unitized assembly.

# 1.4 PERFORMANCE REQUIREMENTS

- A. System Design: Design and size components to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of wall, including building corners.
  - 1. As calculated in accordance with Kentucky Building Code, as measured in accordance with ASTM E330.
- B. Deflection: Limit mullion deflection to flexure limit of glass; with full recovery of glazing materials.

- C. System Assembly: Accommodate without damage to components or deterioration of seals, movement within system, movement between system and peripheral construction, dynamic loading and release of loads, deflection of structural support framing.
- D. Air Infiltration: Limit air leakage through assembly to 0.06 cfm/min/sq ft of wall area, measured at reference differential pressure across assembly of 1.57 psf as measured in accordance with ASTM E283.
- E. Air and Vapor Seal: Maintain continuous air barrier and vapor retarder throughout assembly, primarily in line with inside pane of glass and inner sheet of infill panel and heel bead of glazing compound.
- F. Water Leakage: None, when measured in accordance with ASTM E331 and E547 with test pressure difference of 20 percent of design pressure, with minimum differential of 2.86 lbf/sq ft and maximum of 12.00 lbf/sq ft.
- G. Expansion / Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F over 12 hour period without causing detrimental effect to system components and anchorage.
- H. System Internal Drainage: Drain water entering joints, condensation occurring in glazing channels, or migrating moisture occurring within system, to exterior by weep drainage network.

# 1.5 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Submittal procedures.
- B. Shop Drawings: For each type of system specified indicate system dimensions, framed opening requirements and tolerances, affected related Work and expansion and contraction joint location and details. Show details demonstrating use and requirement of subsills for all storefronts exposed to exterior weather conditions.
- C. Product Data: Submit component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, and internal drainage details.
- D. Samples: Submit two samples 12 inches in length illustrating finished aluminum surface. Submit samples of all color options available for FRP midrails, where applicable.
- E. Design Data: Indicate framing member structural and physical characteristics, calculations, and dimensional limitations.
- F. Manufacturer's Certificate: Certify products meet or exceed specified requirements.

# 1.6 QUALITY ASSURANCE

- A. Perform Work in accordance with AAMA SFM-1 and AAMA MCWM-1 Metal Curtain Wall, Window, Store Front and Entrance Guide Specifications Manual.
- B. Provide single source manufacturer for all aluminum storefront door and frame materials.

## 1.7 QUALIFICATIONS

- A. Manufacturer and Installer: Company specializing in manufacturing aluminum glazing systems with minimum three years documented experience, and with service facilities within 100 miles of Project.
- B. Design structural support framing components under direct supervision of Professional Engineer experienced in design of this Work and licensed in State of Kentucky

## 1.8 DELIVERY, STORAGE, AND PROTECTION

- A. Section 01 60 00 Product Requirements: Product storage and handling requirements.
- B. Handle Products of this section in accordance with AAMA MCWM-1 Curtain Wall Manual #10.
- C. Protect finished aluminum surfaces with wrapping or strippable coating. Do not use adhesive papers or sprayed coatings which bond when exposed to sunlight or weather.

# 1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 Product Requirements.
- B. Do not install sealants nor glazing materials when ambient temperature is less than 40 degrees F during and 48 hours after installation.

# 1.10 WARRANTY

- A. Section 01 70 00 Execution Requirements: Product warranties and product bonds.
- B. Furnish ten year manufacturer warranty for insulated glass units from seal failure, interpane dusting or misting, and replacement of same.
- C. Correct defective work within a two-year period after Substantial Completion.

# PART 2 PRODUCTS

# 2.1 ALUMINUM-FRAMED STOREFRONT & ENTRIES

- A. Manufacturers:
  - 1. EFCO Corp.
    - a. Series 403, 2" x 4-1/2" Thermal Storefront Framing (double glazed) with
    - b. Series WV410, Thermal Project Out Vent (double glazed).
  - 2. Kawneer Co., Inc.
  - 3. MANKO
  - 4. Special-Lite, Inc.
  - 5. Substitutions: Section 01 60 00.
- B. Product Description:
  - 1. Aluminum Frame: Thermally broken; flush applied glazing stops; screw spline, drainage holes; internal weep drainage system.

- 2. Mullions: Profile of extruded aluminum with internal reinforcement of aluminum or shaped steel structural section.
- 3. Vents: Aluminum framed; Thermally broken; screens; access control white bronze cam locks; 4-bar hinge.

## 2.2 COMPONENTS

- A. Extruded Aluminum: ASTM B221; 6063 alloy, T5 temper typical, 6061 alloy, T6 temper for extruded structural members.
- B. Steel Sections: ASTM A36/A36M; shaped to suit mullion sections, galvanized to G90.
- C. Glass: Specified in Section 08 80 00.
- D. Glazing Materials: As specified on Drawings and in Section 08 80 00.
- E. Hardware (Vent unit): White Bronze, access control cam lock/handle. 4-Bar Hinges.
- F. Flashings and Subsills: Minimum 0.080 inch thick aluminum to match mullion sections where exposed.
- G. Sealant and Backing Materials:
  - 1. Sealant Used Within System (Not Used for Glazing): Manufacturer's standard materials to achieve weather, moisture, and air infiltration requirements.
  - 2. Perimeter Sealant: As specified in Section 07 90 00 <u>INSTALLED UNDER</u> WORK OF THIS SECTION.
- H. Fasteners: Stainless steel.

#### 2.3 FABRICATION

- A. Fabricate components with minimum clearances and shim spacing around perimeter of assembly, yet enabling installation and dynamic movement of perimeter seal.
- B. Accurately fit and secure joints and corners. Make joints flush, hairline, and weatherproof.
- C. Prepare components to receive anchor devices. Fabricate anchors.
- D. Arrange fasteners and attachments to conceal from view.
- E. Prepare components with internal reinforcement for door hardware.
- F. Reinforce framing members for imposed loads.

## 2.4 SHOP FINISHING

- A. Storefront Framing: Factory Anodic Finish: AA-M10-C22-A41, Class 1, clear anodized. AAMA Guide Spec. 611-98.
- B. Vent Unit: Organic; High performance 70% PVDG fluoropolymer Ultrapon; AA-M12-C42-R1X; AAMA Guide Spec. 2605-98; Color Black.

- C. Concealed Steel Items: Galvanized in accordance with ASTM A123/A123M to thickness Grade 85, 2.0 oz/sq ft.
- D. Apply bituminous paint to concealed aluminum and steel surfaces in contact with cementitious or dissimilar metals.
- E. Shop and Touch-Up Primer for Steel Components: SSPC Paint 25 red oxide.
- F. Touch-Up Primer for Galvanized Steel Surfaces: SSPC Paint 20 zinc rich.
- G. Extent of Finish:
  - 1. Apply factory coating to surfaces exposed at completed assemblies.
  - 2. Apply finish to surfaces cut during fabrication so no natural aluminum is visible in completed assemblies, including joint edges.
  - 3. Apply touch-up materials recommended by coating manufacturer for field application to cut ends and minor damage to factory applied finish.

## PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Section 01 30 00 Administrative Requirements: Coordination and project conditions.
- B. Verify dimensions, tolerances, and method of attachment with other Work.
- C. Verify wall openings and adjoining air and vapor seal materials are ready to receive Work of this Section.

#### 3.2 INSTALLATION

- A. Install wall system in accordance with AAMA MCWM-1 Metal Curtain Wall, Window, Store Front and Entrance Guide Specifications Manual.
- B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.
- C. Provide alignment attachments and shims to permanently fasten system to building structure.
- D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent Work.
- E. Provide thermal isolation where components penetrate or disrupt building insulation.
- F. Install sill flashings / subsills on all assemblies exposed to exterior weather. Turn up ends and edges; seal to adjacent Work to form water tight dam.
- G. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.
- H. Install integral flashings and integral joint sealers.

- I. Set thresholds in bed of mastic and secure.
- J. Install hardware using templates provided. Refer to Section 08 71 00 for installation requirements.
- K. Coordinate installation of glass with Section 08 80 00; separate glass from metal surfaces.
- L. Install perimeter sealants in conformance with Section 07 90 00.

#### 3.3 ERECTION TOLERANCES

- A. Section 01 40 00 Quality Requirements: Tolerances.
- B. Maximum Variation from Plumb: 0.06 inches every 3 ft non-cumulative or 1/16 inches per 10 ft, whichever is less.
- C. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch.

## 3.4 ADJUSTING

- A. Section 01 70 00 Execution Requirements: Testing, adjusting and balancing.
- B. Adjust operating hardware for smooth operation.

## 3.5 CLEANING

- A. Section 01 70 00 Execution Requirements: Final cleaning.
- B. Remove protective material from pre-finished aluminum surfaces.
- C. Wash down surfaces with solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.
- D. Remove excess sealant by method acceptable to sealant manufacturer.

# 3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 Execution Requirements: Protecting installed construction.
- B. Protect finished Work from damage.
- 3.7 SCHEDULES
  - A. Refer to Window Schedule, Sheet A3.1.
  - B. Provide all incidental, prefinished flashings associated with storefront systems and as detailed in the drawings and as necessary to complete the work. All flashings shall be extruded where possible and where not possible they shall be .125 inch thick prefinished aluminum break metal.

END OF SECTION

# SECTION 08 71 00 – DOOR HARDWARE

## PART 1 - GENERAL

#### 1.01 RELATED DOCUMENTS

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

#### 1.02 SUMMARY

- A. Section includes:
  - 1. Mechanical and electrified door hardware for:
    - a. Swinging doors.
  - 2. Electronic access control system components, including:
    - a. Electronic access control devices.
  - 3. Field verification, preparation and modification of existing doors and frames to receive new door hardware.
  - 4. The intent of the hardware specification is to specify the hardware for interior and exterior doors, and to establish a type, continuity, and standard of quality. However, it is the door hardware supplier's responsibility to thoroughly review existing conditions, schedules, specifications, drawings, and other Contract Documents to verify the suitability of the hardware specified.
- B. Exclusions: Unless specifically listed in hardware sets, hardware is not specified in this section for:
  - 1. Windows
  - 2. Cabinets (casework), including locks in cabinets
  - 3. Signage
  - 4. Toilet accessories
  - 5. Overhead doors
- C. Related Sections:
  - 1. Division 07 Section "Joint Sealants" for sealant requirements applicable to threshold installation specified in this section.
  - 2. Division 26 sections for connections to electrical power system and for low-voltage wiring.
  - 3. Division 28 sections for coordination with other components of electronic access control system.

#### 1.03 REFERENCES

A. UL - Underwriters Laboratories

- 1. UL 10B Fire Test of Door Assemblies
- 2. UL 10C Positive Pressure Test of Fire Door Assemblies
- 3. UL 1784 Air Leakage Tests of Door Assemblies
- 4. UL 305 Panic Hardware
- B. DHI Door and Hardware Institute
  - 1. Sequence and Format for the Hardware Schedule
  - 2. Recommended Locations for Builders Hardware
  - 3. Key Systems and Nomenclature
- C. ANSI American National Standards Institute
  - 1. ANSI/BHMA A156.1 A156.29, and ANSI/BHMA A156.31 Standards for Hardware and Specialties

## 1.04 SUBMITTALS

- A. General:
  - 1. Submit in accordance with Conditions of Contract and Division 01 requirements.
  - Highlight, encircle, or otherwise specifically identify on submittals deviations from Contract Documents, issues of incompatibility or other issues which may detrimentally affect the Work.
  - 3. Prior to forwarding submittal, comply with procedures for verifying existing door and frame compatibility for new hardware, as specified in PART 3, "EXAMINATION" article, herein.
- B. Action Submittals:
  - 1. Product Data: Technical product data for each item of door hardware, installation instructions, maintenance of operating parts and finish, and other information necessary to show compliance with requirements.
  - 2. Riser and Wiring Diagrams: After final approval of hardware schedule, submit details of electrified door hardware, indicating:
    - a. Wiring Diagrams: For power, signal, and control wiring and including:
      - 1) Details of interface of electrified door hardware and building safety and security systems.
      - 2) Schematic diagram of systems that interface with electrified door hardware.
      - 3) Point-to-point wiring.
      - 4) Risers.
  - 3. Samples for Verification: If requested by Architect, submit production sample or sample installations of each type of exposed hardware unit in finish indicated, and tagged with full description for coordination with schedule.
    - a. Samples will be returned to supplier. Units that are acceptable to Architect may, after final check of operations, be incorporated into Work, within limitations of key coordination requirements.
  - 4. Door Hardware Schedule: Submit schedule with hardware sets in vertical format as illustrated by Sequence of Format for the Hardware Schedule as published by the Door and Hardware Institute. Indicate complete designations of each item required for each door or opening, include:

- a. Door Index; include door number, heading number, and Architects hardware set number.
- b. Opening Lock Function Spreadsheet: List locking device and function for each opening.
- c. Quantity, type, style, function, size, and finish of each hardware item.
- d. Name and manufacturer of each item.
- e. Fastenings and other pertinent information.
- f. Location of each hardware set cross-referenced to indications on Drawings.
- g. Explanation of all abbreviations, symbols, and codes contained in schedule.
- h. Mounting locations for hardware.
- i. Door and frame sizes and materials.
- j. Name and phone number for local manufacturer's representative for each product.
- k. Operational Description of openings with any electrified hardware (locks, exits, electromagnetic locks, electric strikes, automatic operators, door position switches, magnetic holders or closer/holder units, and access control components).
  Operational description should include operational descriptions for: egress, ingress (access), and fire/smoke alarm connections.
  - Submittal Sequence: Submit door hardware schedule concurrent with submissions of Product Data, Samples, and Shop Drawings. Coordinate submission of door hardware schedule with scheduling requirements of other work to facilitate fabrication of other work that is critical in Project construction schedule.
- 5. Key Schedule:
  - a. After Keying Conference, provide keying schedule listing levels of keying as well as explanation of key system's function, key symbols used and door numbers controlled.
  - b. Use ANSI/BHMA A156.28 "Recommended Practices for Keying Systems" as guideline for nomenclature, definitions, and approach for selecting optimal keying system.
  - c. Provide 3 copies of keying schedule for review prepared and detailed in accordance with referenced DHI publication. Include schematic keying diagram and index each key to unique door designations.
  - d. Index keying schedule by door number, keyset, hardware heading number, cross keying instructions, and special key stamping instructions.
  - e. Provide one complete bitting list of key cuts and one key system schematic illustrating system usage and expansion.
    - 1) Forward bitting list, key cuts and key system schematic directly to Owner, by means as directed by Owner.
  - f. Prepare key schedule by or under supervision of supplier, detailing Owner's final keying instructions for locks.
- 6. Templates: After final approval of hardware schedule, provide templates for doors, frames and other work specified to be factory or shop prepared for door hardware installation.
- C. Informational Submittals:
  - 1. Qualification Data: For Supplier, Installer and Architectural Hardware Consultant.
  - 2. Product data for electrified door hardware:
    - a. Certify that door hardware approved for use on types and sizes of labeled fire-rated doors complies with listed fire-rated door assemblies.
  - 3. Certificates of Compliance:

- a. UL listings for fire-rated hardware and installation instructions if requested by Architect or Authority Having Jurisdiction.
- b. Installer Training Meeting Certification: Letter of compliance, signed by Contractor, attesting to completion of installer training meeting specified in "QUALITY ASSURANCE" article, herein.
- c. Electrified Hardware Coordination Conference Certification: Letter of compliance, signed by Contractor, attesting to completion of electrified hardware coordination conference, specified in "QUALITY ASSURANCE" article, herein.
- 4. Warranty: Special warranty specified in this Section.
- D. Closeout Submittals:
  - 1. Operations and Maintenance Data: Provide in accordance with Division 01 and include:
    - a. Complete information on care, maintenance, and adjustment; data on repair and replacement parts, and information on preservation of finishes.
    - b. Catalog pages for each product.
    - c. Factory order acknowledgement numbers (for warranty and service)
    - d. Name, address, and phone number of local representative for each manufacturer.
    - e. Parts list for each product.
    - f. Final approved hardware schedule, edited to reflect conditions as-installed.
    - g. Final keying schedule
    - h. Copies of floor plans with keying nomenclature
    - i. As-installed wiring diagrams for each opening connected to power, both low voltage and 110 volts.
    - j. Copy of warranties including appropriate reference numbers for manufacturers to identify project.

# 1.05 QUALITY ASSURANCE

- A. Supplier Qualifications and Responsibilities: Recognized architectural hardware supplier with record of successful in-service performance for supplying door hardware similar in quantity, type, and quality to that indicated for this Project and that provides certified Architectural Hardware Consultant (AHC) available to Owner, Architect, and Contractor, at reasonable times during the Work for consultation.
  - 1. Warehousing Facilities: In Project's vicinity.
  - 2. Scheduling Responsibility: Preparation of door hardware and keying schedules.
  - 3. Engineering Responsibility: Preparation of data for electrified door hardware, including Shop Drawings, based on testing and engineering analysis of manufacturer's standard units in assemblies similar to those indicated for this Project.
  - 4. Coordination Responsibility: Assist in coordinating installation of electronic security hardware with Architect and electrical engineers and provide installation and technical data to Architect and other related subcontractors.
    - a. Upon completion of electronic security hardware installation, inspect and verify that all components are working properly.
- B. Architectural Hardware Consultant Qualifications: Person who is experienced in providing consulting services for door hardware installations that are comparable in material, design, and extent to that indicated for this Project and meets these requirements:
  - 1. For door hardware, DHI-certified, Architectural Hardware Consultant (AHC).
  - 2. Can provide installation and technical data to Architect and other related subcontractors.

- 3. Can inspect and verify components are in working order upon completion of installation.
- 4. Capable of producing wiring diagrams.
- 5. Capable of coordinating installation of electrified hardware with Architect and electrical engineers.
- C. Single Source Responsibility: Obtain each type of door hardware from single manufacturer.
- D. Fire-Rated Door Openings: Provide door hardware for fire-rated openings that complies with NFPA 80 and requirements of authorities having jurisdiction. Provide only items of door hardware that are listed products tested by Underwriters Laboratories, Intertek Testing Services, or other testing and inspecting organizations acceptable to authorities having jurisdiction for use on types and sizes of doors indicated, based on testing at positive pressure and according to NFPA 252 or UL 10C and in compliance with requirements of firerated door and door frame labels.
- E. Electrified Door Hardware: Listed and labeled as defined in NFPA 70, Article 100, by testing agency acceptable to authorities having jurisdiction.
- F. Accessibility Requirements: For door hardware on doors in an accessible route, comply with governing accessibility regulations cited in "REFERENCES" article, herein.
- G. Keying Conference
  - 1. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including:
    - a. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
    - b. Preliminary key system schematic diagram.
    - c. Requirements for key control system.
    - d. Requirements for access control.
    - e. Address for delivery of keys.
- H. Pre-installation Conference
  - 1. Review and finalize construction schedule and verify availability of materials, Installer's personnel, equipment, and facilities needed to make progress and avoid delays.
  - 2. Inspect and discuss preparatory work performed by other trades.
  - 3. Inspect and discuss electrical roughing-in for electrified door hardware.
  - 4. Review sequence of operation for each type of electrified door hardware.
  - 5. Review required testing, inspecting, and certifying procedures.
- I. Coordination Conferences:
  - Installation Coordination Conference: Prior to hardware installation, schedule and hold meeting to review questions or concerns related to proper installation and adjustment of door hardware.
  - 2. Electrified Hardware Coordination Conference: Prior to ordering electrified hardware, schedule and hold meeting to coordinate door hardware with security, electrical, doors and frames, and other related suppliers.

## 1.06 DELIVERY, STORAGE, AND HANDLING

- A. Inventory door hardware on receipt and provide secure lock-up for hardware delivered to Project site.
- B. Tag each item or package separately with identification coordinated with final door hardware schedule, and include installation instructions, templates, and necessary fasteners with each item or package.
  - 1. Deliver each article of hardware in manufacturer's original packaging.
- C. Project Conditions:
  - 1. Maintain manufacturer-recommended environmental conditions throughout storage and installation periods.
  - 2. Provide secure lock-up for door hardware delivered to Project. Control handling and installation of hardware items so that completion of Work will not be delayed by hardware losses both before and after installation.
- D. Protection and Damage:
  - 1. Promptly replace products damaged during shipping.
  - 2. Handle hardware in manner to avoid damage, marring, or scratching. Correct, replace or repair products damaged during Work.
  - 3. Protect products against malfunction due to paint, solvent, cleanser, or any chemical agent.
- E. Deliver keys to manufacturer of key control system for subsequent delivery to Owner.

# 1.07 COORDINATION

- A. Coordinate layout and installation of floor-recessed door hardware with floor construction. Cast anchoring inserts into concrete.
- B. Installation Templates: Distribute for doors, frames, and other work specified to be factory or shop prepared. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- C. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- D. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- E. Existing Openings: Where existing doors, frames and/or hardware are to remain, field verify existing functions, conditions and preparations and coordinate to suit opening conditions and to provide proper door operation.

# 1.08 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of door hardware that fail in materials or workmanship within specified warranty period.

- 1. Warranty Period: Beginning from date of Substantial Completion, for durations indicated.
  - a. Closers:
    - 1) Mechanical: 30 years.
  - b. Exit Devices:
    - 1) Mechanical: 3 years.
    - 2) Electrified: 1 year.
  - c. Locksets:
    - 1) Mechanical: 3 years.
  - d. Continuous Hinges: Lifetime warranty.
  - e. Key Blanks: Lifetime
- 2. Warranty does not cover damage or faulty operation due to improper installation, improper use or abuse.

#### 1.09 MAINTENANCE

A. Maintenance Tools: Furnish complete set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

## PART 2 - PRODUCTS

## 2.01 MANUFACTURERS

- A. The Owner requires use of certain products for their unique characteristics and project suitability to insure continuity of existing and future performance and maintenance standards. After investigating available product offerings, the Awarding Authority has elected to prepare proprietary specifications. These products are specified with the notation: "No Substitute."
  - 1. Where "No Substitute" is noted, submittals and substitution requests for other products will not be considered.
- B. Approval of manufacturers and/or products other than those listed as "Scheduled Manufacturer" or "Acceptable Manufacturers" in the individual article for the product category shall be in accordance with QUALITY ASSURANCE article, herein.
- C. Approval of products from manufacturers indicated in "Acceptable Manufacturers" is contingent upon those products providing all functions and features and meeting all requirements of scheduled manufacturer's product.
- D. Where specified hardware is not adaptable to finished shape or size of members requiring hardware, furnish suitable types having same operation and quality as type specified, subject to Architect's approval.

## 2.02 MATERIALS

A. Fasteners

- 1. Provide hardware manufactured to conform to published templates, generally prepared for machine screw installation.
- 2. Furnish screws for installation with each hardware item. Finish exposed (exposed under any condition) screws to match hardware finish, or, if exposed in surfaces of other work, to match finish of this other work including prepared for paint surfaces to receive painted finish.
- 3. Provide concealed fasteners for hardware units exposed when door is closed except when no standard units of type specified are available with concealed fasteners. Do not use thru-bolts for installation where bolt head or nut on opposite face is exposed in other work unless thru-bolts are required to fasten hardware securely. Review door specification and advise Architect if thru-bolts are required.
- 4. Install hardware with fasteners provided by hardware manufacturer.
- B. Modification and Preparation of Existing Doors: Where existing door hardware is indicated to be removed and reinstalled.
  - 1. Provide necessary fillers, Dutchmen, reinforcements, and fasteners, compatible with existing materials, as required for mounting new opening hardware and to cover existing door and frame preparations.
  - 2. Use materials which match materials of adjacent modified areas.
  - 3. When modifying existing fire-rated openings, provide materials permitted by NFPA 80 as required to maintain fire-rating.
- C. Provide screws, bolts, expansion shields, drop plates and other devices necessary for hardware installation.
  - 1. Where fasteners are exposed to view: Finish to match adjacent door hardware material.
- D. Cable and Connectors: Hardwired Electronic Access Control Lockset and Exit Device Trim:
  - 1. Data: 24AWG, 4 conductor shielded, Belden 9843, 9841 or comparable.
  - 2. DC Power: 18 AWG, 2 conductor, Belden 8760 or comparable.
  - 3. Provide type of data and DC power cabling required by access control device manufacturer for this installation.
  - 4. Where scheduled in the hardware sets, provide each item of electrified hardware and wire harnesses with sufficient number and wire gauge with standardized Molex plug connectors to accommodate electric function of specified hardware. Provide Molex connectors that plug directly into connectors from harnesses, electric locking and power transfer devices. Provide through-door wire harness for each electrified locking device installed in a door and wire harness for each electrified hinge, electrified pivot, and electric power transfer for connection to power supplies.

# 2.03 HINGES

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: Ives 5BB series.
  - 2. Acceptable Manufacturers and Products: Hager BB series, McKinney TA/T4A series.
- B. Requirements:
  - 1. Provide hinges conforming to ANSI/BHMA A156.1.
  - 2. 1-3/4 inch (44 mm) thick doors, up to and including 36 inches (914 mm) wide:
    - a. Exterior: Standard weight, bronze or stainless steel, 4-1/2 inches (114 mm) high

- b. Interior: Standard weight, steel, 4-1/2 inches (114 mm) high
- 3. 1-3/4 inch (44 mm) thick doors over 36 inches (914 mm) wide:
  - a. Exterior: Heavy weight, bronze/stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
- 4. 2 inches or thicker doors:
  - a. Exterior: Heavy weight, bronze or stainless steel, 5 inches (127 mm) high
  - b. Interior: Heavy weight, steel, 5 inches (127 mm) high
- 5. Provide three hinges per door leaf for doors 90 inches (2286 mm) or less in height, and one additional hinge for each 30 inches (762 mm) of additional door height.
- 6. Where new hinges are specified for existing doors or existing frames, provide new hinges of identical size to hinge preparation present in existing door or existing frame.
- 7. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
  - a. Steel Hinges: Steel pins
  - b. Non-Ferrous Hinges: Stainless steel pins
  - c. Out-Swinging Exterior Doors: Non-removable pins
  - d. Out-Swinging Interior Lockable Doors: Non-removable pins
  - e. Interior Non-lockable Doors: Non-rising pins
- Width of hinges: 4-1/2 inches (114 mm) at 1-3/4 inch (44 mm) thick doors, and 5 inches (127 mm) at 2 inches (51 mm) or thicker doors. Adjust hinge width as required for door, frame, and wall conditions to allow proper degree of opening.

# 2.04 CONTINUOUS HINGES

- A. Aluminum Geared
  - 1. Manufacturers:
    - a. Scheduled Manufacturer: Ives.
    - b. Acceptable Manufacturers: Select, McKinney.
  - 2. Requirements:
    - a. Provide aluminum geared continuous hinges conforming to ANSI/BHMA A156.26, Grade 1.
    - b. Provide aluminum geared continuous hinges, where specified in the hardware sets, fabricated from 6063-T6 aluminum.
    - c. Provide split nylon bearings at each hinge knuckle for quiet, smooth, self-lubricating operation.
    - d. Provide hinges capable of supporting door weights up to 450 pounds, and successfully tested for 1,500,000 cycles.
    - e. On fire-rated doors, provide aluminum geared continuous hinges that are classified for use on rated doors by testing agency acceptable to authority having jurisdiction.
    - f. Provide aluminum geared continuous hinges with electrified option scheduled in the hardware sets. Provide with sufficient number and wire gage to accommodate electric function of specified hardware.
    - g. Install hinges with fasteners supplied by manufacturer.
    - h. Provide hinges 1 inch (25 mm) shorter in length than nominal height of door, unless otherwise noted or door details require shorter length and with symmetrical hole pattern.

# 2.05 CYLINDRICAL LOCKS - GRADE 1

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: Best 93K series.
  - 2. Acceptable Manufacturers and Products: No Substitute.

#### B. Requirements:

- 1. Provide cylindrical locks conforming to ANSI/BHMA A156.2 Series 4000, Grade 1, and UL Listed for 3 hour fire doors.
- 2. Cylinders: Refer to "KEYING" article, herein.
- 3. Provide locks with standard 2-3/4 inches (70 mm) backset, unless noted otherwise, with 1/2 inch latch throw. Provide proper latch throw for UL listing at pairs.
- 4. Provide locksets with separate anti-rotation thru-bolts, and no exposed screws.
- 5. Provide independently operating levers with two external return spring cassettes mounted under roses to prevent lever sag.
- 6. Provide standard ASA strikes unless extended lip strikes are necessary to protect trim.
- 7. Provide electrified options as scheduled in the hardware sets.
- 8. Lever Trim: Solid cast levers without plastic inserts and wrought roses on both sides.
  - a. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

## 2.06 EXIT DEVICES

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: Von Duprin 98/35A series.
  - 2. Acceptable Manufacturers and Products: No Substitute.
- B. Requirements:
  - 1. Provide exit devices tested to ANSI/BHMA A156.3 Grade 1 and UL listed for Panic Exit or Fire Exit Hardware.
  - 2. Cylinders: Refer to "KEYING" article, herein.
  - 3. Provide touchpad type exit devices, fabricated of brass, bronze, stainless steel, or aluminum, plated to standard architectural finishes to match balance of door hardware.
  - 4. Touchpad must extend a minimum of one half of door width. No plastic inserts are allowed in touchpads.
  - 5. Provide exit devices with deadlatching feature for security and for future addition of alarm kits and/or other electrified requirements.
  - 6. Provide flush end caps for exit devices.
  - 7. Provide exit devices with manufacturer's approved strikes.
  - 8. Provide exit devices cut to door width and height. Install exit devices at height recommended by exit device manufacturer, allowable by governing building codes, and approved by Architect.
  - 9. Mount mechanism case flush on face of doors, or provide spacers to fill gaps behind devices. Where glass trim or molding projects off face of door, provide glass bead kits.
  - 10. Provide cylinder or hex-key dogging as specified at non fire-rated openings.
  - 11. Removable Mullions: 2 inches (51 mm) x 3 inches (76 mm) steel tube. Where scheduled as keyed removable mullion, provide type that can be removed by use of a keyed cylinder, which is self-locking when re-installed.
  - 12. Provide electrified options as scheduled.

- 13. Provide exit devices with optional trim designs to match other lever and pull designs used on the project.
  - a. Tactile Warning (Knurling): Where required by authority having jurisdiction. Provide on levers on exterior (secure side) of doors serving rooms considered to be hazardous.

# 2.07 ELECTRIC STRIKES

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: Von Duprin 6000 Series.
  - 2. Acceptable Manufacturers and Products: No Substitute.
- B. Requirements:
  - 1. Provide electric strikes designed for use with type of locks shown at each opening.
  - 2. Provide electric strikes UL Listed as burglary-resistant.
  - 3. Where required, provide electric strikes UL Listed for fire doors and frames.
  - 4. Provide transformers and rectifiers for each strike as required. Verify voltage with electrical contractor.

## 2.08 POWER SUPPLIES

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: Schlage/Von Duprin PS900 series.
  - 2. Acceptable Manufacturers and Products: No Substitute.
- B. Requirements:
  - 1. Provide power supplies approved by manufacturer of supplied electrified hardware.
  - Provide appropriate quantity of power supplies necessary for proper operation of electrified locking components as recommended by manufacturer of electrified locking components with consideration for each electrified component using power supply, location of power supply, and approved wiring diagrams. Locate power supplies as directed by Architect.
  - 3. Provide regulated and filtered 24 VDC power supply, and UL class 2 listed.
  - 4. Provide power supplies with the following features:
    - a. 12/24 VDC Output, field selectable.
    - b. Class 2 Rated power limited output.
    - c. Universal 120-240 VAC input.
    - d. Low voltage DC, regulated and filtered.
    - e. Polarized connector for distribution boards.
    - f. Fused primary input.
    - g. AC input and DC output monitoring circuit w/LED indicators.
    - h. Cover mounted AC Input indication.
    - i. Tested and certified to meet UL294.
    - j. NEMA 1 enclosure.
    - k. Hinged cover w/lock down screws.
    - I. High voltage protective cover.

## 2.09 CYLINDERS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: Best.
- B. Requirements:
  - Provide interchangeable cylinders/cores to match Owner's existing key system, compliant with ANSI/BHMA A156.5; latest revision; cylinder face finished to match lockset, manufacturer's series as indicated. Refer to "KEYING" article, herein.
- C. Construction Keying:
  - 1. Replaceable Construction Cores.
    - a. Provide temporary construction cores replaceable by permanent cores, furnished in accordance with the following requirements.
      - 1) 3 construction control keys
      - 2) 12 construction change (day) keys.
    - b. Owner or Owner's Representative will replace temporary construction cores with permanent cores.

#### 2.10 KEYING

- A. Provide cylinders/cores keyed into Owner's existing factory registered keying system.
- B. Comply with guidelines in ANSI/BHMA A156.28, incorporating decisions made at keying conference.
- C. Requirements:
  - 1. Provide permanent cylinders/cores keyed by the manufacturer according to the following key system.
    - a. Master Keying system as directed by the Owner.
  - 2. Forward bitting list and keys separately from cylinders, by means as directed by Owner. Failure to comply with forwarding requirements will be cause for replacement of cylinders/cores involved at no additional cost to Owner.
  - 3. Provide keys with the following features:
    - a. Material: Nickel silver
  - 4. Identification:
    - a. Mark permanent cylinders/cores and keys with applicable blind code per DHI publication "Keying Systems and Nomenclature" for identification. Do not provide blind code marks with actual key cuts.
    - b. Identification stamping provisions must be approved by the Architect and Owner.
    - c. Stamp cylinders/cores and keys with Owner's unique key system facility code as established by the manufacturer; key symbol and embossed or stamped with "DO NOT DUPLICATE" along with the "PATENTED" or patent number to enforce the patent protection.

- d. Failure to comply with stamping requirements will be cause for replacement of keys involved at no additional cost to Owner.
- e. Forward permanent cylinders/cores to Owner, separately from keys, by means as directed by Owner.
- 5. Quantity: Furnish in the following quantities.
  - a. Change (Day) Keys: 3 per cylinder/core.
  - b. Permanent Control Keys: 3.
  - c. Master Keys: 6.

# 2.11 DOOR CLOSERS

- A. Manufacturers and Products:
  - 1. Scheduled Manufacturer and Product: LCN 4010/4110/4020 series.
  - 2. Acceptable Manufacturers and Products: No Substitute.
- B. Requirements:
  - Provide door closers conforming to ANSI/BHMA A156.4 Grade 1 requirements by BHMA certified independent testing laboratory. Certify surface mounted mechanical closers to meet fifteen million (15,000,000) full load cycles. ISO 9000 certify closers. Stamp units with date of manufacture code.
  - 2. Provide door closers with fully hydraulic, full rack and pinion action with high strength cast iron cylinder, and full complement bearings at shaft.
  - 3. Cylinder Body: 1-1/2 inch (38 mm) diameter with 11/16 inch (17 mm) diameter double heat-treated pinion journal.
  - 4. Hydraulic Fluid: Fireproof, passing requirements of UL10C, and requiring no seasonal closer adjustment for temperatures ranging from 120 degrees F to -30 degrees F.
  - 5. Spring Power: Continuously adjustable over full range of closer sizes, and providing reduced opening force as required by accessibility codes and standards.
  - 6. Hydraulic Regulation: By tamper-proof, non-critical valves, with separate adjustment for latch speed, general speed, and backcheck.
  - 7. Provide closers with solid forged steel main arms and factory assembled heavy-duty forged forearms for parallel arm closers. When closers are parallel arm mounted, provide closers which mount within 6-inch (152 mm) top rail without use of mounting plate so that closer is not visible through vision panel from pull side.
  - 8. Pressure Relief Valve (PRV) Technology: Not permitted.
  - 9. Finish for Closer Cylinders, Arms, Adapter Plates, and Metal Covers: Powder coating finish which has been certified to exceed 100 hours salt spray testing as described in ANSI/BHMA Standard A156.4 and ASTM B117, or has special rust inhibitor (SRI).
  - 10. Provide special templates, drop plates, mounting brackets, or adapters for arms as required for details, overhead stops, and other door hardware items interfering with closer mounting.

# 2.12 PROTECTION PLATES

- A. Manufacturers:
  - 1. Scheduled Manufacturer: Ives.
  - 2. Acceptable Manufacturers: Burns, Rockwood.
- B. Requirements:

- 1. Provide kick plates, mop plates, and armor plates minimum of 0.050 inch (1 mm) thick, beveled four edges as scheduled. Furnish with sheet metal or wood screws, finished to match plates.
- 2. Sizes of plates:
  - a. Kick Plates: 8 inches (204 mm) high by 2 inches (51 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs
  - b. Armor Plates: 34 inches (963 mm) high by 1-1/2 inches (38 mm) less width of door on single doors, 1 inch (25 mm) less width of door on pairs

# 2.13 OVERHEAD STOPS AND OVERHEAD STOP/HOLDERS

- A. Manufacturers:
  - 1. Scheduled Manufacturers: Glynn-Johnson.
  - 2. Acceptable Manufacturers: No Substitute.
- B. Requirements:
  - 1. Provide heavy duty concealed mounted overhead stop or holder as specified for exterior and interior vestibule single acting doors.
  - 2. Where overhead holders are specified provide friction type at doors without closer and positive type at doors with closer.

# 2.14 DOOR STOPS AND HOLDERS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: Ives.
  - 2. Acceptable Manufacturers: Burns, Rockwood.
- B. Provide door stops at each door leaf:
  - 1. Provide wall stops wherever possible. Provide convex type where mortise type locks are used and concave type where cylindrical type locks are used.
  - 2. Where wall stop cannot be used, provide overhead stop.

# 2.15 THRESHOLDS, SEALS, DOOR SWEEPS, AUTOMATIC DOOR BOTTOMS, AND GASKETING

- A. Manufacturers:
  - 1. Scheduled Manufacturer: Zero International.
  - 2. Acceptable Manufacturers: National Guard, Pemko.
- B. Requirements:
  - 1. Provide thresholds, weather-stripping (including door sweeps, seals, and astragals) and gasketing systems (including smoke, sound, and light) as specified and per architectural details. Match finish of other items.
  - Smoke- and Draft-Control Door Assemblies: Where smoke- and draft-control door assemblies are required, provide door hardware that meets requirements of assemblies tested according to UL 1784 and installed in compliance with NFPA 105.
  - 3. Size of thresholds:

- a. Saddle Thresholds: 1/2 inch (13 mm) high by jamb width by door width
- b. Bumper Seal Thresholds: 1/2 inch (13 mm) high by 5 inches (127 mm) wide by door width
- 4. Provide door sweeps, seals, astragals, and auto door bottoms only of type where resilient or flexible seal strip is easily replaceable and readily available.

# 2.16 SILENCERS

- A. Manufacturers:
  - 1. Scheduled Manufacturer: lves.
  - 2. Acceptable Manufacturers: Burns, Rockwood.
- B. Requirements:
  - 1. Provide "push-in" type silencers for hollow metal or wood frames.
  - 2. Provide one silencer per 30 inches (762 mm) of height on each single frame, and two for each pair frame.
  - 3. Omit where gasketing is specified.

## 2.17 FINISHES

- A. Finish: BHMA 626/652 (US26D); except:
  - 1. Continuous Hinges: BHMA 628 (US28)
  - 2. Protection Plates: BHMA 630 (US32D)
  - 3. Overhead Stops and Holders: BHMA 630 (US32D)
  - 4. Door Closers: Powder Coat to Match
  - 5. Wall Stops: BHMA 630 (US32D)
  - 6. Weatherstripping: Clear Anodized Aluminum
  - 7. Thresholds: Mill Finish Aluminum

# PART 3 - EXECUTION

#### 3.01 EXAMINATION

- A. Prior to installation of hardware, examine doors and frames, with Installer present, for compliance with requirements for installation tolerances, labeled fire-rated door assembly construction, wall and floor construction, and other conditions affecting performance.
- B. Field verify existing doors and frames receiving new hardware and existing conditions receiving new openings. Verify that new hardware is compatible with existing door and frame preparation and existing conditions.
- C. Examine roughing-in for electrical power systems to verify actual locations of wiring connections before electrified door hardware installation.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

## 3.02 PREPARATION

- A. Where on-site modification of doors and frames is required:
  - 1. Carefully remove existing door hardware and components being reused. Clean, protect, tag, and store in accordance with storage and handling requirements specified herein.
  - 2. Field modify and prepare existing door and frame for new hardware being installed.
  - 3. When modifications are exposed to view, use concealed fasteners, when possible.
  - 4. Prepare hardware locations and reinstall in accordance with installation requirements for new door hardware and with:
    - a. Steel Doors and Frames: For surface applied door hardware, drill and tap doors and frames according to ANSI/SDI A250.6.
    - b. Wood Doors: DHI WDHS.5 "Recommended Hardware Reinforcement Locations for Mineral Core Wood Flush Doors."
    - c. Doors in rated assemblies: NFPA 80 for restrictions on on-site door hardware preparation.

## 3.03 INSTALLATION

- A. Mount door hardware units at heights to comply with the following, unless otherwise indicated or required to comply with governing regulations.
  - 1. Standard Steel Doors and Frames: ANSI/SDI A250.8.
  - 2. Custom Steel Doors and Frames: HMMA 831.
  - 3. Wood Doors: DHI WDHS.3, "Recommended Locations for Architectural Hardware for Wood Flush Doors."
- B. Install each hardware item in compliance with manufacturer's instructions and recommendations, using only fasteners provided by manufacturer.
- C. Do not install surface mounted items until finishes have been completed on substrate. Protect all installed hardware during painting.
- D. Set units level, plumb and true to line and location. Adjust and reinforce attachment substrate as necessary for proper installation and operation.
- E. Drill and countersink units that are not factory prepared for anchorage fasteners. Space fasteners and anchors according to industry standards.
- F. Install operating parts so they move freely and smoothly without binding, sticking, or excessive clearance.
- G. Hinges: Install types and in quantities indicated in door hardware schedule but not fewer than quantity recommended by manufacturer for application indicated or one hinge for every 30 inches (750 mm) of door height, whichever is more stringent, unless other equivalent means of support for door, such as spring hinges or pivots, are provided.
- H. Lock Cylinders: Install construction cores to secure building and areas during construction period.
  - 1. Furnish permanent cores to Owner for installation.
- I. Wiring: Coordinate with Division 26, ELECTRICAL sections for:

- 1. Conduit, junction boxes and wire pulls.
- 2. Connections to and from power supplies to electrified hardware.
- 3. Connections to fire/smoke alarm system and smoke evacuation system.
- 4. Connection of wire to door position switches and wire runs to central room or area, as directed by Architect.
- 5. Testing and labeling wires with Architect's opening number.
- J. Door Closers: Mount closers on room side of corridor doors, inside of exterior doors, and stair side of stairway doors from corridors. Mount closers so they are not visible in corridors, lobbies and other public spaces unless approved by Architect.
- K. Closer/Holders: Mount closer/holders on room side of corridor doors, inside of exterior doors, and stair side of stairway doors.
- L. Power Supplies: Locate power supplies as indicated or, if not indicated, above accessible ceilings or in equipment room, or alternate location as directed by Architect.
- M. Thresholds: Set thresholds in full bed of sealant complying with requirements specified in Division 07 Section "Joint Sealants."
- N. Stops: Provide floor stops for doors unless wall or other type stops are indicated in door hardware schedule. Do not mount floor stops where they may impede traffic or present tripping hazard.
- O. Perimeter Gasketing: Apply to head and jamb, forming seal between door and frame.
- P. Meeting Stile Gasketing: Fasten to meeting stiles, forming seal when doors are closed.
- Q. Door Bottoms: Apply to bottom of door, forming seal with threshold when door is closed.

#### 3.04 FIELD QUALITY CONTROL

- A. Engage qualified manufacturer trained representative to perform inspections and to prepare inspection reports.
  - 1. Representative will inspect door hardware and state in each report whether installed work complies with or deviates from requirements, including whether door hardware is properly installed and adjusted.

# 3.05 ADJUSTING

- A. Initial Adjustment: Adjust and check each operating item of door hardware and each door to ensure proper operation or function of every unit. Replace units that cannot be adjusted to operate as intended. Adjust door control devices to compensate for final operation of heating and ventilating equipment and to comply with referenced accessibility requirements.
  - 1. Electric Strikes: Adjust horizontal and vertical alignment of keeper to properly engage lock bolt.
  - 2. Door Closers: Adjust sweep period to comply with accessibility requirements and requirements of authorities having jurisdiction.
- B. Occupancy Adjustment: Approximately three to six months after date of Substantial Completion, Installer's Architectural Hardware Consultant must examine and readjust each

item of door hardware, including adjusting operating forces, as necessary to ensure function of doors and door hardware.

# 3.06 CLEANING AND PROTECTION

- A. Clean adjacent surfaces soiled by door hardware installation.
- B. Clean operating items as necessary to restore proper function and finish.
- C. Provide final protection and maintain conditions that ensure door hardware is without damage or deterioration at time of Substantial Completion.

# 3.07 DOOR HARDWARE SCHEDULE

- A. Hardware items are referenced in the following hardware. Refer to the above-specifications for special features, options, cylinders/keying, and other requirements.
- B. Hardware Sets:

Hardware Set No. 01A

For us	se on ma	ark/door #(s):			
100.1					
Each	to have:				
2	EA	CONT. HINGE	224HD	628	IVE
1	EA	REMOVABLE MULLION	4854 STAB	689	VON
1	EA	RIM CYLINDER	1E72	626	BES
2	EA	MORTISE CYLINDER	1E74	626	BES
1	EA	PANIC HARDWARE	CD-98-DT-696	626	VON
1	EA	PANIC HARDWARE	CD-98-NL-696-LS	626	VON
1	EA	ELECTRIC STRIKE	6111 FSE EB 12/24 VAC/VDC	630	VON
2	EA	SURFACE CLOSER	4111 SCUSH MC ST-1586	689	LCN
2	EA	KICK PLATE	8400 8" X 1" LDW B-CS	630	IVE
1	EA	ASTRAGAL SET	326AA-S	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	GASKETING	429AA-S	AA	ZER
1	EA	THRESHOLD	65A-223	A	ZER
1	EA	DESKTOP MINI CONSOLE	DTMO-2	TAN	SDC
1	EA	POWER SUPPLY	PS902 900-8F 120/240 VAC	LGR	SCE

DOORS REQUIRE SPECIAL 3/8 INCH UNDERCUT FOR ADA TYPE THRESHOLD. DESCRIPTION OF OPERATION:

PRESSING DESK RELEASE BUTTON WILL RELEASE ELECTRIC STRIKE FOR ACCESS. FREE EGRESS AT ALL TIMES.

ONLY ONE POWER SUPPLY AND DESK CONSOLE UNIT REQUIRED. LISTED IN HARDWARE SET 01A

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Hard For u 101.	lware Se use on n 1	et No. 01B nark/door #(s):			
Each	n to have	9:			
2	EA	CONT. HINGE	224HD	628	IVE
1	EA	REMOVABLE MULLION	4854 STAB	689	VON
1	EA	RIM CYLINDER	1E72	626	BES
2	EA	MORTISE CYLINDER	1E74	626	BES
1	EA	PANIC HARDWARE	CD-98-DT-696	626	VON
1	EA	PANIC HARDWARE	CD-98-NL-696-LS	626	VON
1	EA	ELECTRIC STRIKE	6111 FSE EB 12/24 VAC/VDC	630	VON
2	EA	SURFACE CLOSER	4111 HCUSH MC	689	LCN
2	EA	KICK PLATE	8400 8" X 1" LDW B-CS	630	IVE
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
	0010TI				

DESCRIPTION OF OPERATION;

PRESSING DESK RELEASE BUTTON WILL RELEASE ELECTRIC STRIKE FOR ACCESS. FREE EGRESS AT ALL TIMES.

ONLY ONE POWER SUPPLY AND DESK CONSOLE UNIT REQUIRED. LISTED IN HARDWARE SET 01A

Hardware Set No. 02

For use on mark/door #(s):

100.2

Each to have:

2	EA	CONT. HINGE	224HD	628	IVE
1	EA	KEYED MULLION	KR4954 STAB	689	VON
3	EA	MORTISE CYLINDER	1E74	626	BES
2	EA	PANIC HARDWARE	CD-98-DT-696	626	VON
2	EA	SURFACE CLOSER	4111 SCUSH MC ST-1586	689	LCN
2	EA	KICK PLATE	8400 8" X 1" LDW B-CS	630	IVE
1	EA	ASTRAGAL SET	326AA-S	AA	ZER
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
1	EA	GASKETING	429AA-S	AA	ZER
1	EA	THRESHOLD	65A-223	А	ZER

DOORS REQUIRE SPECIAL 3/8 INCH UNDERCUT FOR ADA TYPE THRESHOLD.

Breathitt County Public Schools Sebastian Elementary School Partial Renovation KDE Project 19-320

Hard	ware Se	et No. 03			
For u	use on m	nark/door #(s):			
101.2	2				
Each	n to have	):			
2	EA	CONT. HINGE	224HD	628	IVE
1	EA	KEYED MULLION	KR4954 STAB	689	VON
2	EA	MORTISE CYLINDER	1E74	626	BES
2	EA	PANIC HARDWARE	CD-98-DT-696	626	VON
2	EA	SURFACE CLOSER	4111 HCUSH MC	689	LCN
2	EA	KICK PLATE	8400 8" X 1" LDW B-CS	630	IVE
1	EA	MULLION SEAL	8780NBK PSA	BK	ZER
Hard	ware Se	et No. 04			
For u	use on m	nark/door #(s):			
200		201 202			
Each	n to have	9:			
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRANCE	93K-7-AB-15C-S3	626	BES
1	EA	OH STOP & HOLDER	100F	630	GLY
Hard	ware Se	et No. 05			
For u	use on m	nark/door #(s):			
300.	1	301 203	204		
Each	n to have	9:			
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM	93K-7-D-15C-S3	626	BES
1	EA	OH STOP & HOLDER	100F	630	GLY
1	EA	ARMOR PLATE	8400 34" X 1 1/2" LDW B-CS	630	IVE
Hard	ware Se	et No. 06			
For u	use on m	nark/door #(s):			
300.2	2				
Each	n to have	9:			
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	STOREROOM	93K-7-D-15C-S3	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE
Hard	ware Se	et No. 07			
For u	use on m	nark/door #(s):			
302		304			
Each	n to have	):			
3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	INTRUDER	93K-7-IN-15C-S3	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE

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Hardware Set No. 08

For use on mark/door #(s): 303

Each to have:

3	EA	HINGE	5BB1 4.5 X 4.5	652	IVE
1	EA	OFFICE/ENTRANCE	93K-7-AB-15C-S3	626	BES
1	EA	WALL STOP	WS406/407CVX	630	IVE

END OF SECTION

SECTION 088000 - GLAZING

## PART 1 - GENERAL

## 1.1 SUMMARY

- A. Section Includes:
  - 1. Glass glazing for metal frames, doors, and storefront/windows.
  - 2. Glazing accessories and sealants.
- B. Related Requirements:
  - 1. Section 079000 Joint Protection: Sealant and backup material other than glazing sealants.
  - 2. Section 081213 Standard Steel Frames.
  - 3. Section 081314 Standard Steel Doors.
  - 4. Section 081416 Flush Wood Doors.
  - 5. Section 084113 Aluminum-Framed Entrances and Storefronts.
  - 6. Section 109000 Miscellaneous Specialties Speak-thru Grill

#### 1.2 REFERENCE STANDARDS

- A. American National Standards Institute:
  - 1. ANSI Z97.1 Safety Glazing Materials Used in Buildings Safety Performance Specifications and Methods of Test.
- B. American Society of Civil Engineers:
  - 1. ASCE 7 Minimum Design Loads for Buildings and Other Structures.
- C. ASTM International:
  - 1. ASTM C509 Standard Specification for Elastomeric Cellular Preformed Gasket and Sealing Material.
  - 2. ASTM C864 Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers.
  - 3. ASTM C920 Standard Specification for Elastomeric Joint Sealants.
  - 4. ASTM C1036 Standard Specification for Flat Glass.
  - 5. ASTM C1048 Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass.
  - 6. ASTM C1172 Standard Specification for Laminated Architectural Flat Glass.
  - 7. ASTM C1193 Standard Guide for Use of Joint Sealants.
  - 8. ASTM C1376 Standard Specification for Pyrolytic and Vacuum Deposition Coatings on Flat Glass.
  - 9. ASTM D635 Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position.
  - 10. ASTM D1929 Standard Test Method for Determining Ignition Temperature of Plastics.
  - 11. ASTM D4802 Standard Specification for Poly(Methyl Methacrylate) Acrylic Plastic Sheet.
  - 12. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 13. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.

- 14. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- 15. ASTM E1300 Standard Practice for Determining Load Resistance of Glass in Buildings.
- 16. ASTM E1425 Standard Practice for Determining the Acoustical Performance of Windows, Doors, Skylight, and Glazed Wall Systems.
- 17. ASTM E1886 Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.
- 18. ASTM E1996 Standard Specification for Performance of Exterior Windows, Curtain Walls, Doors, and Impact Protective Systems Impacted by Windborne Debris in Hurricanes.
- 19. ASTM E2190 Standard Specification for Insulating Glass Unit Performance and Evaluation.
- D. Glass Association of North America:
  - 1. GANA Sealant Manual.
  - 2. GANA Glazing Manual.
  - 3. GANA Laminated Glazing Reference Manual.
- E. National Fenestration Rating Council:
  - 1. ANSI/NFRC 100 Procedure for Determining Fenestration Product U-factors.
  - 2. ANSI/NFRC 200 Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.
  - 3. NFRC 300 Test Method for Determining the Solar Optical Properties of Glazing Materials and Systems.
- F. NFPA:
  - 1. NFPA 80 Standard for Fire Doors and Other Opening Protectives.
  - 2. NFPA 252 Standard Methods of Fire Tests of Door Assemblies.
  - 3. NFPA 257 Standard on Fire Test for Window and Glass Block Assemblies.
- G. UL:
  - 1. UL Building Materials Directory.
  - 2. UL 10C Standard for Positive Pressure Fire Tests of Door Assemblies.

# 1.3 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Submittal procedures.
- B. Product Data:
  - 1. Glass: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.
  - 2. Glazing Sealants, Compounds and Accessories: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors where exposed.
- C. Samples:
  - 1. Glass: Submit two samples illustrating each glass unit & coloration.
  - 2. Glazing Materials: Submit 6 inch long bead of glazing sealant & gaskets proposed for use.
- D. Certificates: Certify products meet or exceed specified requirements.

## 1.4 QUALIFICATIONS

A. Installer: Company specializing in performing Work of this section with minimum five years documented experience.

## 1.5 SEQUENCING

- A. Section 011000 Summary: Requirements for sequencing.
- B. Sequence activities in phases; refer to Article 1.4 TIMES OF COMPLETION AND LIQUIDATED DAMAGES for a detailed description of phasing requirements.

## 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 Product Requirements.
- B. Do not install glazing when ambient temperature is less than 50 degrees F.
- C. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

## 1.7 WARRANTY

- A. Section 017000 Execution Requirements: Product warranties and product bonds.
- B. Furnish ten-year warranty to include coverage for sealed glass units from seal failure, interpane dusting or misting, and replacement of same.
- C. Furnish ten-year warranty to include coverage for delamination of laminated glass and replacement of same.

# PART 2 - PRODUCTS

#### 2.1 PERFORMANCE REQUIREMENTS

- A. Provide glass and glazing materials for continuity of building enclosure vapor retarder and air barrier:
  - 1. In conjunction with materials described in Section 079000.
  - 2. To utilize inner pane of multiple pane sealed units for continuity of air barrier and vapor retarder seal.
  - 3. To maintain continuous air barrier and vapor retarder throughout glazed assembly from glass pane to heel bead of glazing sealant.
- B. Size glass to withstand dead loads and positive and negative live loads acting normal to plane of glass as calculated in accordance with Kentucky Building Code and as measured in accordance with ASTM E330.
- C. Limit glass deflection to 1/200 or flexure limit of glass with full recovery of glazing materials, whichever is less.

# 2.2 FLOAT GLASS MATERIALS

- A. Heat Strengthened Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind HS heat strengthened, Condition A uncoated, float glass.
- B. Tempered Glass: ASTM C1048, Type 1 transparent flat, Quality Q3, Kind FT fully tempered, Condition A uncoated, float glass with horizontal tempering.
  - 1. Furnish tempered glass where heat strengthened glass cannot meet specified performance requirements.
  - 2. Furnish tempered glass conforming to CPSC 16 CFR 1201 at locations where safety glass is required by Kentucky Building code.

# 2.3 FLOAT GLASS PRODUCTS

- A. Float Glass Manufacturers:
  - 1. PPG Industries
  - 2. ACH Glass Operations
  - 3. AFG Industries, Inc.
  - 4. Guardian Industries Corp.
  - 5. AGC G;ass Company
  - 6. Pilkington North America, Inc.
  - 7. Oldcastle Glass
  - 8. Substitutions: See Instructions to Bidders paragraph 3.g.
- B. Clear Glass: Heat strengthened, and Tempered float glass as specified; Class 1 clear.
  - 1. Clear heat strengthened glass.
  - 2. Clear tempered glass.
  - 3. Minimum Thickness: 1/4 inch

# 2.4 INSULATING GLASS PRODUCTS

- A. Insulating Glass Manufacturers:
  - 1. PPG Industries: basis of design.
  - 2. AFG Industries, Inc.
  - 3. AGC Glass Company
  - 4. OldCastle Glass
  - 5. Arch Aluminum and Glass
  - 6. Guardian Industries Corp.
  - 7. Viracon Model
  - 8. Substitutions: Section 01 60 00 Product Requirements.
- B. Insulating Glass: ASTM E2190 certified by Insulating Glass Certification Council and Insulating Glass Manufacturers Alliance; with silicone sealant edge seal; place reflective film within unit; purge interpane space with dry hermetic air.
  - 1. Total Unit Thickness: 1 inch
  - 2. Insulating Glass Unit Edge Seal Construction: thermally broken, mitered and spigoted corners.
  - 3. Insulating Glass Unit Edge Seal Material: black color.
- C. Double Pane Low E Insulating Clear Glass:
  - 1. Total Unit Thickness: 1 inch
  - 2. Product: PPG Solarban 60
  - 3. Coating on Surface #2

- 4. U-Factor Winter: .29 maximum.
- 5. U-Factor Summer: .27 maximum.
- 6. Solar Heat Gain Coefficient: .38 maximum.
- 7. UV Transmittance: 35% maximum.
- 8. Visible Light Transmittance: 70% minimum.
- 9. Solar Transmittance: 44% maximum.
- D. Insulated (IG) Spandrel Coated Glass (Type FG-SC), ASTM C1048 Kind HS heat strengthened, Condition C other coated glass.
  - 1. Total Unit Thickness: 1 inch
  - 2. Coat back of No. 2 surface.
  - 3. Single color as selected by Architect.

## 2.5 GLAZING SEALANTS

- A. Elastomeric Glazing Sealants: Materials compatible with adjacent materials including glass, insulating glass seals, and glazing channels.
  - 1. Silicone Glazing Sealant: ASTM C920, Type S, Grade NS, Class and Use suitable for glazing application indicated; single component; chemical curing; capable of water immersion without loss of properties; non-bleeding, non-staining, cured Shore A hardness of 15 to 25.
    - a. Structural Silicone: Furnish high-modulus structural silicone glazing materials where sealant bonds glass to substrate.
- B. Dense Gaskets: Resilient extruded shape to suit glazing channel retaining slot; black color.
  - 1. Neoprene: ASTM C864.
  - 2. EPDM: ASTM C864.
  - 3. Silicone: ASTM C1115.
- C. Soft Gaskets: ASTM C509; resilient extruded shape to suit glazing channel retaining slot; black color.
  - 1. Neoprene.
  - 2. EPDM.
  - 3. Silicone.
- D. Pre-Formed Glazing Tape: Size to suit application.
  - 1. Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
    - a. Butyl Corner Sealant: ASTM C920 single component non-skinning butyl compatible with glazing tape; black color.

## 2.6 GLAZING ACCESSORIES

- A. Setting Blocks: Elastomeric material recommended by glass manufacturer, 80 to 90 Shore A durometer hardness, length of 0.1 inch for each square foot of glazing or minimum 4 inch x width of glazing rabbet space minus 1/16 inch x height to suit glazing method and pane weight and area.
- B. Spacer Shims: Elastomeric material recommended by glass manufacturer, 50 to 60 Shore A durometer hardness, minimum 3 inch long x one half the height of glazing stop x thickness to suit application.
## PART 3 - EXECUTION

#### 3.1 EXAMINATION

- A. Section 017000 Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that openings for glazing are correctly sized and within acceptable tolerances.
- C. Verify that surfaces of glazing channels or recesses are clean, free of obstructions possibly impeding moisture movement, weeps are clear, and that surfaces are ready to receive glazing.

#### 3.2 PREPARATION

- A. Section 017000 Execution and Closeout Requirements: Requirements for installation preparation.
- B. Clean contact surfaces with solvent and wipe dry.
- C. Seal porous glazing channels or recesses with primer or sealer compatible with substrate.
- D. Prime surfaces scheduled to receive sealant.

#### 3.3 INSTALLATION

- A. Perform installation in accordance with GANA Glazing Manual.
  1. Glazing Sealants: Comply with ASTM C1193.
- B. Exterior Wet/Dry Method (Preformed Tape and Sealant) Installation:
  - 1. Cut glazing tape to length and set against permanent stops, 3/16 inch below sight line. Seal corners by butting tape and dabbing with compatible butyl sealant.
  - 2. Apply heel bead of butyl sealant along intersection of permanent stop with frame ensuring full perimeter seal between glass and frame to complete continuity of air and vapor seal.
  - 3. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
  - 4. Rest glazing on setting blocks and push against tape and heel bead of sealant with sufficient pressure to attain full contact at perimeter of pane or glass unit.
  - 5. Install removable stops, with spacer strips inserted between glazing and applied stops, 1/4 inch below sight line.
  - 6. Fill gap between glazing and stop with elastomeric glazing sealant to depth equal to bite of frame on glazing, but not more than 3/8 inch below sight line.
  - 7. Apply cap bead of elastomeric glazing sealant along void between stop and glazing, to uniform line, flush with sight line. Tool or wipe sealant surface smooth.
- C. Exterior Wet Method (Sealant and Sealant) Installation:
  - 1. Place setting blocks at 1/4 points and install glazing pane or unit.
  - 2. Install removable stops with glazing centered in space by inserting spacer shims both sides at 24 inches intervals, 1/4 inch below sight line.
  - 3. Fill gaps between glazing and stops with elastomeric glazing sealant to depth of bite on glazing, but not more than 3/8 inch below sight line to ensure full contact with glazing and continue the air and vapor seal.
  - 4. Apply sealant to uniform line, flush with sight line. Tool or wipe sealant surface smooth.

- D. Interior Dry Method (Tape and Tape) Installation:
  - 1. Cut glazing tape to length and set against permanent stops, projecting 1/16 inch above sight line.
  - 2. Place setting blocks at 1/4 points with edge block no more than 6 inches from corners.
  - 3. Rest glazing on setting blocks and push against tape for full contact at perimeter of pane or unit.
  - 4. Place glazing tape on free perimeter of glazing in same manner described above.
  - 5. Install removable stop without displacement of tape. Exert pressure on tape for full continuous contact.
  - 6. Knife trim protruding tape.

# 3.4 CLEANING

- A. Section 01 70 00 Execution Requirements: Final cleaning.
- B. Remove glazing materials from finish surfaces.
- C. Remove labels after Work is complete.
- D. Clean glass and adjacent surfaces.

# 3.5 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 01 70 00 Execution Requirements: Protecting installed construction.
- B. After installation, mark pane with an 'X' by using removable plastic tape or paste.

# 3.6 SCHEDULE

- A. The following schedule is a list of principal items only. Refer to the drawings for a detailed description of glazing requirements.
  - 1. Exterior doors/windows: 1" clear insulated Low E FACTORY GLAZED, tempered as required by Code.
  - 2. Interior doors/frames: <sup>1</sup>/<sub>4</sub>" clear float glass **FACTORY GLAZED**, tempered as required by Code.
  - 3. Window Type W-1: In addition to 1" clear insulated Low E glazing described above, provide 1" insulated Spandrel Glass units, as shown on Sheet A3.1.
  - 4. Window Type W-2: Provide 1/2" tempered glass in new steel framed transaction window in Vestibule 100, as shown on Sheet A3.1, with cut-outs as shown on Drawings.

# SECTION 092116 - GYPSUM BOARD ASSEMBLIES

### PART 1 - GENERAL

### 1.1 SUMMARY

#### A. Section Includes:

- 1. Nonstructural metal stud wall framing.
- 2. Non-Fire-rated Gypsum board and finishing.
- 3. Acoustic insulation.
- B. Related Requirements:
  - 1. Section 061000 Carpentry: blocking
  - 2. Section 099000 Painting and Coating

#### 1.2 REFERENCE STANDARDS

- A. American Society of Civil Engineers:
  - 1. ASCE 7 Minimum Design Loads for Buildings and Other Structures.
- B. ASTM International:
  - 1. ASTM C475/C475M Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board.
  - 2. ASTM C514 Standard Specification for Nails for the Application of Gypsum Board.
  - 3. ASTM C557 Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing.
  - 4. ASTM C645 Standard Specification for Nonstructural Steel Framing Members.
  - 5. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  - 6. ASTM C754 Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products.
  - 7. ASTM C840 Standard Specification for Application and Finishing of Gypsum Board.
  - 8. ASTM C954 Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs from 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness.
  - ASTM C1002 Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs.
  - 10. ASTM C1178/C1178M Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel.
  - 11. ASTM C1280 Standard Specification for Application of Exterior Gypsum Panel Products for Use as Sheathing.
  - 12. ASTM C1288 Standard Specification for Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets.
  - 13. ASTM C1325 Standard Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units.
  - 14. ASTM C1396/C1396M Standard Specification for Gypsum Board.
  - 15. ASTM C1629/C1629M Standard Classification for Abuse-Resistant Nondecorated Interior Gypsum Panel Products and Fiber-Reinforced Cement Panels.

- 16. ASTM D3273 Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber.
- 17. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
- 18. ASTM E90 Standard Test Method for Laboratory Measurement of Airborne Sound Transmission Loss of Building Partitions and Elements.
- 19. ASTM E119 Standard Test Methods for Fire Tests of Building Construction and Materials.
- 20. ASTM F1667 Standard Specification for Driven Fasteners: Nails, Spikes, and Staples.
- C. Gypsum Association:
  - 1. GA-214 Recommended Levels of Gypsum Board Finish.
  - 2. GA-216 Application and Finishing of Gypsum Panel Products.
  - 3. GA-600 Fire Resistance Design Manual.
- D. National Fire Protection Association:
  - 1. NFPA 265 Standard Methods of Fire Tests for Evaluating Room Fire Growth Contribution of Textile or Expanded Vinyl Wall Coverings on Full Height Panels and Walls.
  - 2. NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth.
- E. Underwriters Laboratories Inc.:
  - 1. UL Fire Resistance Directory.
- 1.3 SUBMITTALS
  - A. Section 013300 Submittal Procedures: Requirements for submittals.
  - B. Product Data: Submit manufacturer's information on metal framing, gypsum board, finishing, and acoustic accessories.
- 1.4 QUALITY ASSURANCE
  - A. Perform Work according to ASTM C840, GA-214, GA-216.

## 1.5 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this Section with minimum three years' documented experience.
- B. Installer: Company specializing in performing Work of this Section with minimum three years' documented experience.
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A. Section 016000 Product Requirements: Requirements for transporting, handling, storing, and protecting products.

- B. Inspection: Accept materials on Site in manufacturer's original packaging and inspect for damage.
- C. Store materials according to manufacturer instructions.
- D. Protection:
  - 1. Protect materials from moisture and dust by storing in clean, dry location remote from construction operations areas.
  - 2. Provide additional protection according to manufacturer instructions.

#### 1.7 AMBIENT CONDITIONS

- A. Section 015000 Temporary Facilities and Controls: Requirements for ambient condition control facilities for product storage and installation.
- B. Maintain temperature at not less than 40 degrees F for the mechanical application of gypsum board unless otherwise recommended by manufacturer.
- C. Maintain temperature at not less than 50 degrees F for the adhesive application of gypsum board, and for field finishing and texturing, unless otherwise recommended by manufacturer.
- D. Maintain not less than 90 footcandles of light in all areas during finishing of gypsum wallboard.

# PART 2 - PRODUCTS

#### 2.1 GYPSUM BOARD ASSEMBLIES

- A. Manufacturers:
  - 1. National Gypsum Co.
  - 2. United States Gypsum Co.
  - 3. Georgia Pacific Building Products
  - 4. Substitutions: Section 016000 Product Requirements

# 2.2 COMPONENTS – GYPSUM BOARD ASSEMBLIES

- A. Framing Materials:
  - 1. Studs and Tracks: 4", ASTM C645; GA-216; galvanized sheet steel, minimum 20 gage inch thick, C shape.
  - 2. Furring, Framing, and Accessories: Of same material as studs and tracks. Dimension and configuration to fit purpose as indicated on the Drawings.
  - 3. Fasteners: size and type recommended by manufacturer and suited to specific application.
  - 4. Anchorage to Substrate: Tie wire, screws, and other metal supports, of type and size to suit application; to rigidly secure materials in place.
  - 5. Adhesive: ASTM C557.
- B. Gypsum Board Materials: ASTM C1396/C.
  - 1. Abuse Resistant Gypsum Board. 5/8 inch thick x maximum sheet size available. Product shall contain additives designed to enhance surface indentation resistance and impact resistance of the core and shall be surfaced with abrasion-resistant paper on the front

and long edges with heavy liner paper bonded to the back side. Hi-Abuse Brand (Fire-Shield) as manufactured by National Gypsum Company or equal.

## 2.3 ACCESSORIES

- A. Acoustic Insulation: ASTM C665; preformed glass fiber, friction fit type, unfaced, 3 1/2 inch thick.
- B. Acoustic Sealant: Non-hardening, non-skinning, for use in conjunction with gypsum board.
- C. Corner Beads: Metal.
- D. Edge Trim: GA-216; Type L bead. All edges shall receive gypsum compound and rubbed out for smooth appearance. Use of exposed plastic trim is not allowed at any location, or under any condition.
- E. Joint Materials: ASTM C475; GA-216; reinforcing tape, joint compound, adhesive, and water.
- F. Textured Finish Materials Latex-based texturing material containing fine aggregate.
- G. Fasteners: ASTM C1002, Type S12.

# PART 3 - EXECUTION

## 3.1 EXAMINATION

- A. Section 017000 Execution and Closeout Requirements: Requirements for installation examination.
- B. Verify that Site conditions are ready to receive Work of this Section.
- C. Verify that opening dimensions are as indicated on Shop Drawings or as instructed by manufacturer.

## 3.2 DEMOLITION

- A. Extend existing gypsum board installations using materials and methods as specified.
- B. Repair and remodel existing gypsum board assemblies that remain or are to be altered.

## 3.3 INSTALLATION

- A. Metal Stud Installation:
  - 1. Install studs in accordance with ASTM C754, GA-216 and GA-600.
  - 2. Metal Stud Spacing: 16 inches on center.
  - 3. Extend stud framing through ceiling to structure above. Maintain clearance under structural building members to avoid deflection transfer to studs. Provide extended leg ceiling runners.

- 4. Door Opening Framing: Install double studs at door frame jambs. Install stud tracks on each side of opening, at frame head height, and between studs and adjacent studs.
- 5. Blocking: Bolt or screw steel channels to studs. Install blocking for support of plumbing fixtures, toilet partitions, wall cabinets, wood frame opening, toilet accessories, hardware, and at all locations where wall mounted fixtures, equipment, or accessories are specified. Coordinate with other trades as necessary.
- B. Acoustic Accessories Installation:
  - 1. Place acoustic insulation in partitions tight within spaces, around cut openings, behind and around electrical and mechanical items within or behind partitions, and tight to items passing through partitions.
  - 2. Install full height of wall framing floor to roof structure above.
  - 3. Install acoustic sealant at gypsum board perimeter at:
    - a. Metal Framing: One bead.
    - b. Face Layer.
    - c. Seal penetrations of partitions by conduit, pipe, duct work, rough-in boxes, and all other items.
- C. Gypsum Board Installation:
  - 1. Install gypsum board in accordance with GA-216 and GA-600.
  - 2. Provide full coverage of gypsum board on framing from floor to roof structure above.
  - 3. Erect single layer board in most economical direction with ends and edges occurring over firm bearing.
  - 4. Erect single layer fire rated gypsum board vertically, with edges and ends occurring over firm bearing.
  - 5. Use screws when fastening gypsum board to metal furring or framing.
  - 6. Place control joints consistent with lines of building spaces in accordance with manufacturer's recommendations. Consult Architect at any area in question.
  - 7. Place corner beads at external corners. Use longest practical length. Place edge trim where gypsum board abuts dissimilar materials, or where wallboard reveal is detailed.
- D. Joint Treatment:
  - 1. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
  - 2. Feather coats on to adjoining surfaces so that camber is maximum 1/32 inch.
  - 3. Finish gypsum board to 4" above ceiling height. Area above this height is to be unfinished.

## 3.4 ERECTION TOLERANCES

- A. Section 014000 Quality Requirements: Tolerances.
- B. Maximum Variation of Finished Gypsum Board Surface from Flat Surface: 1/8 inch in 10 feet.

## 3.5 SCHEDULES

- A. Gypsum wallboard partition walls as shown on the drawings. Finishes in accordance with GA-214 Level:
  - 1. Level 1: Above finished ceilings concealed from view.
  - 2. Level 5: Walls and soffits exposed to view.
- B. Provide acoustic batt insulation in all wall assemblies shown on the drawings.

C. Refer to the Contract Drawings for type, quantity and location of Gypsum Board Assembly requirements.

SECTION 093000 - TILE

# PART 1 GENERAL

- 1.1 SUMMARY
  - A. Section includes porcelain tile for wall and floor applications using thin-set application method; porcelain tile wall base, and marble threshold.
  - B. Related Sections:
    - 1. Section 04 20 00 Unit Masonry
    - 2. Section 07 90 00 Joint Sealers.
    - 3. Division 26 Plumbing Fixtures

#### 1.2 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI A108.1 Installation of Ceramic Tile, A collection.
  - 2. ANSI A108.10 Specifications for Installation of Grout in Tilework.
  - 3. ANSI A108.1A Specifications for Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar.
  - 4. ANSI A108.1B Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
  - 5. ANSI A108.1C Specifications for Contractors Option: Installation of Ceramic Tile in the Wet-Set Method with Portland Cement Mortar -or- Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex Portland Cement Mortar.
  - 6. ANSI A108.4 Specifications for Ceramic Tile Installed with Organic Adhesives or Water-Cleanable Tile Setting Epoxy Adhesive.
  - 7. ANSI A108.5 Specifications for Ceramic Tile Installed with Dry-Set Portland Cement Mortar or Latex-Portland Cement Mortar.
  - 8. ANSI A108.6 Specifications for Ceramic Tile Installed with Chemical-Resistant, Water-Cleanable Tile-Setting and -Grouting Epoxy.
  - 9. ANSI A108.7 Specifications for Electrically Conductive Ceramic Tile Installed with Conductive Dry-Set Portland Cement Mortar.
  - 10. ANSI A108.8 Specifications for Ceramic Tile Installed with Chemical-Resistant Furan Mortar and Grout.
  - 11. ANSI A108.9 Specifications for Ceramic Tile Installed with Modified Epoxy Emulsion Mortar/Grout.
  - 12. ANSI A118.1 Standard Specification for Dry-Set Portland Cement Mortar.
  - 13. ANSI A118.3 Chemical-Resistant, Water-Cleanable, Tile-Setting and -Grouting Epoxy and Water-Cleanable Tile-Setting Epoxy Adhesive.
  - 14. ANSI A118.4 Latex-Portland Cement Mortar.
  - 15. ANSI A118.5 Chemical-Resistant Furan Mortar and Grout.
  - 16. ANSI A118.6 Ceramic Tile Grouts.
  - 17. ANSI A118.8 Modified Epoxy Emulsion Mortar/Grout.
  - 18. ANSI A118.9 Test Methods and Specifications for Cementitious Backer Units.
  - 19. ANSI A136.1 Organic Adhesives for Installation of Ceramic Tile.
  - 20. ANSI A137.1 Ceramic Tile.
- B. American Society for Testing and Materials:
  - 1. ASTM C847 Standard Specification for Metal Lath.

### C. Tile Council of America:

1. TCA - Handbook for Ceramic Tile Installation.

# 1.3 SUBMITTALS

- A. Section 01 33 00 Submittal Procedures: Submittal procedures.
- B. Product Data: Submit instructions for using grouts and adhesives.
- C. Samples: Provide color samples of tile, marble thresholds and grout for selection.

#### 1.4 CLOSEOUT SUBMITTALS

- A. Section 01 70 00 Execution and Closeout Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit recommended cleaning methods, cleaning materials, stain removal methods, and polishes and waxes.

#### 1.5 QUALITY ASSURANCE

A. Perform Work in accordance with TCA Handbook and ANSI A108 Series/A118 Series.

#### 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum ten years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.

#### 1.7 PRE-INSTALLATION MEETINGS

- A. Section 01 30 00 Administrative Requirements: Pre-installation meeting.
- B. Convene minimum one week prior to commencing work of this section.

#### 1.8 DELIVERY, STORAGE, AND HANDLING

- A. Section 01 60 00 Product Requirements: Product storage and handling requirements.
- B. Protect adhesives and grouts from freezing or overheating.

## 1.9 ENVIRONMENTAL REQUIREMENTS

- A. Section 01 60 00 Product Requirements.
- B. Do not install adhesives and grouts in unventilated environment.
- C. Maintain ambient and substrate temperature of 50 degrees F during installation of mortar materials.

# 1.10 EXTRA MATERIALS

- A. Section 01 70 0 Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Furnish one full carton of each type, size and color used, and 12 pieces of each special shape and color used.

#### PART 2 PRODUCTS

- 2.1 TILE
  - A. Manufacturers:
    - 1. Dal-Tile International, Mosaic ColorBody Porcelain
    - 2. American Olean Tile Co.
    - 3. Summitville
    - 4. Substitutions: Section 01600 Product Requirements.
- B. RESTROOM FLOOR TILE [one color, no pattern] Moisture Absorption: 0 to 0.5 percent. Coefficient of Friction: Wet: ≤ 0.60, Dry: ≤ 0.70 Size: 2 x 2 x ¼" Shape: Square Surface Finish: Unglazed, non-abrasive. Material: Ceramic Porcelain Mosaics. Color: As selected by Architect, price Group 2.
- C. RESTROOM BASE: [6" High, one color, no pattern] Moisture Absorption: 0 to 0.5 percent. Size: 2 x 2 x ¼" Shape: Square Surface Finish: Unglazed, non-abrasive. Material: Ceramic Porcelain Mosaics. Top Edge: Bullnosed Internal Corner: Coved External Corner: Bullnosed Color: As selected by Architect from Price Group 2.
- E. WALL TILE BEHIND WATER FOUNTAIN: [Full height floor to above ceiling, striped pattern] Moisture Absorption: 0 to 0.5 percent. Size: 2 x 2 x ¼" Shape: Square Surface Finish: Unglazed, non-abrasive. Material: Ceramic Porcelain Mosaics. Any exposed edges: Bull nosed Pattern: Refer to Elevation E/A4.1. Colors: From Price Groups 2-5. Color A: Price Group 2 Color B: Price Group 5 Color C: Price Group 4 Color D: Price Group 4 Wall Base: to match color, pattern and type of adjacent wall tiles.

### 2.2 ACCESSORIES

- A. Adhesive Materials:
  - 1. Epoxy Adhesive: ANSI A118.3, thin-set bond type.
- B. Mortar Materials:
  - 1. Mortar Bond Coat Materials:
    - a. Epoxy: ANSI A118.3.
- C. Thresholds: marble-type, standard color most similar to tile color, honed finish 4" x <sup>3</sup>/<sub>4</sub>" size by full width of wall or frame opening. Heights to meet ADA requirements. Transitions between porcelain floor tile in restrooms and VCT in corridor.
- D. Grout Materials:
  - 1. Epoxy Grout: ANSI A118.8, modified epoxy emulsion grout, color as selected by Architect. Single color for all areas of tile.

## PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Section 01 30 00 Administrative Requirements: Coordination and project conditions.
- B. Verify surfaces are ready to receive work.

### 3.2 PREPARATION

- A. Protect surrounding work from damage.
- B. Vacuum clean surfaces and damp clean.
- C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

# 3.3 INSTALLATION

- A. Install tile, base and grout in accordance with applicable requirements of ANSI A108.1 through A108.10, and TCA Handbook recommendations.
- B. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor and base joints.
- C. Place tile with joints uniform in width, subject to variance in tolerance allowed in tile size. Make joints watertight, without voids, cracks, excess mortar, or excess grout.
- D. Provide special internal and exterior corners pieces for base and wall tiles.
- E. Sound tile after setting. Replace hollow sounding units.
- F. Keep expansion joints free of adhesive or grout. Apply sealant to joints.
- G. Allow tile to set for a minimum of 48 hours prior to grouting.

- H. Grout tile joints.
- I. Apply sealant to junction of tile and dissimilar materials and junction of dissimilar planes.
- J. Installation Floors Thin-Set Methods:
  - 1. Over new interior concrete substrates:
    - a. Where epoxy bond coat and grout are indicated, install in accordance with TCA Handbook Method F131-05.

# 3.4 CLEANING

- A. Section 01 70 00 Execution and Closeout Requirements: Final cleaning.
- B. Clean tile and grout surfaces.
- 3.5 PROTECTION OF INSTALLED CONSTRUCTION
  - A. Section 01 70 00 Execution Requirements: Protecting installed construction.
  - B. Do not permit traffic over finished floor surface for 4 days after installation.

# 3.6 SCHEDULES

- A. Refer to Room Finish Schedule on Sheet A3.1.
- B. Refer to Restroom Plans and Elevations on Sheets A4.1 and A4.2.

# SECTION 095113 - ACOUSTICAL PANEL CEILINGS

### PART 1 GENERAL

- 1.1 SUMMARY
  - A. Section includes acoustic panels, perimeter trim, and suspension system.
  - B. Related Sections:
    - 1. Section 092116 Gypsum Board Assemblies: soffit
    - 2. Division 23 Mechanical: Sprinkler heads, diffusers and grille devices installed in ceiling system.
    - 3. Division 27 Electrical: Lighting Fixtures, Sound system devices, Security system devices and Fire alarm components in ceiling system.

#### 1.2 REFERENCES

- A. American Society for Testing and Materials:
  - ASTM C635 Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
  - 2. ASTM C636 Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels.
  - 3. ASTM C665 Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing.
  - 4. ASTM E580 Standard Practice for Application of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Requiring Seismic Restraint.
  - 5. ASTM E1264 Standard Classification for Acoustical Ceiling Products.
- B. Ceilings and Interior Systems Construction Association:
  - 1. CISCA Acoustical Ceilings: Use and Practice.
- C. Underwriters Laboratories Inc.:
  - 1. UL Fire Resistance Directory.
- D. Warnock Hersey:
  - 1. WH Certification Listings.

# 1.3 PERFORMANCE REQUIREMENTS

- A. Installed System: Conform to Kentucky Building Code for installation performance requirements for the suspended metal grid system.
- B. Suspension System: Rigidly secure acoustic ceiling system including integral mechanical and electrical components with maximum deflection of 1:360.

### 1.4 SUBMITTALS

- A. Section 013300 Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Submit attachment details and spacing showing calculations on compliance with Kentucky Building Code requirements for seismic design performance.

Submit shop drawings on metal grid system showing panel sizes, configuration and all edge conditions.

- C. Product Data: Submit data on metal grid system components, and acoustic units.
- D. Samples: Submit two samples illustrating material and finish of acoustic units and perforated metal panels.
- E. Samples: Submit two samples each, of suspension system main runner, cross runner, and perimeter molding.
- F. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.

#### 1.5 QUALITY ASSURANCE

A. Conform to CISCA requirements.

#### 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum three years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum three five years documented experience.
- C. Provide seismic design of suspended ceiling under direct supervision of Professional Engineer experienced in design of this Work and licensed in the State of Kentucky.

### 1.7 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 Product Requirements.
- B. Maintain uniform temperature of minimum 60 degrees F, and maximum humidity of 40 percent prior to, during, and after acoustic unit installation.
- C. Maintain not less than 90 footcandles of light in all areas during installation of ceiling tile.

#### 1.8 SEQUENCING

- A. Section 011000 Summary: Work sequence.
- B. Sequence Work to ensure acoustic ceilings are not installed until building is enclosed, sufficient heat is provided, dust generating activities have terminated, and overhead work is completed, tested, and approved.
- C. Install acoustic units after interior wet work is dry.

### 1.9 EXTRA MATERIALS

A. Section 017000 - Execution Requirements: Spare parts and maintenance products.

B. Furnish two unopened cartons of extra tile to the Owner upon completion of the work.

## PART 2 PRODUCTS

# 2.1 SUSPENDED ACOUSTICAL CEILINGS

- A. Manufacturers:
  - 1. USG Interiors. DX suspension system with Radar High-NRC, #22121.
  - 2. Armstrong World Industries: Equal to USG basis of design product
  - 3. Substitutions: Section 016000 Product Requirements

## 2.2 COMPONENTS

- A. Acoustic Tile: ASTM E1264, conforming to the following:
  - 1. Size: 24 x 24 inches.
  - 2. Thickness: 3/4 inches.
  - 3. Edge: Shadow-Line Bevel (SLT)
  - 4. Composition: Mineral
  - 5. Light Reflectance: 84 percent.
  - 6. NRC Range: .70
  - 7. CAC min.: 35
  - 8. Surface Color: White.
  - 9. Surface Finish: Non-directional lightly textured
  - 10. Anti-Mold & Mildew/Sag Resistant.
  - 11. Recycled Content:  $\geq$  57%
- B. Grid:
  - 1. Non-fire Rated Grid: ASTM C635, exposed T; components die cut and interlocking.
  - 2. Grid Materials: Commercial quality cold rolled steel with hot dipped galvanized coating.
  - 3. Exposed Grid Surface Width: 15/16 inch.
  - 4. Grid Finish: White color
  - 5. Accessories: Stabilizer bars, clips, splices, and perimeter moldings as required for suspended grid system.
  - 6. Support Channels and Hangers: Galvanized steel; size and type to suit application, seismic requirements, and ceiling system flatness requirement specified.

## 2.3 ACCESSORIES

A. Touch-up Paint: Type and color to match acoustic and grid units.

# PART 3 EXECUTION

- 3.1 EXAMINATION
  - A. Section 013000 Administrative Requirements: Coordination and project conditions.
  - B. Verify layout of hangers will not interfere with other work.

# 3.2 INSTALLATION

- A. Lay-In Grid Suspension System:
  - 1. Install suspension system in accordance with ASTM C636 and as supplemented in this section.
  - 2. Install system in accordance with ASTM E580.
  - 3. Install system capable of supporting imposed loads to deflection of 1/360 maximum.
  - 4. Locate system on room axis according to reflected plan. Do not allow "layering" of multiple pieces of spline to occur at walls to accommodate rooms that are out of square. Layout room to ensure tile dimension is never less than 4" in any direction. Consult Architect in areas of question or unusual difficulty.
  - 5. Install after major above ceiling work is complete. Coordinate location of hangers with other work.
  - 6. Install hanger clips during steel deck erection. Install additional hangers and inserts as required.
  - 7. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.
  - 8. Where ducts or other equipment prevent regular spacing of hangers, reinforce nearest affected hangers and related carrying channels to span extra distance.
  - 9. Do not support components on main runners or cross runners when weight causes total dead load to exceed deflection capability. Support fixture loads by supplementary hangers located within 6 inches of each corner; or support components independently.
  - 10. Do not eccentrically load system, or produce rotation of runners.
  - 11. Perimeter Molding:
    - a. Install edge molding at intersection of ceiling and vertical surfaces.
    - b. Use longest practical lengths.
    - c. Overlap corners.
    - d. Install at junctions with other interruptions.
  - 12. Form expansion joints. Form to accommodate plus or minus 1-inch movement. Maintain visual closure.
- B. Acoustic Units:
  - 1. Fit acoustic units in place, free from damaged edges or other defects detrimental to appearance and function.
  - 2. Lay directional patterned units one way with pattern parallel to shortest room axis. Fit border trim neatly against abutting surfaces.
  - 3. Install units after above ceiling work is complete.
  - 4. Install acoustic units level, in uniform plane, and free from twist, warp, and dents.
  - 5. Cutting Acoustic Units:
    - a. Cut to fit irregular grid and perimeter edge trim.
      - b. Cut square reveal edges to field cut units.
      - c. Double cut and field paint exposed edges of tegular units.
  - 6. Where bullnose concrete block corners occur, install preformed closures to match perimeter molding.

## 3.3 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances.

- B. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet.
- C. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

# 3.4 CLEANING

A. Clean all ceiling systems upon completion to remove fingerprints, dirt, or any other blemish from all metal and acoustic surfaces. Inspect acoustic panels for damaged corners or other defect and replace with new panels.

## 3.5 SCHEDULE

A. Grid and Tile: All areas where suspended ceilings are specified. Refer to Reflected Ceiling Plans, Sheets A2.1 and A2.2 and Room Finish Schedule, Sheet A3.1.

# SECTION 096500 - RESILIENT FLOORING

### PART 1 GENERAL

- 1.1 SUMMARY
  - A. Section includes floor preparation to receive new flooring including skim coat and/or selfleveling cementitious underlayment concrete as required where new floor meets existing floor, or on all existing concrete slab subfloors where new VCT flooring is to be installed.
  - B. Section includes resilient VCT tile flooring; and resilient Vinyl base.
  - C. Stripping and application of 5 coats of wax for vinyl floor tile.

#### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM E84 Standard Test Method for Surface Burning Characteristics of Building Materials.
  - 2. ASTM E648 Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
  - 3. ASTM E662 Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
  - 4. ASTM F1066 Standard Specification for Vinyl Composition Floor Tile.
  - 5. ASTM F1303 Standard Specification for Sheet Vinyl Floor Covering with Backing.
  - 6. ASTM F1344 Standard Specification for Rubber Floor Tile.
  - 7. ASTM F1861 Standard Specification for Resilient Wall Base.
- B. Federal Specification Unit:
  - 1. FS L-F-475 Floor Covering Vinyl, Surface (Tile and Roll), with Backing.
  - 2. FS RR-T-650 Treads, Metallic and Nonmetallic, Skid Resistant.
- C. National Fire Protection Association:
  - 1. NFPA 253 Standard Method of Test for Critical Radiant Flux for Floor Covering Systems Using a Radiant Heat Energy Source.

## 1.3 PERFORMANCE REQUIREMENTS

- A. Conform to Kentucky Building Code for fire performance ratings as follows:
  - 1. Flooring, critical radiant flux (CRF): Minimum 0.22 watt per square centimeter, per ASTM E 648.
  - 2. Flooring, smoke developed: Maximum 450 per ASTM E662.
  - 3. Wall base, flame spread: Maximum 75 per ASTM E84.
  - 4. Wall base, smoke developed: Maximum 450 per ASTM E84.

# 1.4 SUBMITTALS

- A. Section 013300 Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data describing physical and performance characteristics; including sizes, patterns and colors available; and installation instructions.

- C. Samples:
  - 1. Submit manufacturer's complete set of color samples for initial selection.
  - 2. Submit two samples, 2x2 inch in size illustrating color and pattern for each resilient flooring product specified.
- D. Submit name of C.F.I. Certified Installer and the certification qualification number.

### 1.5 CLOSEOUT SUBMITTALS

- A. Section 017000 Execution Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

#### 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Installer: Company specializing in performing Work of this section with minimum five years documented experience.
- C. The installer must be C.F.I. certified (C-2 level or higher) 7 days prior to submittal of first pay request. <u>A certified person should be on the job at all times during installation procedures.</u>
- 1.7 ENVIRONMENTAL REQUIREMENTS
  - A. Section 016000 Product Requirements.
  - B. Maintain temperature in storage area between 55 degrees F and 90 degrees F.
  - C. Store materials for not less than 48 hours prior to installation in area of installation at temperature of 70 degrees F to achieve temperature stability. Thereafter, maintain conditions above 55 degrees F.

## 1.8 TESTING

- A. Installer of resilient flooring shall be responsible for confirming concrete substrates are suitable to receive new flooring and adhesives.
- B. Installer of resilient flooring shall perform calcium chloride testing AND relative humidity testing by means of coring the concrete slab prior to commencement of installation of resilient flooring.

### 1.9 EXTRA MATERIALS

- A. Section 017000 Execution Requirements: Spare parts and maintenance products.
- B. Furnish <u>**2 boxes</u>** of each floor tile type and color used and 20 ft. of wall base.</u>

# PART 2 PRODUCTS

# 2.1 TILE FLOORING

- A. Manufacturers, Vinyl Composition:
  - 1. Armstrong World Industries, Inc. Standard Excelon Imperial Texture. This is the basis of design and Owner's preferred product.
  - 2. Tarkett, Colorworks.
  - 3. Azrock Commercial Flooring, Cortina Colors.
  - 4. Substitutions: Section 016000 Product Requirements.
- B. Vinyl Composition Tile: ASTM F1066
  - 1. Size: 12 x 12 inch.
  - 2. Thickness: 0.125 inch.
  - 3. Pattern: Marbleized.
  - 4. Color: As selected by Architect from mfr. standards. Single color for all areas designated for new VCT.

### 2.3 RESILIENT BASE

- A. Manufacturers Vinyl Base:
  - 1. Flexco Vinyl Wall Base
  - 2. Johnsonite
  - 3. Roppe Corp.
  - 4. Substitutions: Section 016000 Product Requirements.
- B. Base: ASTM F1861 Vinyl top set; coved:
  - 1. Height: 4 inch.
  - 2. Thickness: 0.125 inch thick.
  - 3. Finish: Satin.
  - 4. Length: roll
  - 5. Color: As selected by Architect from mfr. standards. Single color for all areas designated for new base.

#### 2.4 ACCESSORIES

- A. Subfloor Filler: White premix latex type recommended by adhesive material manufacturer.
- B. Self-Leveling Underlayment Concrete: Cement based self-leveling underlayment system including primers, additives and accessories. System shall be Ardex K 15 or approved equal.
- C. Primers and Adhesives: Waterproof; types recommended by flooring manufacturer.
- D. Tile adhesive shall be low VOC, clear or white in color. Equivalent tile adhesives are Azrock Clear Thin Spread Adhesive, Tarkett equal or DRITAC 6200 Adhesive in halls and general education areas. In cafeterias, art rooms, science rooms and other areas exposed to water or temperature changes (refrigerators/freezers) the equivalent adhesive is Azrock Polyurethane Adhesive, Tarkett equal or DRITAC 6200 Adhesive.
- E. Sealer and Wax: Types recommended by flooring manufacturer and approved by Owner.

# PART 3 EXECUTION

#### 3.1 EXAMINATION

- A. Section 013100 Project Management and Coordination: Verification of existing conditions before starting Work.
- B. Verify concrete floors are dry to maximum moisture content of 7 percent, or less if required by flooring manufacturer, and exhibit negative alkalinity, carbonization, and dusting.
- C. Perform relative humidity testing at a rate of one core test/7,500 GSF. The relative humidity tests shall be performed IN ADDITION TO calcium chloride testing.
- D. Verify floor and lower wall surfaces are free of substances capable of impairing adhesion of new adhesive and finish materials.

### 3.2 PREPARATION

- A. Remove sub-floor ridges and bumps. Fill minor low spots, cracks, joints, holes, and other defects with sub-floor filler to achieve smooth, flat, hard surface.
   Bidders shall recognize this is a partial renovation project. Additional floor prep will be required where the new floor slab meets the existing floor slab, and where new VCT is installed on existing concrete slabs.
- B. Prohibit traffic until filler is cured.
- C. Vacuum clean flooring substrate immediately prior to beginning tile installation.
- D. Provide skim coat of manufacturer recommended filler/primer to prepare existing concrete substrates to receive specified flooring.
- E. Where floor leveling requirements exceed 1/8", use self-leveling cementitious underlayment. Install in conformance with manufacturer's written instructions.
- F. Pay particular attention to locations where there is a control or expansion joint in the existing concrete slab and transitions through doors. Grind, fill, and prepare areas as required to receive new resilient flooring.
- G. Verify C.F.I. certified installer is on site prior to, at commencement, and at all times during installation procedures.

## 3.3 INSTALLATION - TILE FLOORING

- A. Install in accordance with manufacturer's instructions.
- B. Mix tile from container to ensure shade variations are consistent when tile is placed.
- C. Spread only enough adhesive to permit installation of materials before initial set.
- D. Set flooring in place, press with heavy roller to attain full adhesion.

- E. Lay flooring with joints and seams parallel to building lines to produce symmetrical tile pattern, minimize number of seams, and to prevent width of any tile from being less than 3". Where conditions require 3" or less pieces of tile, cut the last two rows of tile into two equal width rows.
- F. **Install tile in single direction.** Allow minimum 1/2 full size tile width at room or area perimeter.
- G. Scribe flooring to walls, columns, cabinets, floor outlets, and other appurtenances to produce tight joints.
- H. Where floor finishes are different on opposite sides of door, terminate flooring under centerline of door.
- I. Install edge strips at unprotected or exposed edges, where flooring terminates, and where indicated.
- J. Install flooring in recessed floor access covers. Maintain floor pattern.

### 3.4 INSTALLATION – BASE

- A. <u>Application of vinyl cove base by single or multiple bead caulking guns shall not be</u> <u>allowed</u>. Application shall be made with notched full-spread trowels covering the entire surface within 1/16" of all edges. The amount of adhesive shall be determined by manufacturer's recommendations and surface texture. All excess adhesive shall be removed according to manufacturer's specifications.
- B. Trowel apply adhesive to back of base covering the entire surface within 1/16" of all edges. The amount of adhesive shall be determined by manufacturer's recommendation and substrate surface texture. All excess adhesive shall be removed according to mfr. specifications.
- C. Fit joints tightly and make vertical. Minimize to greatest degree possible all joints. Maintain minimum dimension of 18 inches between joints.
- D. Miter internal corners. At external corners, "v" cut back of base strip to 2/3 of it's thickness and fold.
- E. Install base on solid backing. Bond tightly to wall and floor surfaces.
- F. Scribe and fit to door frames and other interruptions.
- 3.5 CLEANING AND WAXING (applicable to VCT Flooring)
  - A. Section 017000 Execution Requirements: Final cleaning.
  - B. Remove excess adhesive from floor, base, and wall surfaces without damage.
  - C. Clean, seal, and WAX (5 coats) resilient flooring products in accordance with manufacturer's instructions. Coordinate with Owner's Maintenance Division so they can follow with an additional 2 coats of wax before occupancy is allowed. If coatings of this contract are damaged by construction dirt or traffic before the Owner has applied the

additional coats, the Contractor shall strip all wax start the process over again without additional cost to the Owner.

# 3.6 PROTECTION OF INSTALLED CONSTRUCTION

- A. Section 017000 Execution Requirements: Protecting installed construction.
- B. Prohibit traffic on resilient flooring for 72 hours after installation.
- C. Prohibit traffic on resilient flooring after clean/seal/wax process until Owner acceptance of floors.

# 3.7 SCHEDULE

- A. Prepare all floors, including those scheduled to receive finishes OTHER THAN resilient flooring for new finish floor. Patch, repair and level as necessary for new finish to be installed.
- B. Refer to Room Finish Schedule on Sheet A3.1.

# SECTION 099000 - PAINTING AND COATING

### PART 1 GENERAL

- 1.1 SUMMARY
  - A. Section includes surface preparation and field application of paints and other coatings.
  - B. Related Sections:
    - 1. Section 042000 Unit Masonry Assemblies.
    - 2. Section 055000 Metal Fabrications: Shop primed items.
    - 3. Section 081213 Standard Steel Frames
    - 4. Section 091314 Standard Steel Doors
    - 5. Section 092116 Gypsum Board Assemblies.
    - 6. Division 23 Mechanical Identification.
    - 7. Division 26 Electrical Identification.

## 1.2 REFERENCES

- A. American Society for Testing and Materials:
  - 1. ASTM D16 Standard Terminology Relating to Paint, Varnish, Lacquer, and Related Products.
  - 2. ASTM D4442 Standard Test Methods for Direct Moisture Content Measurement of Wood and Wood-Base Materials.
- B. Painting and Decorating Contractors of America:
  1. PDCA Architectural Painting Specification Manual.
- C. SSPC: The Society for Protective Coatings:
   1. SSPC Steel Structures Painting Manual.
- 1.3 DEFINITIONS
  - A. Conform to ASTM D16 for interpretation of terms used in this section.
- 1.4 SUBMITTALS
  - A. Section 013300 Submittal Procedures: Submittal procedures.
  - B. Product Data: Submit data on finishing products.
  - C. Samples: Submit one complete set of manufacturers paint deck for color selection.
  - D. Manufacturer's Installation Instructions: Submit special surface preparation procedures and substrate conditions requiring special attention.
- 1.5 CLOSEOUT SUBMITTALS
  - A. Section 017000 Execution and Closeout Requirements: Closeout procedures.

B. Operation and Maintenance Data: Submit data on cleaning, touch-up, and repair of painted and coated surfaces.

## 1.6 QUALIFICATIONS

- A. Manufacturer: Company specializing in manufacturing products specified in this section with minimum five years documented experience.
- B. Applicator: Company specializing in performing work of this section with minimum five years documented experience.

### 1.7 FIELD SERVICES

A. Bidders shall field verify existing conditions and test existing paint coatings to ensure compatibility of proposed new coatings prior to preparation of bid. Include all costs required to adjust specified coatings as appropriate for compatibility with existing conditions.

# 1.8 PRE-INSTALLATION MEETINGS

- A. Section 013000 Administrative Requirements: Pre-installation meeting.
- B. Convene minimum two weeks prior to commencing work of this section.

#### 1.9 DELIVERY, STORAGE, AND HANDLING

- A. Section 016000 Product Requirements: Product storage and handling requirements.
- B. Deliver products to site in sealed and labeled containers; inspect to verify acceptability.
- C. Container Label: Include manufacturer's name, type of paint, brand name, lot number, brand code, coverage, surface preparation, drying time, cleanup requirements, color designation, and instructions for mixing and reducing.
- D. Paint Materials: Store at minimum ambient temperature of 45 degrees F and maximum of 90 degrees F, in ventilated area, and as required by manufacturer's instructions.

#### 1.10 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 Product Requirements.
- B. Do not apply materials when surface and ambient temperatures are outside temperature ranges required by paint product manufacturer.
- C. Do not apply exterior coatings during rain or snow when relative humidity is outside humidity ranges, or moisture content of surfaces exceed those required by paint product manufacturer.
- D. Minimum Application Temperatures for Latex Paints: 45 degrees F for interiors; 50 degrees F for exterior; unless required otherwise by manufacturer's instructions.

- E. Minimum Application Temperature for Varnish Finishes: 65 degrees F for interior or exterior, unless required otherwise by manufacturer's instructions.
- F. Provide lighting level of 80 ft candle measured mid-height at substrate surface.

# 1.11 SEQUENCING

- A. Section 011000 Summary: Work sequence.
- B. Sequence application to the following:
  - 1. Do not apply finish coats until paintable sealant is applied.
  - 2. Back prime wood trim before installation of trim.

#### 1.12 WARRANTY

- A. Section 01 70 0 Execution and Closeout Requirements: Product warranties and product bonds.
- B. Furnish five year manufacturer warranty for paints and coatings.

## 1.13 EXTRA MATERIALS

- A. Section 017000 Execution and Closeout Requirements: Spare parts and maintenance products.
- B. Supply 1 full unopened gallon of each color, type, and surface texture; store where directed.
- C. Label each container with color, type, texture, room locations in addition to manufacturer's label.

#### 1.14 MOCKUP

- A. Section 014000 Quality Requirements: Mock-up requirements.
- B. Not required.

# PART 2 PRODUCTS

#### 2.1 MANUFACTURERS

- A. Porter Paints basis of spec unless otherwise specifically noted
- B. Sherwin Williams
- C. ICI
- D. Benjamin Moore
- E. Perspective-Coronado
- F. Substitutions: Section 016000 Product Requirements

# 2.3 MATERIALS

A. Coatings: Ready mixed, except field catalyzed coatings. Prepare pigments:

- 1. To a soft paste consistency, capable of being readily and uniformly dispersed to a homogeneous coating.
- 2. For good flow and brushing properties.
- 3. Capable of drying or curing free of streaks or sags.
- B. Accessory Materials: Linseed oil, shellac, turpentine, paint thinners and other materials not specifically indicated but required to achieve the finishes specified; commercial quality.
- C. Patching Materials: Latex filler.
- D. Fastener Head Cover Materials: Latex or Epoxy filler.

## 2.4 FINISHES

- A. Refer to schedule at end of section for surface finish.
- B. Refer to Room Finish Schedule, Sheet A3.1.

## PART 3 EXECUTION

- 3.1 EXAMINATION
  - A. Section 013000 Administrative Requirements: Coordination and project conditions.
  - B. Verify surfaces and substrate conditions are ready to receive Work as instructed by product manufacturer.
  - C. Examine surfaces scheduled to be finished prior to commencement of work. Report conditions capable of affecting proper application.
  - D. Test shop applied primer for compatibility with subsequent cover materials.
  - E. Measure moisture content of surfaces using electronic moisture meter. Do not apply finishes unless moisture content of surfaces are below the following maximums:
    - 1. Plaster and Gypsum Wallboard: 12 percent.
    - 2. Masonry, Concrete, and Concrete Unit Masonry: 12 percent.
    - 3. Interior Wood: 15 percent, measured in accordance with ASTM D4442.
    - 4. Exterior Wood: 15 percent, measured in accordance with ASTM D4442.
    - 5. Concrete Floors: 8 percent.

#### 3.2 PREPARATION

- A. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.
- B. Surfaces: Correct defects and clean surfaces capable of affecting work of this section. Remove or repair existing coatings exhibiting surface defects including shop applied primers and zinc coatings.
- C. Marks: Seal with shellac those which may bleed through surface finishes.

- D. Impervious Surfaces: Remove mildew by scrubbing with solution of tetra-sodium trisodium phosphate and bleach. Rinse with clean water and allow surface to dry.
- E. Aluminum Surfaces Scheduled for Paint Finish: Remove surface contamination by steam or high pressure water. Remove oxidation with acid etch and solvent washing. Apply etching primer immediately following cleaning.
- F. Asphalt, Creosote, or Bituminous Surfaces Scheduled for Paint Finish: Remove foreign particles to permit adhesion of finishing materials. Apply latex based compatible sealer or primer.
- G. Insulated Coverings: Remove dirt, grease, and oil from canvas and cotton.
- H. Concrete Floors: Remove contamination, acid etch, and rinse floors with clear water. Verify required acid-alkali balance is achieved. Allow to dry.
- I. Copper Surfaces Scheduled for Paint Finish: Remove contamination by steam, high pressure water, or solvent washing. Apply vinyl etch primer immediately following cleaning.
- J. Copper Surfaces Scheduled for Natural Oxidized Finish: Remove contamination by applying oxidizing solution of copper acetate and ammonium chloride in acetic acid. Rub on repeatedly for required effect. Once attained, rinse surfaces with clear water and allow to dry.
- K. Gypsum Board Surfaces: Fill minor defects with filler compound. Spot prime defects after repair.
- L. Galvanized Surfaces: Remove surface contamination and oils and wash with solvent. Apply coat of etching primer.
- M. Concrete and Unit Masonry Surfaces Scheduled to Receive Paint Finish: Remove dirt, loose mortar, scale, salt or alkali powder, and other foreign matter. Remove oil and grease with solution of tri-sodium phosphate; rinse well and allow to dry. Remove stains caused by weathering of corroding metals with solution of sodium metasilicate after thoroughly wetting with water. Allow to dry.
- N. Plaster Surfaces: Fill hairline cracks, small holes, and imperfections with latex patching plaster. Make smooth and flush with adjacent surfaces. Wash and neutralize high alkali surfaces.
- O. Uncoated Steel and Iron Surfaces: Remove grease, mill scale, weld splatter, dirt, and rust. Where heavy coatings of scale are evident, remove by power tool wire brushing or sandblasting; clean by washing with solvent. Apply treatment of phosphoric acid solution, ensuring weld joints, bolts, and nuts are similarly cleaned. Spot prime paint after repairs.
- P. Shop Primed Steel Surfaces: Sand and scrape to remove loose primer and rust. Feather edges to make touch-up patches inconspicuous. Clean surfaces with solvent. Prime bare steel surfaces. Prime metal items including shop primed items.

- Q. Interior Wood Items Scheduled to Receive Paint Finish: Wipe off dust and grit prior to priming. Seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after primer has dried; sand between coats.
- R. Interior Wood Items Scheduled to Receive Transparent Finish: Wipe off dust and grit prior to sealing, seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes and cracks after sealer has dried; sand lightly between coats.
- S. Exterior Wood Scheduled to Receive Paint Finish: Remove dust, grit, and foreign matter. Seal knots, pitch streaks, and sappy sections. Fill nail holes with tinted exterior paintable caulking compound after prime coat has been applied.
- T. Exterior Wood Scheduled to Receive Transparent Finish: Remove dust, grit, and foreign matter; seal knots, pitch streaks, and sappy sections with sealer. Fill nail holes with tinted exterior caulking compound after sealer has been applied.
- U. Metal Doors Scheduled for Painting: Prime metal door top and bottom edge surfaces.

# 3.3 APPLICATION

- A. Apply products in accordance with manufacturer's recommendations.
- B. Do not apply finishes to surfaces that are not dry. Allow applied coats to dry before next coat is applied.
- C. Apply each coat to uniform appearance (min one primer and 2 finish coats: 5-6 mils wet film finish each). Apply each coat of paint slightly darker than preceding coat unless specified otherwise 0% tint in primer, 50% tint in first Finish coat and 100% tint in second or subsequent Finish coats.
- D. Sand wood and metal surfaces lightly between coats to achieve required finish.
- E. Vacuum clean surfaces of loose particles. Use tack cloth to remove dust and particles just prior to applying next coat.
- F. Where clear finishes are required, tint fillers to match wood. Work fillers into grain before set. Wipe excess from surface.
- G. Prime concealed surfaces of interior and exterior woodwork with primer paint.
- H. Prime concealed surfaces of interior wood surfaces scheduled to receive stain or varnish finish with gloss varnish reduced 25 percent with thinner.
- I. Finishing Mechanical And Electrical Equipment:
  - 1. Refer to Division 20-23 and Division 26 for schedule of color coding and identification banding of equipment, duct work, piping, and conduit.
  - 2. Paint shop primed equipment.
  - 3. Remove unfinished louvers, grilles, covers, and access panels on mechanical and electrical components and paint separately.
  - 4. Prime and paint insulated and exposed pipes, conduit, boxes, insulated and exposed ducts, hangers, brackets, collars and supports, except where items are shop finished.

- 5. Paint interior surfaces of air ducts and convector and baseboard heating cabinets visible through grilles and louvers with one coat of flat black paint to visible surfaces. Paint dampers exposed behind louvers, grilles, and convector and baseboard cabinets to match face panels.
- 6. Paint exposed conduit and electrical equipment occurring in finished areas.
- 7. Paint both sides and edges of plywood backboards for electrical and telephone equipment before installing equipment.
- 8. Color code equipment, piping, conduit, and exposed duct work in accordance with engineer's instructions. Color band and identify with flow arrows, names, and numbering.
- 9. Reinstall electrical cover plates, hardware, light fixture trim, escutcheons, and fittings removed prior to finishing.
- 3.4 FIELD QUALITY CONTROL
  - A. Section 014000 Quality Requirements: Testing and Inspection Services.
  - B. Inspect and test questionable coated areas in accordance with manufacturer's recommended method for determining thickness of applied coating.

# 3.5 CLEANING

- A. Section 017000 Execution Requirements: Final cleaning.
- B. Collect waste material which may constitute fire hazard, place in closed metal containers, and remove daily from site.

# 3.7 SCHEDULE – <u>EXTERIOR SURFACES</u>

- A. Steel:
  - 1. One coat primer (on existing or unprimed steel) Speedhide Rust Inhibitive Steel primer PPG 6-208
  - Two coats of acrylic PITT-TECH Plus Int/Ext Semi-Gloss DTM Industrial Enamel 90-1210 Series

# 3.5.1 SCHEDULE - <u>INTERIOR SURFACES</u> (ALL SYSTEMS TO BE LOW ODOR/ LOW VOC MATERIALS)

- A. Concrete, Concrete Block, Cement Plaster: EPOXY FINISH
  - 1. One coat of block filler. (eliminate on existing masonry walls) Perma-Crete LTC Concrete Block & Masonry Surface Filler 4-100
  - 2. Two coat of Acrylic Epoxy Pitt Glaze WB1 Interior Semi-Gloss Pre-Catalyzed Water-Borne Acrylic Epoxy.
  - 3. Provide additional coats on existing masonry walls as necessary for full coverage in areas where a color change is made.
- B. Concrete, Concrete Block, Cement Plaster: LATEX FINISH
  - 1. One coat of block filler. (eliminate on existing masonry walls) Perma-Crete LTC Concrete Block & Masonry Surface Filler 4-100
  - 2. Two coat 100% Acrylic Pure Performance Semi-Gloss Latex 9-500 Series
  - 3. Provide additional coats on existing masonry walls as necessary for full coverage in areas where a color change is made.

- C. Steel / Hollow Metal doors &/or frames:
  - 1. Two coats acrylic PITT-TECH Plus Int/Ext Semi-Gloss DTM Industrial Enamel 90-1210 Series
- D. Gypsum Board:
  - 1. One coat of latex primer sealer Porter Paints
  - 2. Two coats of interior latex Pure Performance Interior Eggshell Latex 9-300 Series.

## 3.6 SCHEDULE

- A. Refer to Room Finish Schedule on Sheet A3.1.
- B. COLOR: Paint colors will be selected following receipt of the shop drawing submittals. The number and placement of Interior Paint Colors will not exceed Color Level III as defined by PDCA Standard P3-93.
- C. The work includes, but is not limited to:
  - 1. Preparation of and new paint finish on all existing interior painted surfaces.
  - 2. Preparation and paint finish on all new gypsum board and concrete masonry units exposed to view on the interior of the building.
  - 3. New steel doors and frames.
  - 4. Sanding, preparation and new paint finish on existing wood door and steel frame in Reception 103, Area A.
  - 5. Paint finish on all new and existing exterior steel lintels in Area C.
  - 6. Paint finish on all metal fabrications (excluding anodized aluminum products) exposed to view.

### SECTION 101100 - VISUAL DISPLAY SURFACES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

- A. New porcelain-faced steel marker boards, surface mounted with continuous "Z" bar at top and "L" clips at bottom no glue.
- B. New surface-mounted tackboards, mounted same method as marker boards.
- C. Trim, chalk/marker rail, map rail.
- 1.02 RELATED SECTIONS
  - A. Section 042000 Unit Masonry

#### 1.03 REFERENCES

- A. American National Standards Institute:
  - 1. ANSI A135.4 Basic Hardboard.
  - 2. ANSI A208.1 Mat-Formed Wood Particleboard.

#### B. ASTM International:

- ASTM A424 Standard Specification for Steel, Sheet, for Porcelain Enameling.
   ASTM A653/A653M Standard Specification for Steel Sheet, Zinc-Coated
- (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet
- ASTM B209 Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate.
- 4. ASTM B221 Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- 5. ASTM C208 Standard Specification for Cellulosic Fiber Insulating Board.
- 6. ASTM C1396/C1396M Standard Specification for Gypsum Board.
- C. California Department of Health Services:
  - 1. CA/DHS/EHLB/R-174 Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers, including 2004 Addenda.
- D. Federal Specification Unit:
  - 1. FS CCC-W-408 Wall Covering, Vinyl-Coated.
  - 2. FS L-P-1040 Plastic Sheets and Strips (Polyvinyl Fluoride).
- E. Forest Stewardship Council:
  - 1. FSC Guidelines Forest Stewardship Council Guidelines.
- F. National Fire Protection Association:
  - 1. NFPA 701 Standard Methods of Fire Tests for Flame Propagation of Textiles and Films.
- G. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168[-January 7, 2005] Adhesive and Sealant Applications.

## 1.04 SUBMITTALS

- A. Submit under provisions of Section 013300 Submittal Procedures.
- B. Shop Drawings: Indicate wall elevations, dimensions, joint locations and special anchor details.
- C. Product Data: Provide data on chalkboards and surface covering, trim and accessories.
- D. Samples: Submit samples illustrating materials and finish, color and texture of markerboard and trim.

#### 1.05 OPERATION AND MAINTENANCE DATA

- A. Maintenance Data: Include data on regular cleaning and stain removal.
- 1.06 QUALIFICATIONS
  - A. Manufacturer: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

### 1.07 FIELD MEASUREMENTS

- A. Verify that field measurements are as indicated on shop drawings.
- 1.08 WARRANTY
  - A. Provide five year warranty.
  - B. Warranty: Include coverage of chalkboard and markerboard surface from discoloration due to cleaning, crazing or cracking and staining.

## 1.09 REGULATORY REQUIREMENTS

A. Conform to KBC for flame/smoke rating of fabric-covered tackboards in accordance with ASTM E84.

## PART 2 PRODUCTS

- 2.01 MANUFACTURERS markerboards
  - A. Ghent Model FH1 markerboard
  - B. Claridge Products equal to Ghent
  - C. Marsh equal to Ghent
  - D. Substitutions: Under provisions of Section 016000.

# 2.02 MARKERBOARD MATERIAL

- A. White Porcelain enamel steel with mitered square corners and aluminum trim.
- B. Shall have continuous, solid box-type chalk tray with ribbed tray and end closures.
- C. Shall have top-mtd integral map rail with cork insert and map holders for every 48\* of map rail provided.

# 2.03 TACKBOARD/DISPLAY SURFACING MATERIAL

- A. Non-rated Substrate: natural cork, homogeneous composition with vinyl surface, as Claridge Products "Fabricork".
  - 1. Total Thickness including cork: 1/4 inch.
  - 2. Roll Width: 48 inches.
  - 3. Color: To be selected by Architect.

# 2.06 CORE AND FRAME MATERIALS

- A. Hardboard: AHA A135.4, tempered face, ¼ inch
- B. Foil Backing: Aluminum foil sheet, 0.005 inch thick.
- C. Frame and Chalkrail: Aluminum extrusions, ASTM B221.
- 2.07 ACCESSORIES
  - A. Mounting Bars: Continuous "Z" bar at top of 6" steel 24" o.c. at and "L" brackets at bottom. No glue permitted in this method.
  - B. Schluter Strips for Cork roll material.
  - C. Temporary Protective Cover: Sheet polyethylene, 8 mil thick.
- 2.08 FABRICATION MARKERBOARDS
  - A. Outer Face Sheet: Steel, 24 gage thick with porcelain face.
  - B. Core: Hardboard 3/8 inch thick.
  - C. Backing Surface: Aluminum foil, 0.015 inch thick.
  - D. Splice Joint: Concealed spline of sheet steel.
  - E. Accessories: Furnish with map rail, aluminum map hooks, map rail end stops, chalk trough per classroom.
- 2.09 FABRICATION TACKBOARDS
  - A. Outer Facing: Cork, 7/32 inch with vinyl covering.
  - B. Core: Hardboard, 1/4 thick.
  - C. Backing Surface: Aluminum foil, 0.005 inch thick.
  - D. Spline Joint: manufacturer's "H" batten. (Not applicable to custom units)
  - E. Accessories: Furnish with map rail per room, aluminum map hooks, map rail end stops.
- 2.10 FABRICATION FRAME AND TRIM
  - A. Aluminum Frame: Of flat profile; exposed fasteners, map rail with cork insert over chalk board, and tackboard surfaces.
  - B. Aluminum Chalkrail: one piece full length of Marker boards, molded ends; exposed fasteners.
- 2.11 FINISHES MARKER BOARDS
  - A. Porcelain Enamel: Glass fibered enamel, baked to vitreous surfaces; Porcelain Enamel Institute Type A; White color as selected.
  - B. Aluminum Frame, Chalkrail, and Accessories: Mill Finish natural aluminum.
- 2.12 DISPLAY RAILS MATERIALS
  - A. Claridge #51 Economy Display Rail, or equal: Heavy gauge extruded aluminum with 1/4" thick cork insert in tan, 1" wide, in longest available lengths.
  - B. Substitutions: Under provisions of Section 016000 Product Requirements
- PART 3 EXECUTION
- 3.01 EXAMINATION
  - A. Verify site conditions under provisions of Section 014000 Quality Requirements.
  - B. Verify that internal wall blocking is ready to receive work and positioning dimensions are as instructed by the manufacturer.
  - C. Verify flat wall surface for frameless adhesive applied type.

# 3.02 INSTALLATION

- A. Install boards and recessed display cases in accordance with manufacturer's instructions.
- C. Secure units level and plumb.
- D. Boards: Butt panels tight with concealed spline to hairline joint.
- E. Carefully cut holes in Boards for thermostats, wall switches, and power or data outlets.

# 3.03 CLEANING

- A. Clean work under provisions of 01 70 00 Execution and closeout Requirements.
- B. Remove temporary protective cover at date of Substantial Completion.
- 3.04 SCHEDULE Work of this section includes but is not limited to:
  - 1. Tackboards and Markerboards, locations as shown on the Floor Plans, Sheets A1.1 and A1.2.
  - 2. Provide:
    - i. 8' Markerboards: four (4) total.
    - ii. 8' Tackboards: two (2) total.
    - iii. 4' Tackboard: two (2) total.
## SECTION 102115 - PLASTIC TOILET COMPARTMENTS

## PART 1 GENERAL

## 1.1 SUMMARY

- A. Section includes 1" thick solid high density polyethylene (HDPE) toilet compartments, doors and urinal screens.
- B. Related Sections:
  - 1. Section 042000 Unit Masonry
  - 2. Section 093000 Tile
  - 3. Section 102800 Toilet, Bath, and Laundry Accessories.

## 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM A666 Standard Specification for Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.

#### 1.3 SUBMITTALS

- A. Section 01330 Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall and floor supports, door swings.
- C. Product Data: Submit data on panel construction, hardware, and accessories.
- D. Samples: Submit two 6x6 inch in size illustrating panel finish, color, and sheen.
- E. Manufacturer's Installation Instructions: Submit special procedures, perimeter conditions requiring special attention.

### 1.4 COORDINATION

A. Section 013000 - Administrative Requirements: Coordination and project conditions. Coordinate Work with placement of support framing and anchors in wall.

#### PART 2 PRODUCTS

## 2.1 SOLID PLASTIC TOILET COMPARTMENTS

- A. Manufacturers:
  - 1. Bradley basis of design: Bradmar Partitions
  - 2. Scranton
  - 3. Hadrian
  - 4. Ampco
  - 5. Substitutions: Refer to Section 016000 Material and Equipment.

B. Product Description: floor mounted overhead braced.

## 2.2 COMPONENTS

- A. Toilet Compartments: High Density polyethylene (HDPE) panels, doors, and pilasters, floor-mounted headrail-braced.
  - 1. Color: as selected from manufacturer standard color options.
- B. Door and Panel Dimensions:
  - 1. Panel Thickness: 1 inch
  - 2. Door Width:
    - a. Typical: 30 inch min. clearance, in-swing.
    - b. ADA Accessible: 32 inch min clearance., out-swing.
  - 3. Panel Height: 55 inch
  - 4. Pilaster Height: 82 inch
  - 5. Thickness of Pilasters: 1 inch.
  - 6. Overhead braced.
  - 7. Wall-mtd components to use continuous panel bracket.
- C. Urinal Screens: Wall mounted with continuous panel bracket.
  - 1. Panel Thickness: 1 inch
  - 2. Panel Height: 42 inch min.

## 2.3 ACCESSORIES

- A. Pilaster Shoes and Sleeves: Formed, ASTM A666 Type 304 stainless steel with No. 4 finish, 3 inch high, concealing floor fastenings. Provide adjustment for floor variations with screw jack through steel saddles integral with pilaster.
- B. Head Rails: Hollow anodized aluminum tube, with anti-grip profiles and cast socket wall brackets.
- C. Brackets: Satin stainless steel.
- D. Attachments, Screws, and Bolts: Stainless steel, tamper proof type.
  - 1. For attaching panels and pilasters to brackets: Through-bolts and nuts; tamper proof.
- E. Hardware: Satin Stainless steel:
  - 1. Continuous hinges.
  - 2. Continuous wall brackets.
  - 3. Shall be heavy duty and utilize theft resistant thru-bolt construction.
  - 4. Thumb turn door latch with exterior emergency access feature.
  - 5. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
  - 6. Coat hook with rubber bumper; one for each compartment, mounted on door.
  - 7. Furnish door pull for outswinging doors.
  - 8. Furnish metal heat sink at bottom of doors and partitions.

## PART 3 EXECUTION

## 3.1 EXAMINATION

- A. Section 013000 Administrative Requirements: Coordination and project conditions.
- B. Verify field measurements are as indicated on shop drawings.
- C. Verify correct spacing of and between plumbing fixtures.
- D. Verify correct location of built-in framing, anchorage, and bracing.

## 3.2 INSTALLATION

- A. Maintain 3/8 to 1/2 inch space between wall and panels and between wall and end pilasters.
- B. Attach panel brackets securely to walls using anchor devices.
- C. Attach panels and pilasters to brackets. Locate head rail joints at pilaster center lines.
- D. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

# 3.3 ERECTION TOLERANCES

A. Section 014000 - Quality Requirements: Tolerances. Maximum Variation From Indicated Position: 1/4 inch. Maximum Variation From Plumb: 1/8 inch.

## 3.4 ADJUSTING

- A. Section 017000 Execution Requirements: Testing, adjusting, and balancing.
- B. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch.
- C. Adjust hinges to position doors in partial opening position when unlatched. D. Return outswinging doors to closed position.
- D. Adjust adjacent components for consistency of line or plane.

## 3.5 SCHEDULES -

A. Refer to Enlarged Restroom Drawings on Sheet A4.1 and Elevations on Sheets A4.1 & A4.2.

# END OF SECTION

SECTION 102800 - TOILET ACCESSORIES

### PART 1 GENERAL

### 1.1 SUMMARY

- A. Section includes commercial grade toilet accessories.
- B. Related Sections:
  - 1. Section 042000 Unit Masonry.
  - 2. Section 102115 Plastic Toilet Compartments.

### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM A123 Standard Specification for Zinc (Hot Dip Galvanized) Coatings on Iron and Steel Products.
  - 2. ASTM A153 Standard Specification for Zinc Coating (Hot Dip) on Iron and Steel Hardware.
  - 3. ASTM A269 Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service.
  - 4. ASTM A653 Standard Specification for Steel Sheet, Zinc Coated (Galvanized) or Zinc Iron Alloy Coated (Galvannealed) by the Hot Dip Process.
  - 5. ASTM A666 Standard Specification for Annealed or Cold Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar.
  - 6. ASTM B456 Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium.
  - 7. ASTM C1036 Standard Specification for Flat Glass.
- B. California Department of Health Services:
  - 1. CA/DHS/EHLB/R-174 Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers.
- C. South Coast Air Quality Management District:
  - 1. SCAQMD Rule 1168 Adhesive and Sealant Applications.

### 1.3 SUBMITTALS

- A. Section 013300 Submittal Procedures: Submittal procedures.
- B. Product Data: Submit data on accessories describing size, finish, details of function, attachment methods.
- C. Manufacturer's Installation Instructions: Submit special procedures, conditions requiring special attention.
- 1.4 CLOSEOUT SUBMITTALS
  - A. Section 017000 Execution Requirements: Closeout submittal procedures.

B. Include in the closeout manual a list of all toilet accessories, name of manufacturer, model number for each accessory, cleaning and maintenance instructions and name and telephone number where replacement parts may be obtained.

## 1.5 COORDINATION

- A. Section 013000 Administrative Requirements: Coordination and project conditions.
- B. Coordinate the Work with placement of internal wall reinforcement and reinforcement of toilet partitions to receive anchor attachments.

# PART 2 PRODUCTS

# 2.1 TOILET AND BATH ACCESSORIES

- A. Manufacturers:
  - 1. Bobrick Washroom Accessories basis for specifications (unless otherwise noted).
  - 2. Bradley Corp
  - 3. McKinney
  - 4. Substitutions: Section 016000 Product Requirements.

## 2.2 COMPONENTS

- A. Accessories General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.
  - 1. Grind welded joints smooth.
  - 2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.
- B. Stainless Steel Sheet: ASTM A666, Type 304.
- C. Stainless Steel Tubing: ASTM A269, stainless steel.
- D. Galvanized Sheet Steel: ASTM A653, G90 zinc coating.
- E. Mirror Glass: Float glass, Type I, Class 1, Quality q2 (ASTM C 1036), with silvering, copper coating, and suitable protective organic coating to copper backing in accordance with FS A-A-3002.
- F. Adhesive: Two component epoxy type, waterproof, approved by manufacturer.
- G. Fasteners, Screws, and Bolts: Hot dip galvanized, tamper-proof.
- H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

## 2.3 TOILET ACCESSORIES

### Provided by Owner. Installed by Contractor: (1) Toilet Paper Dispensers: TBD

- (2) Paper Towel Dispensers: TBD.
- (3) Soap Dispensers: TBD

## Provided AND Installed by Contractor:

- 1. Mirrors: Fixed, stainless steel framed, 1/4 inch tempered glass mirror.
  - A. Bobrick, #B-290 2448, Welded Frame
  - B. Size: 24 inches x 48 inches
  - C. One-piece, roll-formed  $\frac{3}{4}$  x  $\frac{3}{4}$  angle frame. Type 304 SS angle with satin finish.
  - D. Backing: galvanized steel secured to frame with concealed screws, equipped with integral horizontal hanging brackets and separate wall hanger for concealed mounting.
  - E. Glass to meet requirements of ASTM C 1036.
- Grab Bars: Stainless steel, 1-1/2 inches outside diameter, heavy duty 18 gauge 304 stainless steel tubing, standard grasping surface finish, concealed flange mounting. Meets or exceeds FHA, VA, ANSI and UFA standards. Minimum 1-1/2 inches clearance between wall and inside of grab bar.
  - A. Length and configuration:
    - a. <u>Set 1 Ambulatory Stall:</u> (provide 1 set for each stall) Two – 42" horizontal
    - b. <u>Set 2 Wheelchair Accessible Stall:</u> (provide 1 set for each stall)
      - One 36" horizontal
      - One 42" horizontal
      - One 18" vertical
  - B. Manufacturers: Bradley. ASI. Bobrick.

## 2.4 FACTORY FINISHING

- A. Stainless Steel: No. 4 satin brushed finish, unless otherwise noted.
- B. Baked Enamel: Pre-treat to clean condition, apply one coat primer and minimum two coats baked enamel.
- C. Galvanizing for Items other than Sheet: ASTM A123/A123M to 1.25 oz/sq yd. Galvanize ferrous metal and fastening devices.
- D. Shop Primed Ferrous Metals: Pre-treat and clean, spray apply one coat primer and bake.
- E. Back paint components where contact is made with building finishes to prevent electrolysis.

# PART 3 EXECUTION

- 3.1 EXAMINATION
  - A. Section 013000 Administrative Requirements: Coordination and project conditions.
  - B. Verify exact location of accessories for installation.
  - C. Verify field measurements are as indicated on product data.

### 3.2 PREPARATION

- A. Deliver inserts and rough-in frames to site for timely installation.
- B. Provide templates and rough-in measurements as required.
- 3.3 INSTALLATION
  - A. Install plumb and level, securely and rigidly anchored to substrate.
  - B. Mounting Heights and Locations: As required by accessibility regulations and/or shown on Drawings.

### 3.4 SCHEDULES

- A. Refer to Enlarged Restroom Plan on Sheet A4.1.
- B. Schedule:
  - 1. Mirrors: Provide One (1) per Restroom. Total Qty. = Two (2).
  - 2. Grab Bars:
    - a. Boy's Restroom 303:
      - 1) Set 1 (Ambulatory Stall): One (1)
      - 2) Set 2 (Wheelchair Stall): Two (2)
    - b. Girl's Restroom 305:
      - 1) Set 1 (Ambulatory Stall): One (1)
      - 2) Set 2 (Wheelchair Stall): Two (2)

## END OF SECTION

## SECTION 104400 - FIRE PROTECTION SPECIALTIES

## PART 1 GENERAL

## 1.1 SUMMARY

- A. Section includes fire extinguishers; fire extinguisher cabinets; and brackets for wall mounting.
- B. Signage should be provided for placement next to each Class "K"
- C. Related Sections:
  - 1. Section 042000 Unit Masonry: Roughed-in wall openings.

### 1.2 REFERENCES

- A. ASTM International:
  - 1. ASTM E814 Standard Test Method for Fire Tests of Penetration Firestop Systems.
- B. National Fire Protection Association:
  - 1. NFPA 10 Standard for Portable Fire Extinguishers.
- C. UL:
  - 1. UL Fire Protection Equipment Directory.

# 1.3 PERFORMANCE REQUIREMENTS

- A. Conform to applicable building code.
- B. Provide extinguishers classified and labeled by Underwriters Laboratories Inc. for purpose specified and indicated.
- C. Provide fire extinguisher cabinets classified and labeled by Underwriters Laboratories Inc. for purpose specified and indicated.

#### 1.4 SUBMITTALS

- A. Section 013300 Submittal Procedures: Submittal procedures.
- B. Shop Drawings: Indicate cabinet physical dimensions, rough-in measurements for recessed cabinets, wall bracket mounted measurements, location.
- C. Product Data: Submit extinguisher operational features, color and finish, anchorage details.
- D. Manufacturer's Installation Instructions: Submit special criteria and wall opening coordination requirements.
- E. Manufacturer's Certificate: Certify Products meet or exceed specified requirements.

### 1.5 CLOSEOUT SUBMITTALS

- A. Section 017000 Execution Requirements: Closeout procedures.
- B. Operation and Maintenance Data: Submit test, refill or recharge schedules and recertification requirements.

### 1.6 ENVIRONMENTAL REQUIREMENTS

- A. Section 016000 Product Requirements: Environmental conditions affecting products on site.
- B. Do not install extinguishers when ambient temperature are capable of freezing extinguisher ingredients.

### PART 2 PRODUCTS

### 2.1 FIRE EXTINGUISHERS

- A. Manufacturers:
  - 1. Larsen's Manufacturing Co.,
  - 2. JL Industries
  - 3. Substitutions: Section 016000 Product Requirements
- B. Type One Multi-purpose Dry Chemical Type: Cast steel tank, with pressure gage; Class ABC, Size 10 lbs., in wall cabinet.
- C. Extinguisher Finish: Red steel enamel.

## 2.2 FIRE EXTINGUISHER CABINETS

- A. Manufacturers:
  - 1. Larsen's Manufacturing Co., Model 2409-R3, Vertical Duo Door style with die cut lettering.
  - 2. Substitutions: Section 016000 Product Requirements
- B. Metal: Cold rolled steel with white baked acrylic enamel.
- C. Configuration: Rolled edge semi-recessed type with 2 <sup>1</sup>/<sub>2</sub>" rolled edge flange, sized to accommodate extinguisher.
- D. Door: Cold rolled steel with white baked acrylic enamel with vertical lite in door.
  - 1. Reinforced for flatness and rigidity.
  - 2. "Larsen-Loc" steel cam latching system, or equal, with pull same finish as door.
- E. Door Glazing: Glass, clear, tempered glass.
- F. Cabinet Mounting Hardware: Concealed type appropriate to cabinet.
- G. Form cabinet enclosure with right angle inside corners and seams. Form perimeter trim and door stiles.

- H. Pre-drill for anchors.
- I. Hinge doors for 180 degree opening with continuous piano hinge.
- J. Weld, fill, and grind components smooth.
- K. Glaze doors with resilient channel gasket glazing.
- L. Finishing Cabinet Exterior Trim and Door: White baked acrylic enamel.
- M. Finishing Cabinet Interior: White baked acrylic enamel.

## 2.3 ACCESSORIES

- A. Extinguisher Brackets: Formed steel, galvanized.
- B. Cabinet Signage: Die cut red lettering on outside of door.

## PART 3 EXECUTION

- 3.1 EXAMINATION
  - A. Section 013000 Administrative Requirements: Coordination and project conditions.
  - B. Verify rough openings for cabinet are correctly sized and located.

# 3.2 INSTALLATION

- A. Install cabinets plumb and level in wall openings, 60 inches from finished floor to top of cabinet.
- B. Secure rigidly in place.
- C. Place extinguishers in cabinets and on wall brackets as indicated on Floor Plans.
- D. Position cabinet signage as required by authorities having jurisdiction.

### 3.3 SCHEDULE

- A. Refer to Fire Extinguisher [recessed mounted] Locations on Plan A/A1.2.
- B. The following list is provided as a convenience only: Refer to drawings for specific locations –

TYPE ONE Corridor 301

END OF SECTION

# SECTION 109500 - MISCELLANEOUS SPECIALTIES

### PART 1 GENERAL

#### 1.01 SECTION INCLUDES

This Section includes the furnishing and installation of miscellaneous specialties items shown on the drawings and herein described, including the following:

- A. Corner Guards
- B. Window Speak-Thru Grill

#### 1.02 RELATED SECTIONS

- A. Section 061000 Carpentry: Blocking for mounting of specialties.
- B. Section 088000 Glazing
- C. Section 092116 Gypsum Board Assemblies; Metal Studs + Reinforced Fiberboard

#### 1.03 SUBMITTALS

- A. Submit shop drawings to Architect prior to fabrication or shipment. Permission to waive shop drawings requirement may be given by the Architect upon request on an item by item basis.
- B. Shop drawings: Indicate locations, construction and anchorage details, dimensions, and quantities of products specified.
- C. Product Data; Provide data for all specialties.
- D. Manufacturer's Installation Instructions: Indicate special procedures, and any conditions requiring special attention.
- E. Submit color charts for finishes where applicable. Colors to be selected by Architect.

#### 1.04 GENERAL REQUIREMENTS

- A. The Contractor shall be responsible for all fabrication and for the correct fitting of all equipment shown on the plans or described in this section of the specifications.
- B. Verify all dimensions with measurements taken at the job site and with drawings or instructions of other trades whose work adjoins or engages work under this section.
- C. All equipment to be furnished and installed under these specifications shall be handled, delivered, and stored in such a manner as to preclude damage of any nature whatsoever. Any item so damaged will be rejected and shall be removed from the site and replaced with new materials meeting the requirements of these specifications.

# PART 2 PRODUCTS

### 2.01 CORNER GUARDS

- A. Balco Products rigid vinyl composition with continuous retainer screwed into the steel studs.
- B.  $1 \frac{1}{2}$ " x  $1 \frac{1}{2}$ " x 48". Location at top of vinyl floor base.
- 2.02 WINDOW SPEAK-THRU GRILL
  - A. Nissen & Company Heavy wrought aluminum 6063T5 with Anoldized 204 R-1 Clear Alumilite finish No. 834-A.
  - B. Stock No. 444-2, 4-1/2" outside diameter, 3" inside diameter, non-electronic.

## PART 3 EXECUTION

### 3.01 EXAMINATION

- A. Section 011000 Summary: Coordination and Meetings; Verification of existing conditions before starting work.
- B. Verify substrates are ready to receive mounting of specialties. Verify adequate blocking is in place where applicable.
- C. Beginning of installation means installer accepts existing surfaces.

### 3.02 INSTALLATION

- A. Install and clean all specialties in accordance with manufacturer's instructions.
- B. Secure specialties rigidly in place.

#### 3.03 SCHEDULES

- A. Corner Guards: Install on outside corners of all new gypsum board walls in corridors of Area 'B'. Total Qty. = Four (4).
- B. Window Speak-Thru Grill: Install in new ½" tempered glass transaction window in Vestibule 100 into Reception 103. Total Qty. = One (1).

# END OF SECTION

# MECHANICAL INDEX

#### SECTION NUMBER DIVISION 21 – FIRE SUPPRESSION

21 10 00 WATER BASED FIRE SUPPRESSION SYSTEM

# **DIVISION 22 – PLUMBING**

- 22 01 00 GENERAL PROVISIONS FOR PLUMBING WORK
- 22 02 00 EXCAVATION AND BACKFILLING FOR UNDERGROUND PIPING
- 22 05 17 SLEEVING, CUTTING, PATCHING AND REPAIRING
- 22 05 29 HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT
- 22 05 53 IDENTIFICATION OF PIPING AND EQUIPMENT
- 22 06 00 PLUMBING SYSTEMS DEMONSTRATION AND TRAINING
- 22 07 19 PLUMBING PIPING INSULATION
- 22 10 00 PLUMBING PIPING AND VALVES
- 22 11 19 DOMESTIC WATER PLUMBING SPECIALTIES
- 22 11 23 DOMESTIC WATER PUMPS
- 22 13 19 SANITARY AND STORM PIPING SPECIALTIES
- 22 33 00 ELECTRIC DOMESTIC WATER HEATERS
- 22 42 00 PLUMBING FIXTURES AND EQUIPMENT

## SECTION 21 10 00 – WATER BASED FIRE SUPPRESSION SYSTEM

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This section covers the complete installation of a full wet-pipe, fire protection sprinkler system and related items.
- B. Provide all items, articles, materials, operations and/or methods listed, mentioned or herein specified, including all labor, materials, equipment and incidentals necessary and required for their completion.
- C. Design drawings for this project show the location of fire protection system work is required. Any additional system components or sprinkler heads that may be required to meet all NFPA 13 requirements is the responsibility of the contractor. Any areas not shown to be sprinkled but required to be sprinkled by NFPA 13 requirements shall be sprinkled by the contractor and include any and all equipment required.
- D. Contractor shall submit design drawings and calculations to engineer for approval prior to submission to HBC.

# 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 220100 GENERAL PROVISION FOR PLUMBING WORK
- C. Section 220200 EXCAVATION AND BACKFILLING FOR UNDERGROUND PIPING
- D. Section 220517 SLEEVING, CUTTING, PATCHING AND REPAIRING PLUMBING
- E. Section 220529 HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT
- 1.3 WORK INCLUDED
  - A. The work covered by this section of the specifications consists of the furnishing of all materials, labor, equipment and appurtenances and the performance of all operations required for the installation of a system of automatic sprinklers.
  - B. Work shall commence at a point where shown and shall include all necessary parts, accessories and items of work required for a complete and finished installation including all normally closed flow switches for use by the fire alarm system.
  - C. All piping including all valves, sprinkler heads, alarm valve, control valves, etc.
  - D. Any apparatus, machinery, material small items or incidentals not mentioned herein, which may be found necessary to complete or perfect any portion of the installation in a substantial manner and in compliance with the requirements stated, implied or intended in these specifications, shall be furnished without extra cost to the owner. This shall include fire department connections, post indicator valve, water motor gong, ALARM BELL, backflow checks, all electrical power and control wiring and interlock which is not shown on the Electrical Drawings, etc. to provide a complete system and approved fire protection system.
  - E. The building areas in general are based on light hazard occupancy with storage rooms and mechanical rooms on ordinary hazard; head spacing as required. A system based on hydraulic calculation, as approved by NFPA 13, is acceptable, and as required by the

insuring company. Occupancy hazard shall be confirmed by the local Fire Marshal and/or the authority having jurisdiction before calculations are performed.

### 1.4 SPECIAL REQUIREMENTS

- A. No Contractor other than those regularly engaged in the installation of approved and franchised automatic sprinkler systems will be considered or approved for the work under this Section of the specifications. Bidders must have had not less than five years' experience in the fabrication and erection of such systems and shall have completed installations similar and equal in scope to this system under approval by one or more of the recognized underwriting associations in the insurance field.
- B. Before submitting bid, examine all mechanical, electrical, architectural and structural drawings, visit the site and become acquainted with all conditions that may, in any way whatsoever, affect the execution of this work.
- C. The Contractor shall take his own measurements and be responsible for exact size and location of all openings required for installation of this work. Figured dimensions where indicated are reasonably accurate and should govern in setting out work. Detailed method of installation is not indicated. Sprinkler Contractor shall coordinate exact ceiling grid location and install sprinkler heads centered in the 2' x 2' and 2' x 4' ceiling panels. Location of sprinkler head must be carefully coordinated with the Architect.
- D. It shall be this Contractor's responsibility to verify all existing water line sizes and to conduct water flow tests and report to the Architect and Engineer the results of water flow test. Existing water flow test listed within the bidding documents is for bidding purposes only. The Contractor shall conduct/obtain his own water flow test information for use in shop drawing/hydraulic calculations. Water flow test shall be done in accordance with NFPA 291 and use a minimum of two (2) fire hydrants. The test shall be fully coordinated with the utility company, fire department and owner and witnessed by the Architect/Engineer's representative.
- E. It is not the intent of these Plans and Specifications to provide a complete detailed description of the apparatus, materials, equipment, etc., which is required to make a complete installation of a specified fire protection system. Include all required sprinkler heads, tamper switches, material and equipment and perform all work required to install a complete and approved installation.
- F. All materials and methods shall be in accordance with applicable codes, regulations and/or ordinances and meet approval of local inspection authority and insuring agency having jurisdiction. The latest edition of the National Board of Fire Underwriters Bulletins shall be the minimum requirement for all work. All materials under this Contract shall be listed by the Underwriter's Laboratories, Inc., as approved for fire protection installation. The installation shall comply with the NFPA, and the Kentucky Building Code and Local Fire Marshal in every respect.
- G. Perform work under this section in close harmony with other sections so completed work shall present a neat and workmanlike installation.
- H. All road crossings or excavation and backfill required for the completion of this work shall be a part of this Contract.
- I. Any paving, floors, or other improvements disturbed or destroyed as a result of installation of sprinkler system, shall be restored or replace to Owner's satisfaction.

### 1.5 SHOP DRAWINGS

A. Prepare detailed shop drawings for the complete sprinkler system, showing the location of the heads, piping and other installation details and submit plans to the Architect. Drawings shall bear the stamp of a certified sprinkler technician and shall be complete with all calculations and equipment drawings for approval of Architect, Engineer and the

Department of Housing, Building and Construction and/or the authority having jurisdiction.

- B. Sprinklers shall be shown on drawings, submittals and project information and shall be identified by the manufacturer's style or series designation as published in the appropriate agency listing or approval. Trade names and abbreviations are not permitted.
- C. Shop drawings and descriptive literature shall be submitted as a minimum, but not limited to the following:
  - 1. Sprinkler Heads
  - 2. O. S. & Y Valve
  - 3. Alarm Control
  - 4. Back Flow Preventer Detector Check
  - 5. Pipe Hanger and Support

## 1.6 PERMITS, CODES AND INSTALLATIONS

- A. All construction permits and inspections for the automatic sprinkler system shall be paid for and furnished under this section. The work shall be installed in a manner to comply with all state and local codes applicable and with all requirements of NFPA Standard 13 latest revision for the installation of sprinkler systems. The entire installation, all materials, etc., shall meet their requirements.
- B. Contact the serving Water Company to determine their cost for any tap on fees, vault, values, piping, equipment required to complete the fire protection tie in. These costs shall be included in this Contract.
- C. Pay for all fees and costs arising from this installation and for any and all destruction to property, both public and private, which may arise from this service tap on.
- D. No work is to be started by the Contractor until Contractor's drawings are approved by the Division of Housing, Building and Construction and the local Fire Marshal's offices, and one copy delivered to the Architect. Entire installation is to be approved by the Division of Housing, Building and Construction, and the local Fire Marshal and/or the authority having jurisdiction. Final payment will not be made until these approvals are received.

## 1.7 INSURANCE CARRIER REQUIREMENTS

- A. All material shall conform to FME & R requirements.
- B. The sprinkler system shall be hydraulically designed for light hazard requirements except where noted on the drawings. Minimum hose stream shall be 100 gpm applied at the hydrant closest to the user. Design shall use the area/density method. The room design method shall not be used.
- C. Shop drawing shall be submitted to the engineer for review prior to other submittals.
- D. Shop drawings shall be submitted to HBC for approval prior to the start of construction.

## 1.8 OPERATION AND MAINTENANCE INSTRUCTIONS

A. Deliver to the architect three (3) copies of the complete operating and maintenance instructions for the equipment furnished and installed under this contract. Provide the aforementioned parties with parts lists for all new equipment items. Each set shall be provided in a plastic or hard back binder with notations of contents. See Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK.

B. The Contractor shall adequately instruct the Owner's maintenance personnel in the proper operation of all sprinkler devices installed. See Section 220600 PLUMBING SYSTEMS DEMONSTRATION AND TRAINING for a complete description of requirements.

### 1.9 RECORD DRAWINGS

A. After all work has been completed, provide for the Architect's records one (1) complete set of as built "Record Drawings" showing final installation of the work.

## PART 2 - PRODUCTS

### 2.1 EQUIPMENT AND MATERIALS

- A. All equipment and materials shall be new and approved by the UL and/or NFPA. System design shall be 175 PSIG.
- B. Trade name and manufacturers mentioned herein are intended only to indicate design, quality and size. Other manufacturers products equal in all respects may be substituted, provided they meet with the prior approval of the architect and are found by him to be equal in every way to the items specified herein.
- C. All devices shall be in accordance with the rules and regulations of the state fire marshal's office in all cases and shall bear the label of approval of the Underwriters Laboratories and/or NFPA.

### 2.2 ACCEPTABLE MANUFACTURERS

A. Allied Piping, Firematic, Grinnell, Reliable, Star, Victualic, Viking, Potter Electric Signal, System Sensor.

### 2.3 INTERIOR WET SYSTEM FIRE PROTECTION PIPING AND FITTINGS

- A. Schedule 40, Black Steel Pipe: ASTM A135. Pipe ends may be factory or field formed to match joining method. NPS 1 to NPS 2.
- B. Interior piping shall be Allied, or equal, "Lightwall", ASTM-A135, Schedule 10 black steel, assembled with ductile iron grooved bolted, mechanical pipe fittings, ASTM A 536, Series 100 Victaulic, or equal. Joints shall be Victaulic style 75 or equal. NPS 2-1/2 to NPS 8.
  - 1. Grooved joint fittings shall be manufactured of ductile iron, conforming to ASTM A 536; forged steel, conforming to ASTM A 234; or fabricated from carbon steel pipe, conforming to ASTM A 53; with grooved ends conforming to ANSI/AWWA C606.
  - 2. Bulged short pattern fittings may be used in lieu of standard pattern fittings. The fittings shall have a flow rate equal to standard pattern fittings.
- C. Grooved joint couplings shall consist of ductile iron housings, conforming to ASTM A 536, complete with pressure responsive synthetic rubber gasket. (Grade to suit the intended service.)
  - 1. Rigid Type: Coupling housings cast with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with NFPA 13. Couplings shall be fully installed at visual pad-to-pad offset contact. Tongue and recess rigid type couplings shall not be permitted.
    - a. Victaulic Style 005 or engineer approved equal.
    - b. 1-1/4" through 4": Installation-Ready, for direct slab installation without field disassembly or loose parts. Victaulic Style 009-EZ or engineer approved equal.

- 2. Flexible Type: Use in locations where vibration attenuation and stress relief are required or for seismic applications in accordance with manufacturer's recommendations. Victaulic Style 75 or engineer approved equal.
- 3. Flange Adapter: Flat face, for direct connection to ANSI Class 125 or 150 flanged components. Victaulic Style 744, 741 or equal.

# 2.4 EXTERIOR FIRE PROTECTION WATER PIPING AND FITTINGS

- A. Materials specified and used are subject to final approval of the fire marshal and the local water company.
- B. Fire service fittings 2-1/2" and larger shall be cement lined, mechanical joint or grooved end, cast iron water main or PVC pressure in conformance to the latest ASA, ASTM, FS and AWWA specification. Cast iron fittings shall have the manufacturer's standard coal tar on asphaltic base coating outside and a cement lining on the inside, all in accordance with ASA 21.4. Fittings shall be rated at 250 PSI working pressure. PVC piping shall be C-900, 200 PSI rating per local water company standards with tracer wire.
- C. All material shall be FME & R approved.
- 2.5 SPRINKLER HEADS
  - A. All sprinkler heads shall be Underwriter's approved automatic spray semi-recessed sprinklers with a white escutcheon to match ceiling and/or exposed upright sprinklers of the correct temperature and type for each location unless otherwise noted. Provide a spare head cabinet with one sprinkler wrench. Quantity of extra heads as indicated in NFPA #13.
  - B. Stainless steel flexible sprinkler drops may be used to properly locate sprinkler heads. The flexible tube shall be braided (FM-1637) of unbraided/corrugated (UL 2443) type 304 stainless steel. The drops shall be UL listed or FM approved with one-piece open gate bracket for sprinkler installation before or after the bracket is secured to the ceiling gird. Any flexible drop 36-inches or longer must be listed for a minimum of three 90-degree bends to insure proper installation.
  - C. Sprinkler heads 7' 0" or less above floor and other heads where subject to mechanical injury shall be provided with wire guards.

## 2.6 SPRINKLER HEAD CABINET

A. Steel Cabinet with hinged cover designed for wall mounting and having a finished appearance. Cabinet shall hold a minimum of six spare sprinklers plus a sprinkler wrench. Provide number of sprinkler heads required by NFPA 13.

## 2.7 CONTROL VALVES

- A. All valves 2" and smaller shall be bronze, solid bronze solid ball or wedge disc, screwed or grooved end pattern, ball type or outside rising stem and yoke, designed for 150 psi working pressure and approved by Underwriters Laboratories and Factory Mutual.
- B. All gate valves 2-1/2" and larger shall be iron body, bronze mounted, double disc, parallel seats outside screw and yoke and grooved end, screwed or flanged pattern designed for 160 psi working pressure and approved by Underwriters Laboratories.
- C. All butterfly valves 2-1/2" and larger shall be ductile iron body, elastomer encapsulated ductile iron disc with integrally cast stem, grooved pattern designed for 300 psi maximum working pressure and approved by Underwriters Laboratories.
- D. Valve Operators: Where indicated on drawings, provide UL and FM approved indicator parts.

### 2.8 CHECK VALVES

A. Check valves shall be ductile iron body, bronze or stainless steel mounted, flanged or grooved and Underwriters and Factory Mutual approved for 250 psi or 175 lbs. working pressure.

### 2.9 ALARM VALVES

A. Standard: UL 193. Design: For horizontal or vertical installation. Include trim sets for bypass, drain, electrical sprinkler alarm switch, pressure gages, retarding chamber, and fill-line attachment with strainer. Drip Cup Assembly: Pipe drain without valves and separate from main drain piping.

### 2.10 DRAINS

- A. Where drains, flushing connections, etc., are necessary to comply with local code or NBFU requirements, they shall be considered a part of this Contract and furnished and installed accordingly, whether shown specifically on the Drawings or covered in these Specifications.
- B. All sprinkler branch piping shall be installed to drain at main riser wherever possible.
- C. Where sprinkler piping is trapped, an approved auxiliary draw-off shall be provided and installed. Provide all test drains as required. All exposed piping on the exterior of the building shall be rust proofed and painted, color as selected by Architect. Provide splash blocks at all exterior drains.

## 2.11 INSPECTOR'S TEST STATIONS

- A. Install 1" inspection test connection. Discharge from test connection shall run to open air. All locations must comply with NFPA requirements and local Fire Marshall requirements.
- B. Inspection test connection shall have an attached metal tag bearing the words "Test Connection".
- 2.12 PRESSURE GAGES
  - A. Standard: UL 393. Dial Size: 3-1/2- to 4-1/2-inch diameter. Pressure Gage Range: [0- to 250-psig minimum. Label: Include "WATER" label on dial face.
  - В.

## 2.13 WALL AND CEILING ESCUTCHEONS

A. This contractor shall furnish and install on all lines passing through the floor, ceiling or wall in finished areas, an approved escutcheon as specified in Section 220517 – SLEEVING, CUTTING, PATCHING AND REPAIRING - PLUMBING. Escutcheons shall be submitted for approval before installation. Standard plates used in the industry may not be acceptable.

## 2.14 HANGERS

- A. Furnish and install all hangers of approved pattern and size to support all pipes in a substantial manner.
- B. See Section 220529 SUPPORTS AND ANCHORS FOR PLUMBING PIPING AND EQUIPMENT of these specifications for pipe hangers and brackets.
- C. Hangers for overhead piping shall comply with NBFU requirements as to size and spacing. Special and improvised supports and hangers shall meet with the approval of the Underwriters Laboratories and the Architect

# PART 3 - EXECUTION

3.1 PIPING INSTALLATION

- A. Locations and Arrangements: Drawing plans, schematics, and diagrams indicate general location and arrangement of piping. Install piping as indicated on approved working plans.
  - 1. Deviations from approved working plans for piping require written approval from authorities having jurisdiction. File written approval with Architect before deviating from approved working plans.
  - 2. Coordinate layout and installation of sprinklers with other construction that penetrates ceilings, including light fixtures, HVAC equipment, and partition assemblies.
  - 3. It shall be the responsibility of the contractor to examine the building and the drawings, confirming all dimensions before any pipe is cut, to determine if any offsets, etc., are necessary. Where additional offsets are required, they shall be made without any additional cost to the architect.
- B. Piping Standard: Comply with NFPA 13 requirements for installation of sprinkler piping.
- C. Use listed fittings to make changes in direction, branch takeoffs from mains, and reductions in pipe sizes.
- D. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- E. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- F. Install "Inspector's Test Connections" in sprinkler system piping, complete with shutoff valve, and sized and located according to NFPA 13.
- G. Install sprinkler piping with drains for complete system drainage.
- H. Install sprinkler control valves, test assemblies, and drain risers adjacent to standpipes when sprinkler piping is connected to standpipes.
- I. Install automatic (ball drip) drain valve at each check valve for fire-department connection, to drain piping between fire-department connection and check valve. Install drain piping to and spill over floor drain or to outside building.
- J. Install alarm devices in piping systems.
- K. Fill wet-pipe sprinkler system with water.
- L. Install hangers and supports for sprinkler system piping according to NFPA 13. Comply with requirements for hanger materials in NFPA 13.
- M. Install pressure gages on riser or feed main, at each sprinkler test connection, and at top of each standpipe. Include pressure gages with connection not less than NPS 1/4 and with soft-metal seated globe valve, arranged for draining pipe between gage and valve. Install gages to permit removal, and install where they are not subject to freezing.
- N. Be responsible for locating all openings required in walls, floors, ceilings or roof, for all materials and equipment furnished under this section of the specifications.
- O. Sleeves or openings shall be provided for passage of pipes. Where openings or sleeves have been omitted, they shall be drilled or sawed as required by the architect. All cutting and patching shall be done by the trades whose work is affected. All expenses incurred shall be a responsibility of this section of the specifications.
- P. Install sleeves for piping penetrations of walls, ceilings, and floors. Comply with requirements for sleeves specified in Section 220517 SLEEVING, CUTTING, PATCHING AND REPAIRING PLUMBING.

- Q. Install sleeve seals for piping penetrations of concrete walls and slabs. Comply with requirements for sleeve seals specified in Section 220517 SLEEVING, CUTTING, PATCHING AND REPAIRING PLUMBING.
- R. Install escutcheons for piping penetrations of walls, ceilings, and floors. Comply with requirements for escutcheons specified in Section 220517 SLEEVING, CUTTING, PATCHING AND REPAIRING PLUMBING.

# 3.2 JOINT CONSTRUCTION

- A. Install couplings, flanges, flanged fittings, unions, nipples, and transition and special fittings that have finish and pressure ratings same as or higher than system's pressure rating for aboveground applications unless otherwise indicated.
- B. Install unions adjacent to each valve in pipes NPS 2 and smaller.
- C. Install flanges, flange adapters, or couplings for grooved-end piping on valves, apparatus, and equipment having NPS 2-1/2 and larger end connections.
- D. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- E. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.
- F. Flanged Joints: Select appropriate gasket material in size, type, and thickness suitable for water service. Join flanges with gasket and bolts according to ASME B31.9.
- G. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
  - 1. Apply appropriate tape or thread compound to external pipe threads.
  - 2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.
- H. Twist-Locked Joints: Insert plain end of steel pipe into plain-end-pipe fitting. Rotate retainer lugs one-quarter turn or tighten retainer pin.
- I. Steel-Piping, Pressure-Sealed Joints: Join lightwall steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- J. Steel-Piping, Cut-Grooved Joints: Cut square-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe joints.
- K. Steel-Piping, Roll-Grooved Joints: Roll rounded-edge groove in end of pipe according to AWWA C606. Assemble coupling with housing, gasket, lubricant, and bolts. Join steel pipe and grooved-end fittings according to AWWA C606 for steel-pipe grooved joints.
- L. Steel-Piping, Pressure-Sealed Joints: Join Schedule 5 steel pipe and steel pressure-seal fittings with tools recommended by fitting manufacturer.
- M. Extruded-Tee Connections: Form tee in copper tube according to ASTM F 2014. Use tool designed for copper tube; drill pilot hole, form collar for outlet, dimple tube to form seating stop, and braze branch tube into collar.
- N. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.
- 3.3 VALVE AND SPECIALTIES INSTALLATION
  - A. Install listed fire-protection valves, trim and drain valves, specialty valves and trim, controls, and specialties according to NFPA 13 and authorities having jurisdiction.

- B. Install listed fire-protection shutoff valves supervised open, located to control sources of water supply except from fire-department connections. Install permanent identification signs indicating portion of system controlled by each valve.
- C. Install check valve in each water-supply connection. Install backflow preventers instead of check valves in potable-water-supply sources.
- D. Specialty Valves:
  - 1. Install valves in vertical position for proper direction of flow, in main supply to system.
  - 2. Install alarm valves with bypass check valve and retarding chamber drain-line connection.
- 3.4 SPRINKLER INSTALLATION
  - A. All heads must "line up" and work in with the ceiling pattern of the lights and heating equipment. All heads located in lay-in ceiling tile shall be centered along the centerline of the tile. Heads may be located at the center and quarter points of the tile. Avoid ducts, lights, hangers, etc. Install dry-type sprinklers with water supply from heated space. Do not install pendent or sidewall, wet-type sprinklers in areas subject to freezing.
  - B. Install sprinklers into flexible, sprinkler hose fittings, and install hose into bracket on ceiling grid.
- 3.5 IDENTIFICATION
  - A. Install labeling and pipe markers on equipment and piping according to requirements in NFPA 13. Piping shall be marked on 20' centers. Where pipe extends through walls, identify pipe on both sides of wall.
  - B. Identify system components, wiring, cabling, and terminals.
- 3.6 FIELD QUALITY CONTROL
  - A. Perform the following tests and inspections:
    - 1. Leak Test: After installation, charge systems and test for leaks. Repair leaks and retest until no leaks exist.
    - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
    - 3. Flush, test, and inspect sprinkler systems according to NFPA 13, "Systems Acceptance" Chapter.
    - 4. Energize circuits to electrical equipment and devices.
    - 5. Coordinate with fire-alarm tests. Operate as required.
    - 6. Verify that equipment hose threads are same as local fire department equipment.
  - B. Sprinkler piping system will be considered defective if it does not pass tests and inspections.
  - C. Prepare test and inspection reports.
- 3.7 CLEANING
  - A. Clean dirt and debris from sprinklers.
  - B. Only sprinklers with their original factory finish are acceptable. Remove and replace any sprinklers that are painted or have any other finish than their original factory finish.
- 3.8 EXTERIOR FIRE PROTECTION WATER PIPING

- A. Installation is subject to final approval of the Fire Marshall and local water company.
- B. Mains shall be buried with a minimum of 3.5 ft. of coverage per FM. Mains shall be flushed with water at a minimum of 6 ft. per second, and hydrostatically tested at 200 psi for 2 hours. The contractor shall provide a material and test certificate to the engineer to verify proper testing.
- C. Provide all concrete work required for thrust blocks, etc. See drawings for thrust block requirements.
- D. Provide all excavation and backfill required. See Section 220200 EXCAVATION AND BACKFILLING FOR UNDERGROUND PIING.

# END OF SECTION 21 10 00

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAY-ZGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I NG D I A G R A M	C E R T I F I C A T I O N	S A M P L E S	OTHER
Fire Suppression System	х	Х	х	Х		Х	х	

## SECTION 22 01 00 – GENERAL PROVISIONS FOR PLUMBING

### PART 1 – GENERAL

### 1.1 SUMMARY

- A. This section covers the general arrangement of the plumbing systems and related items to complete the work as shown on the drawings and as specified herein.
- B. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- C. The Contractor shall familiarize himself with the work of all other trades, general type construction and the relationship of his work to other sections. He shall examine all working drawings, specifications and conditions affecting his work. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, verify all dimensions in the field and advise the Engineer of any discrepancy before performing any work.
- D. The work shall include complete testing of all equipment and piping at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment.
- E. The Contractor shall perform all necessary temporary work during construction.
- F. Work under this section shall conform to all governing codes, ordinances and regulations of the City, County and State.
- G. The Contractor shall be responsible for all errors in fabrication, for the correct fitting, installation and erection of the various plumbing systems as shown on the drawings.

#### 1.2 SCOPE

- A. This branch of the work includes coordination with all utility companies; providing utility meters; utility tap on fees; agency review fees and all inspection fees; all labor, materials, tools, excavation and backfill and all equipment necessary for the installation of Plumbing Systems as shown on the Drawings and Specifications and/or as required for complete and operating systems. The work shall include starting, balancing and the necessary and required tests to insure the proper operation of the complete system.
- B. A complete and operating plumbing system shall be provided. See plans for diagrams and details.
- C. All work for this project must comply and be in strict accordance with the Kentucky Building Code, Kentucky Plumbing Code, Kentucky Boiler Code, NFPA, ADA, NEC and all local codes and regulations.
- D. In general (as a minimum) all materials and equipment must be installed in strict accordance with manufacturer's requirements; and provided with all required controls, internal fusing, relays, piping connections, electrical connections, etc., to provide for complete and operable systems.

#### 1.3 PERMITS, FEES, CODES AND APPROVALS

- A. Permits and Fees
  - 1. All permits, tap on fees and agency review and inspection fees necessary for the complete Fire Protection and Plumbing systems shall be obtained by the Contractor from the authorities governing such work. The cost of all permits shall be borne by the Contractor.

## B. Codes

- The minimum standard for all plumbing work shall be the requirements of the Kentucky State Plumbing Law, Regulation and Code, Kentucky Building Code, ADA, The Division of Water Quality and local ordinances. All plumbing and fire protection for this project must as a minimum comply and be in strict accordance with the Kentucky Building Code, Kentucky Plumbing Code, Kentucky Boiler Code, NFPA, ADA, NEC, The Division of Water Quality and the "Standards of Safety" of the Commonwealth of Kentucky.
- C. Approvals
  - 1. All work must be approved by the Architect/Engineer, Owner and all related Code Agencies before final payment will be made.
  - 2. As a minimum, the following approval Certificates of Inspection and Approval shall be required:
    - a. Plumbing Inspection
    - b. Health Department Inspection
    - c. Electrical Inspection
    - d. Local and State Building Inspections.
  - 3. Final payment will be contingent upon all Approval Certificates.

# 1.4 DRAWINGS AND SPECIFICATIONS

- A. Contract drawings for work under this section are in part diagrammatic, intended to convey the scope of work and indicate the general arrangement of equipment, piping and the approximate size and location of equipment and outlets. The Contractor shall follow these drawings in laying out his work and shall verify spaces in which his work will be installed, indicating to the Engineer where any conflicts or overlapping of systems occur. Any item of work not clearly included, specified and/or shown, errors or conflict between Plans (Plumbing, Mechanical, Architectural, Structural or Electrical), Specifications, codes and field conditions, shall be clarified by a written request to the Architect by the Bidder before bidding; otherwise, the bidder shall, at his own expense, supply the proper labor and materials to include these items of work and to make good any damages or defects in his work caused by such error, omission or conflict. Under no circumstances shall a Contractor scale the Drawings for the location of equipment and work.
- B. Where job conditions require reasonable changes in indicated locations and arrangement, proposed departures shall be submitted with detailed drawings to the Engineer for approval before any of the proposed work is commenced. All approved departures shall be made at no additional cost to the Owner.
- C. The drawings and the specifications are intended to indicate complete and working systems, unless specifically indicated to the contrary. The work includes the furnishing, installing and connecting of a complete working installation in each case to the full extent set forth in the drawings and herein specified. The Contractor shall be responsible for the complete functioning system, unless specifically noted otherwise.
- D. The drawings and specifications shall be considered as cooperative, work and material included in either, though not mentioned in both, shall be a part of the work to be accomplished and shall be carried out completely in as thorough manner as if covered by both.
- E. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories that may be required. The Contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work

accordingly, furnishing such fittings, pipe, traps, valves and accessories as may be required to make a functional installation at no additional cost to the Owner.

- F. Plumbing as built "Record Drawings" shall be kept up to date each day. "Record Drawings" shall be reviewed by Architect/Engineer each month with contractor's pay request review.
- G. Any deviation in work as shown on plans and specifications must be approved in writing by Architect/Engineer prior to installation.

### 1.5 EXAMINATION OF SITE

- A. Bidders shall visit the site before submitting proposals to satisfy themselves as to the nature and scope of the work and any difficulties attending to the execution.
- B. The submission of a proposal will be construed as evidence that such an examination has been made. Later claims for labor, equipment, materials, etc., required for difficulties encountered which could have been foreseen had such an examination been made, will not be recognized.

## 1.6 EQUIPMENT DESIGN AND INSTALLATION

- A. The design, manufacture, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the applicable standard rules of the following. Where materials are not specifically referred to, but are required, they shall meet the requirements of the applicable code.
  - 1. NEMA -National Electrical Manufacturer's Assoc.
  - 2. UL -Underwriter's Laboratories, Inc.
  - 3. ASME -American Society of Mechanical Engineers
  - 4. ASTM -American Society of Testing Materials
  - 5. ASHRAE -American Society of Heating, Refrigerating and Air Conditioning Engineers
  - 6. BOCA -Building Officials & Code Administrators International, Inc.
  - 7. NFPA -National Fire Protection Association
  - 8. AWWA -American Water Works Association
  - 9. AWS -American Welding Society
  - 10. AMCA -Air Moving and Conditioning Assoc.
  - 11. ANSI -American National Standards Institute
  - 12. NEC -National Electrical Code
  - 13. AIEE -American Institute of Electrical Eng.
  - 14. ARI -Air Conditioning & Refrigeration Institute
  - 15. SMACNA -Sheet Metal and Air Conditioning Contractors National Assoc.
  - 16. LSDHBC -Local and/or State Division of Housing, Building and
    - Construction
  - 17. SPC -State Plumbing Code
  - 18. NPC -National Plumbing Code
  - 19. OSHA -Occupational Safety and Health Adm.
  - 20. EPA -Environmental Protection Agency

- 21. DOE -U.S. Department of Energy
- 22. IMC -International Mechanical Code
- 23. IECC -International Energy Conservation Code
- B. Unless otherwise specified, equipment and materials of the same type and used for the same purpose, shall be products of the same manufacturer.
- 1.7 CAPACITIES, SIZES AND OPERATING CONDITIONS
  - A. Capacities, sizes and conditions specified or shown on drawings shall be regarded as minimum allowable. If the Contractor proposes to furnish any equipment which would have to operate at other than specified conditions to produce final effects, all other directly or indirectly related components of the entire systems (as well as of the structure, finish and other systems in the building) must be properly coordinated to the satisfaction of the Engineer. That is: Operating conditions through the entire system must be such that no motor is overloaded, no equipment operates noisier, faster, or hotter than manufacturer's publication recommends and that no excess stress or demand is imposed on any component of any system or the structure; also that no quality, architectural feature, function or "end result" is affected adversely, in the opinion of the Architect.
  - B. The Architect/Engineer reserves the right to determine if the contractor's proposed materials and equipment of any one manufacturer is acceptable in lieu of the specified material or equipment.
  - C. Where materials and equipment are listed on Drawings and specifications as acceptable or equivalent, this does not relieve the contractor and/or manufacturer from providing and proving to Architect/Engineer that their materials and equipment are equivalent to items the Architect/Engineer used as a guide specification.
  - D. The contractor and manufacturer must confirm to the Architect/Engineer that their equipment and materials will meet the space requirements of the project and that the equipment is easily accessible for maintenance and operation.
- 1.8 LAYOUT
  - A. The Contractor's work lines and established heights shall be in strict accordance with drawings and specifications insofar as these drawings and specifications extend. The Contractor shall verify all dimensions shown and establish all elevations and detail dimensions not shown. He shall also correlate the time so that the work will proceed to the best advantage of the complete job as a unit. The Contractor shall be responsible for furnishing in ample time, any information required to revise footing elevations, build all chases and openings in floors, walls, partitions, ceilings, and roofs to provide clearance which may be required to accommodate the work. The contractor shall set all sleeves, anchor bolts and inserts required to accommodate his equipment before masonry is constructed.
  - B. The Contractor shall layout his work well enough in advance to foresee any conflicts or interferences with work of other sections so that in case of interference, his layout may be altered to suit the conditions, prior to the installation of any work. This procedure will require constant coordination with all sections of the work.

# 1.9 DEMOLITION AND SCHEDULE

- A. All existing plumbing equipment noted on drawings and listed herein that is to be removed or demolished, shall be removed on schedule and disposed of as hereinafter directed.
- B. All items removed shall become the property of the contractor and shall be immediately disposed of offsite at contractor's expense except as noted on drawings unless otherwise directed by owner.

- C. All demolition shall be carefully accomplished in accordance with master construction schedule so as not to remove any item required for support operation during the planned schedule. No item shall be removed until full schedule is worked out with contractors according to owners demands and agreed to in writing by the Engineer.
- D. Storage will be arranged during scheduling process. Contractors to provide own storage and security.
- E. Contractor doing the demolition of equipment must conform to the Clean Air Act of 1990. Refrigerant must be recovered from any air conditioning or refrigeration equipment prior to disconnecting and disposal. The contractor must own and use recovery equipment to meet this requirement. The contractor will be responsible for disposal of refrigerant, refrigerant oil or equipment.
- F. If pipe, insulation or equipment to remain is damaged in appearance or is unserviceable, remove damage or unserviceable portion and replace with new products of equal capacity and quality. All existing piping to remain shall be permanently capped, new or existing valves are not adequate.

## 1.10 ACCESSIBILITY

A. All equipment, valves, motors, traps, unions and all other items which require adjustment, maintenance, repair and observation shall be installed in such a fashion that such maintenance, repair and observation can be readily achieved without undue difficulty. Where the drawings show these items in locations not conforming to the above, the Contractor shall advise the Architect/Engineer of this conflict prior to bid Date otherwise he shall, at his own expense, relocate such items as directed by the Architect/Engineer. Where such items are installed above inaccessible ceilings or in or behind walls, this contractor shall provide approved access panels unless otherwise directed in these Specifications.

## 1.11 ARCHITECTURAL DRAWING AND SPECIFICATIONS

- A. Each Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floor and ceiling heights, for location of walls, partitions, beams etc., and shall be guided accordingly for the setting of all sleeves and equipment.
- B. Under no circumstances shall a Contractor scale the Drawings for the locations of equipment and work.

# 1.12 COOPERATION WITH OTHER CONTRACTORS

A. Each Contractor shall demand and examine all Drawings and Specifications pertaining to the construction before installing the work described and shown under these Drawings and Specifications. Each Contractor shall cooperate with all other contractors in locating piping, openings, chases and equipment in order to avoid conflict with any other contractor's work. It is the responsibility of all trades to examine all shop drawings of other trades that would require equipment to occupy the same space and plane within the building to eliminate any potential conflicts. No extra payment will be allowed for relocation of piping, and equipment not installed in accordance with the above instructions, and which interferes with work and equipment of other contractors.

# 1.13 INSTALLATION OF EQUIPMENT

A. All appliances, materials and equipment shall be installed and connected in accordance with the best engineering practice and in accordance with manufacturer's instructions and recommendations. All auxiliary piping, special controls, water seals, valves, electrical connections, drains, etc., recommended by the manufacturer, required for proper operation, or required by code shall be furnished and installed complete. B. All equipment designed and constructed for indoor use shall not be shipped to the site until such time that the equipment is ready for permanent installation in a dry building or may be stored on site provided equipment is stored in a water and moisture tight storage building or job trailer. Covering equipment outdoors with plastic or tarp is not acceptable.

## 1.14 PROTECTION

- A. No piping shall be installed in any part of the building where danger of freezing may exist without adequate protection being given, whether insulation is specified for the particular piping. All damage resulting from leaking pipes shall be borne by the Contractor under this Division.
- B. All work, equipment and materials shall be protected at all times. All pipe openings shall be closed with caps or plugs during construction. All equipment and accessories shall be tightly covered and protected against dirt, water or other injury during the period of construction.

# 1.15 CUTTING AND PATCHING

- A. All cutting and patching required in connection with the installation of this work, and work due to errors, defective work, ill-timed work or tardiness in properly designating size and location in sufficient time or by failure to notify other trades, shall be done under this section, but only in the manner directed by the Engineer so as to prevent or minimize damage to installed work. Damage as a result of cutting for installation, shall be repaired by mechanics skilled in the trade involved, at no additional expense to the Owner.
- B. No cutting of structural members will be permitted, except when prior permission of the Engineer has been obtained. This work must conform in every respect to the surrounding finish and to the quality of workmanship and materials used.
- C. Piercing of any waterproofing or roofing shall be done only by the trade involved. After the part piercing the waterproofing has been set in place, the opening made for this purpose shall be filled and made absolutely watertight to the satisfaction of the Engineer.
- D. See Section: 220510 SLEEVING, CUTTING, PATCHING AND REPAIRING

## 1.16 FIRE AND SMOKE-STOPPING

- A. Fire-stopping and smoke-stopping shall be provided around all piping penetrations of fire rated and/or smoke-rated floors, walls, ceilings or other barriers.
- B. The materials used shall be UL 263 or UL 1479 classified and meet ASTM E814 standards and be rated for assemblies where applied.
- C. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances that may affect proper fitting, adhesion, or the required fire resistance.
- D. Install penetration seal materials in accordance with manufacturer's instruction.
- E. Seal holes or voids may be penetrations to ensure an effective fire and/or smoke barrier.
- F. Protect materials from damage on surfaces subject to traffic.
- G. Stop insulation flush with wall on insulated pipe and seal edges.
- H. All exposed piping passing through floors, ceilings and walls in finished areas shall be fitted with a chrome plated escutcheon of sufficient outside diameter to amply cover the sleeved opening and ad inside diameter to closely fit the pipe around which it is installed.
- 1.17 CONCRETE WORK AND ANCHOR BOLTS
  - A. The Contractor under this Division shall provide all concrete bases, curbs and pads for all floor and ground mounted equipment unless otherwise indicated.

- B. The Contractor under this Division shall verify the sizes and locations of all supports, bases and pads prior to pouring of same to be certain that the installed units will be compatible.
- C. The Contractor under this Division shall set anchor bolts when required for the equipment prior to pouring of concrete. Sizes and exact locations of bolts shall be determined by the manufacturer's recommendations for the equipment served.
- D. Concrete work must be provided in strict accordance with Section 03 Concrete Work. As a minimum provide pads using 3500 psi concrete not less than 3.5 inches high reinforced with WI.4 x WI.4 welded wire fabric. Chamfer top and edge corners with 3/4" preformed chamfer strips. Subbases shall rest on structural floor and shall be reinforced with steel rods and interconnected with floor reinforcing bars by tie bars hooked at both ends or suitable dowels. Slope top to floor drain if drain is provided in pad.

## 1.18 ACCESS PANELS

- A. The Plumbing Contractor shall furnish all other access panels needed for access to valves, open receptacles, etc., in inaccessible locations installed under this Division of the work.
- B. Access panels shall have a minimum size of 12" x 12" and shall be centered beneath equipment for accessibility and maintenance. Access panels must be of adequate size to service, observe, remove and maintain equipment.
- C. Access panels shall be equal to the types specified under the Architectural Specifications. As a minimum the access panels shall be equivalent to Cesco Products style FB/FB SS, Besco, Inryco/Milcor, Phillips or equivalent, 14 gauge with vandal proof lock and frame as selected by Architect.
- D. Ceiling Types
  - 1. In areas with suspended acoustical tile ceilings (installed on exposed metal grid suspension system so that the tile may be readily removed), equipment, valves, etc., install above these ceilings will be accessible.
  - 2. All plastered ceilings or ceilings having concealed spline type of suspension system will be considered as not removable for accessibility to equipment; therefore, access panels will be required.
  - 3. See Architectural Drawings and Specifications for the types of ceilings throughout the building.
- E. Access panels shall be installed by sub-contractor specialized in access panel installation.

## 1.19 CONNECTION TO EQUIPMENT SPECIFIED IN OTHER SECTIONS

- A. Examine all Contract Documents and be thoroughly familiar with all items of equipment in other sections or by Owner, unless otherwise specified or indicated on Drawings. Roughin for and make final connections to all equipment which requires any of the services specified in this Section and including furnishing and install all valves, P-traps, unions, vacuum breakers and all other specialties as required to make all work and equipment final and operating. It is the intent of the Contract Drawings to detail and indicate all such equipment; however, be responsible for notifying Architect/Engineer in writing of major discrepancies seven (7) days prior to Bid Date; otherwise, all such connections shall be made at no extra cost.
- B. Unless specified otherwise, all conduit, wiring and connections for power to plumbing equipment will be provided by Electrical Contractor. Be responsible for correct sequences of operation of all plumbing equipment after all wiring has been completed.

## 1.20 OPERATING INSTRUCTIONS

A. After all tests have been completed and work accepted by the Owner, a competent representative shall, at a time determined by the Engineer, present verbal and visual instructions to the Owner's personnel in the proper operation of his respective system. For this purpose, each section of work shall be demonstrated and explained to the Owner's personnel and sufficient time allotted for instructions. See Specification Section 220600.

### 1.21 SAFETY

- A. The contractor and his subcontractors for the project shall comply with all applicable Federal, State, and local laws governing safeguards, safety devices, and protective equipment and shall take all other needed actions which they may determine or which the Department may determine to be reasonably necessary to protect the life and health of all employees and personnel on the project, provide for the safety of the public and protect all property affected by the performance of the work covered by the contract.
- B. As provided in KRS Chapter 338 in the Kentucky Occupational Safety and Health Act and in subsequent regulations and standards promulgated by the Kentucky Occupational Safety and Health Standards Board, neither the Contractor nor his subcontractors shall require any laborer or mechanic employed in performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety.
- C. The contractor shall not remove or disturb any suspected hazardous materials, including asbestos-containing materials, lead based paints, electrical equipment containing PCB's, or any other except as instructed in this contract. If any material not covered by the contract is encountered, notify the Engineer immediately.

# 1.22 TESTS - GENERAL

- A. All tests required to establish the adequacy, quality, safety, completed status and suitable operation of each system and all components thereof shall be made in the presence of and to the satisfaction of the Engineer or his authorized representative and other representatives of State and local Government. All instruments, labor and expert service necessary to conduct these tests shall be supplied by the Contractor; power and fuel will be furnished by the Owner.
- B. The final inspection and tests are to be made only after the Engineer is satisfied that the work described in these specifications has been completely installed in accordance with the true spirit and intent of these specifications and that complete preliminary tests were made which indicate adequacy, quality, completion and satisfactory operation. The acceptance of the work herein specified, shall not in any way prejudice the Owner's right to demand replacement of defective material and/or workmanship.

#### 1.23 CLEANING

- A. General: Clean all piping and equipment systems as required to leave the piping and equipment clean and free from scale, silt, contamination, etc., as normally required and as specified herein.
- B. Utilities and Equipment: The Contractor shall provide all necessary temporary materials and equipment to clean the piping and equipment installed under this specification. No permanent equipment shall be used for storage, mixing, settling, compressing, pumping, etc., without the approval of the Architect. The Contractor shall supply a separate and independent source of clean, dry, oil-free air for the blowdown of systems requiring this method of cleaning.

- C. Use of Chemicals: No chemicals, wetting or drying agents shall be used to clean systems or equipment where the materials of the system undergo any changes in their physical or structural characteristics. In case of any doubt as to the compatibility of any materials to the cleaning solution used, the Contractor shall obtain prior written approval for the use of the solution from the manufacturer of the equipment. Piping systems, equipment and sub-assemblies shall be cleaned after completion of welding, machining, threading, testing and any other operations capable of contaminating the system piping or equipment. After cleaning, the permanent strainers shall be removed, cleaned and replaced. Temporary strainers shall be periodically removed, cleaned and replaced during cleaning in lines ahead of equipment to protect against particles becoming lodged in the equipment.
- D. After the Architect/Engineer has complete examination, this Contractor shall remove all stickers, tags, etc., and shall thoroughly clean all equipment, fixtures, and materials installed under his section of the work.
- E. Surplus material, rubbish and equipment resulting from the work shall be removed from the building and premises by the Contractor upon completion of the work in accordance with the General Conditions.
- F. All equipment shall be thoroughly cleaned to "Factory New" condition prior to turning over to owner. Touch up or completely repaint equipment as required.
- G. Keep all nameplates on equipment clean and exposed for easy reading.

# 1.24 WARRANTY AND SERVICE

- Α. All equipment shall be warranted for a period of at least one (1) year from the date of acceptance, as evidenced by date of substantial completion for the entire project or for the last phase of the project, whichever occurs later, against defective materials, design, and workmanship. In addition to the equipment warranty, the Contractor shall provide all repair and adjustment service necessary for the proper operation of the entire system for a period of one (1) year after the date of acceptance, as evidenced by the date of substantial completion for the entire project or for the last phase of the project, whichever occurs later. Upon receipt of notice from the Owner's representative of failure of any part of the warranted system or equipment during the warranty period, the affected part shall be replaced promptly with a new part without cost to the Owner. Upon failure to take action within 24 hours after being notified, the work will be accomplished by the Engineer at the expense of the Contractor. See General Conditions and individual equipment specifications. Note that the warranty period of time specified in this section represents the minimum warranty period required for work performed under specification Division 21, Where the General Conditions and/or individual equipment/system 22 and 23. specifications require a warranty period of longer duration or earlier start date than specified in this paragraph, the longer duration/earlier start date shall supersede for those portions of work covered by that specification. In the event the contractor is notified of warranty issues but does not correct or address the warranty issues prior to the end of the specified warranty period, the contractor will not be relieved of the responsibility to correct the deficient items after the warranty end date has passed.
- B. Make a minimum of two (2) service calls during guarantee period, free of charge, to check with Owner and to check and repair malfunctioning equipment which was installed. Service calls shall be in middle and end of guarantee period and as required to maintain systems operation. Dates shall be listed in operating and maintenance manuals, along with contractor's name and phone number.

## 1.25 ELECTRIC MOTORS

A. All motors shall be designed, tested and applied in accordance with the applicable standards listed hereinbefore. Motors shall be of sufficient size for the duty to be performed and shall not exceed the full load rating when the driven equipment is

operating at specified capacity. Unless otherwise specified, all motors shall be high efficiency type and shall have open frames and continuous-duty classification based on 50 degrees C. ambient temperature. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics. Motors shall meet NEMA high efficiency standards MGI - 1.41.2 for energy efficient polyphase squirrel-cage motor. Efficiency shall be in accordance with MGI - 1.2.55. When motor horse powers required differ from those indicated on the drawings, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, starters and branch-circuit protection at no additional cost to the Owner.

- 1. Motors shall be rated for continuous duty capable of driving the connected loads without exceeding temperature limitations of the motor insulation. Special Class A moisture-resisting insulation (designed to operate in a 50-degree C. ambient without exceeding a temperature rise rating designated by NEMA for the type of enclosure used) shall be utilized in each motor.
- B. Unless otherwise indicated or specified, the electrical components required to operate plumbing equipment, such as, motors, float and pressure switches, solenoid valves, and other devices functioning to control the plumbing equipment, shall be furnished as part of the plumbing equipment, shall be complete and operable, and shall be included under this section of the specifications. All motor starters not part of a motor control center shall be included under this Section and shall be the hand off auto type with 3 over-loads on 3 phase units and 120V control transformer. Conduit and wires required for external electrical connections shall be furnished and are specified under DIVISION 26 ELECTRICAL. Integral phase failure relay shall be provided as a part of all three phase motor starters. Relay shall shut motor down on phase loss or phase unbalance and automatically reset when normal phasing is restored. Phase failure relay shall have adjustable restart time capabilities. Plumbing contractor shall coordinate staggered restart times as required.

# 1.26 AS-BUILT DRAWINGS

- A. The Contractor shall deliver to the Engineer at the completion of the work, one (1) print of "As-Built" drawings, showing legibly and accurately, plumbing and piping systems with equipment locations shown as actually installed. Changes in original plans shall be neatly shown in red pencil. Each print shall be signed by the sub-contractor who has done the work.
- B. During construction the Contractor shall retain a set of blue line drawings on the site for recording all changes. These drawings shall be available for inspection by the Engineer.

## 1.27 TESTS

- A. The Architect/Engineer shall be notified by the Contractor under this Division forty-eight (48) hours in advance of any tests so that the Architect/Engineer or his representative may be present when the tests are run. Leaks or imperfections found shall be corrected and a new test shall be run to the satisfaction of the Architect/Engineer. Upon successful completion of the test, pipe covering may be applied and piping may be concealed. A successful test, even if witnessed, however, does not relieve the Contractor under this Division of the responsibility for any failure during the guarantee period.
- B. After pipe fabrication has been completed, all water piping shall be subjected to a hydrostatic test of 100 psi and proven tight and free of leaks for a 24-hour period. Tests shall be applied to the piping before being attached to any equipment which would be damaged by the test pressure. Damage to equipment caused by testing shall be repaired or replaced without additional cost to the Owner.
- C. The sanitary sewer piping and sanitary waste, vent and drainage piping installed under this Division in, under or outside the building shall be tested by means of water, smoke or air in accordance with the Kentucky State Plumbing Law, Regulation and Code, Division

of Water Quality and the local utility company requirements. These shall be made in the presence of the Plumbing Inspector and the Architect/Engineer.

- D. Exterior water piping shall be tested in strict compliance with local water company. The minimum hydrostatic test pressure is 1 1/2 times the water pressure serving the site.
- E. No insulation, paint, backfill or other prohibitive covering shall be applied to piping prior to the above tests.
- F. Provide all temporary equipment, materials, valves, gauges, etc., required for the preceding tests.
- G. The expense of all tests shall be borne by the Contractor under this Division.

### 1.28 CONTRACTOR FURNISHED DRAWINGS, DESCRIPTIVE DATA AND MANUALS

- A. Approval of Materials and Equipment: Within 30 days of receipt of notice to proceed, and before starting installation, the Contractor shall submit to the Architect for approval, in triplicate, lists of materials, fixtures and equipment to be incorporated in the work. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons therefore shall be submitted with drawings. Where such departures require piping or equipment to be supported otherwise than shown, the details submitted shall include loadings and type and kinds of frames, brackets, stanchions, or other supports necessary. Approved departures shall be supported by sufficient descriptive material, such as catalog cuts, diagrams, and other data published by the manufacturer, as well as evidence of compliance with safety and performance standards, to demonstrate conformance to the specification requirements; catalog numbers alone will not be acceptable.
- B. Conformance to Agency Requirements: Where materials or equipment are specified to be constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Air Moving and Conditioning Association, or the American Society of Heating, Refrigerating and Air Conditioning Engineers, or to be approved by the Underwriters' Laboratories, Inc., the Contractor shall submit proof that the items furnished under this specification conform to such requirements. A certificate or published statement by the manufacturer will be sufficient evidence that the item conforms to the specified requirements. In lieu of such stamp, certificate, or statement, the Contractor may submit written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements listed hereinbefore, including methods of testing, of the specified agencies.
- C. Shop Drawings
  - 1. In accordance with the General Conditions, shop drawings shall be submitted on all units of prefabricated materials. Shop drawings shall show, in detail, all parts of the work, fully dimensioned and shall also indicate construction, concealed and other jointing, thickness of materials, method of anchoring and attachment to other materials. Where required for certain work, submit setting and bending diagrams and mark same to correspond with the design drawings, identifying locations of various items. Show types, sizes and locations of sleeves and inserts.
  - 2. The Contractor shall check all shop drawings for completeness and for correctness before submitting the drawings. If major corrections are required on the drawings, the Contractor shall return the drawings to the originator and have the changes made. The Contractor shall indicate his corrections on the prints in green pencil and sign all prints and other material sent to the Engineer.

- 3. Detail and Erection Drawings: Detail and erection drawings for equipment, piping and other items of this nature shall be carefully prepared in accord with standard practice and shall show erection plans and member details with all individual parts identified on both the detail sheets and erection plans. All identification markings shall be carefully preserved until after the erection process is completed.
- 4. Material Data: The Contractor shall submit descriptive data, as required, on pipe, fittings and valves to be incorporated into the work. This data shall be in sufficient detail to allow the Engineer to determine that the pipe, fittings and valves meet the requirements of the contract drawings and specifications or that they are an acceptable equal to that specified. All data shall be in the form of manufacturer's or supplier's literature concerning the product and shall indicate catalog number, conditions of use, application instructions, and/or other information as applicable.
- 5. Equipment Data: The Contractor shall submit descriptive data on all items of equipment to be furnished and installed under this contract. These submittals shall consist of manufacturer's published catalog information which completely describes component materials, configuration and rough-in data for plumbing and electrical equipment shall also include cuts, diagrams, characteristic curves and capacity information as applicable. Where more than one item of equipment is employed in the same system, the submittal of equipment data will include special diagrams showing the electrical wiring, interconnecting piping, related controls and relation and operation of the various items of equipment for the entire system.
- D. Operating Instructions and Maintenance Manuals, Etc.
  - 1. At completion of the contract, the Owner shall be provided with three (3) bound copies of operations and maintenance instructions, recommended list of spare parts required for a period of one (1) year and a list of any special tools required to maintain the equipment for the various items of the plumbing equipment. Where special tools are required, the Contractor shall furnish two (2) of each such tools to the Owner at no additional contract cost.
  - 2. MANUAL SHALL INCLUDE ALL APPROVED SHOP DRAWINGS OF EQUIPMENT REQUIRING OPERATION AND MAINTENANCE INFORMATION.
  - 3. MANUAL SHALL BE ORGANIZED WITH APPROVED SHOP DRAWING FOLLOWED BY ALL RELATED OPERATION AND MAINTENANCE MATERIAL.
  - 4. EQUIPMENT SHALL BE IDENTIFIED IN ACCORDANCE WITH THE DRAWING NOMENCLATURE AND INCLUDE SUPPLIER OF SAID EQUIPMENT.
  - 5. Instructions shall be included for routine checking of all items requiring continued maintenance.
  - 6. Schematic drawings with actual pieces of plumbing equipment, etc., shall be included; where manufacturer's parts numbers only are applicable, they shall be included.
  - 7. Detailed operating instructions for plumbing equipment shall be included, as well as general maintenance procedures to be followed on such equipment. Manufacturers maintenance and operation manuals will be required where such are normally available with the equipment, but as such information is often of a general nature and applicable to various models of equipment, such information shall be supplemented by specified typed directions for the particular piece of equipment applicable to this project.
- E. Materials, Equipment and Appliances
- 1. Materials: All materials, equipment, products and incidentals to be furnished by the Contractor shall be new, unless otherwise specified, undamaged and the first line quality product of the manufacturer and/or supplier, except when competitive grades fully meet the standards specified in the various technical sections of these specifications.
- 2. Standard Products: Except as otherwise approved by the Engineer, the equipment and appliances to be furnished under these specifications shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design. Where two or more units of the same type and class of equipment are required, the units shall be the product of the same manufacturer and shall be identical insofar as possible. The component parts of the products need not be products of one manufacturer.
- 3. Manufacturer's Directions: Where manufacturer's instructions or recommendations are applicable to the installation or application of materials, the Contractor shall adhere to strict conformance with such instructions or recommendations unless specifically noted to the contrary in these specifications. Where such directions conflict with the drawings and specifications, the Contractor shall inform the Engineer of such conflict and request instructions.
- 4. Samples: The Contractor shall furnish, for approval, samples of materials, profiles, designs, finishes, etc., which are either required by the various sections of specifications or which the Engineer may request from time to time. Samples shall be clearly identified with adequate information for the Engineer's evaluation.
- 5. Materials and Equipment Delivered to Jobsite: All items of materials, equipment, supplies and miscellaneous items to be incorporated into the work shall be delivered to the jobsite with labels, tags, nameplates and/or containers which clearly indicate the manufacturer's item or catalog number or conformance with the applicable standards stipulated in the technical sections of the specifications. Any item which cannot be verified in the field shall not be included in the work until its identity can be established by the Engineer.
- F. Equipment and Material Substitutions
  - 1. Should the Contractor elect to use and install materials which have been approved for use other than specified, he shall be required to make any necessary changes, perform all work and furnish any additional materials and ancillary equipment required to make such substituted materials or equipment function or perform as that specified, at no cost to the Owner. This includes structural, electrical and/or other affected trades.

# 1.29 DEFINITIONS

- A. Plumbing Contractor: Any contractor whether bidding or working independently or under the supervision of a general contractor and/or construction manager and who installs any type of plumbing work.
- B. Plumbing Sub-Contractor: Any contractor contracted to or employed by the plumbing contractor for any work required by the mechanical contractor.
- C. Engineer: The consulting mechanical/electrical engineers either consulting to the owners, architects, other engineers, etc.
- D. A-E: Shall construe architect and/or engineer. In all situations that involve an architect, it shall construe architect, in all others, engineer.

- E. Furnish: Deliver to the site in good condition and turn over to contractor responsible for installation.
- F. Provide: Furnish and install in complete working order.
- G. Install: Install equipment furnished by others.
- H. Indicated: Shown on the drawings or addenda thereto.
- I. Contract Documents: All documents pertinent to the quality and quantity of work to be performed on the project. Includes but not limited to: plans, specifications, instructions to bidders, general and special conditions, addenda, alternates, list of materials, list of subcontractors, unit prices, shop drawings, field orders, change orders, cost breakdown, periodical payment requests, etc.
- 1.30 INTENT
  - A. It is the intention of these specifications and all associated drawings to call for finished work, tested and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use".
  - B. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

PART 2 - PRODUCTS

## NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

END OF SECTION 22 01 00

SECTION 22 02 00 – EXCAVATION AND BACKFILLING FOR UNDERGROUND PIPING

PART 1 - GENERAL

### 1.1 SUMMARY

- A. Section Includes:
  - 1. Excavating and backfilling trenches for utilities and pits for buried utility structures.

# 1.2 FIELD CONDITIONS

A. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

#### PART 2 - PRODUCTS

- 2.1 SOIL MATERIALS
  - A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.
  - B. Satisfactory Soils: Soil free of rock or gravel larger than 3 inches in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
  - C. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch (37.5-mm) sieve and not more than 12 percent passing a No. 200 (0.075-mm) sieve.
  - D. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch (25-mm) sieve and not more than 8 percent passing a No. 200 (0.075-mm) sieve.

# 2.2 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored to comply with local practice or requirements of authorities having jurisdiction.
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored to comply with local practice or requirements of authorities having jurisdiction.
- C. See specification Section 220553 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT.

#### PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

# 3.2 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.

## 3.3 EXCAVATION FOR STRUCTURES

A. Excavation for Underground Tanks, Basins, and Mechanical Utility Structures: Excavate to elevations and dimensions indicated within a tolerance of plus or minus 1 inch. Do not disturb bottom of excavations intended as bearing surfaces.

#### 3.4 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe unless otherwise indicated.
  - 1. Clearance: 12 inches each side of pipe.
- C. All trench excavation side walls greater than five (5) feet in depth shall be sloped, shored, sheeted, braced or otherwise supported by means of sufficient strength to protect workmen within them in accordance with the applicable rules and regulations established for construction by the Department of Labor, Occupational Safety and Health Administration (OSHA), and by local ordinances. Lateral travel distance to an exit ladder or steps shall not be greater than 25 feet in trenches 4 feet or deeper.
- D. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes. Remove projecting stones and sharp objects along trench subgrade.
  - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- E. Trenches in Tree- and Plant-Protection Zones:
  - 1. Hand-excavate to indicated lines, cross sections, elevations, and subgrades. Use narrow-tine spading forks to comb soil and expose roots. Do not break, tear, or chop exposed roots. Do not use mechanical equipment that rips, tears, or pulls roots.
  - 2. Do not cut main lateral roots or taproots; cut only smaller roots that interfere with installation of utilities.

# 3.5 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect/Engineer.
  - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect/Engineer.

## 3.6 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

# 3.7 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Trenches under Footings: Backfill trenches excavated under footings and within 18 inches of bottom of footings with satisfactory soil; fill with concrete to elevation of bottom of footings. Concrete is specified in Section 033000 "Cast-in-Place Concrete."
- D. Trenches under Roadways: Provide 4-inch thick, concrete-base slab support for piping less than 30 inches below surface of roadways. After installing and testing, completely encase piping in a minimum of 4 inches of concrete before backfilling or placing roadway subbase course. Concrete is specified in Section 033000 "Cast-in-Place Concrete."
- E. Initial Backfill: Place and compact initial backfill of subbase material or satisfactory soil, free of particles larger than 1 inch in any dimension, to a height of 12 inches over the pipe.
  - 1. Carefully compact initial backfill under pipe haunches and compact evenly up on both sides and along the full length of piping to avoid damage or displacement of piping. Coordinate backfilling with utilities testing.
- F. Final Backfill: Place and compact final backfill of satisfactory soil to final subgrade elevation.
- G. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.
- 3.8 COMPACTION OF SOIL BACKFILLS AND FILLS
  - A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
  - B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
  - C. Compact soil materials to not less than the following percentages of maximum dry unit weight according to ASTM D 698 or ASTM D 1557:
    - 1. For utility trenches, compact each layer of initial and final backfill soil material at 85 percent.

# 3.9 PROTECTION

- A. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.
- 3.10 DISPOSAL OF SURPLUS AND WASTE MATERIALS

A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 22 02 00

# SECTION 22 05 17 – SLEEVING, CUTTING, PATCHING AND REPAIRING FOR PLUMBING

## PART 1 - GENERAL

- 1.1 SUMMARY
  - A. This section includes requirements for the Plumbing Contractor related to sleeving, cutting, patching, and repairing associated with plumbing work.
- 1.2 WORK INCLUDED
  - A. Sleeves
  - B. Sleeve Seals
  - C. Grout
  - D. Escutcheons
  - E. Lintels
- 1.3 RELATED DOCUMENTS
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK

## PART 2 - PRODUCTS

- 2.1 SLEEVES
  - A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductileiron pressure pipe, with plain ends and integral water stop unless otherwise indicated.
  - B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
  - C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
  - D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
  - E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness, round tube closed with longitudinal joint.
- 2.2 SLEEVE-SEAL SYSTEMS
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. Advance Products & Systems, Inc.
    - 2. Metraflex Company (The).
    - 3. Proco Products, Inc.
  - B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
    - 1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
    - 2. Pressure Plates: Carbon steel, Plastic, or Stainless steel.

3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

# 2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Nonshrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## 2.4 ESCUTCHEONS

- A. Escutcheons shall be Beaton and Caldwell; Carpenter and Patterson; Fee and Mason or approved equivalent. Chromium-plated iron or chromium-plated brass, either one piece or split patterns, held in place by internal spring tension or set screw that completely covers opening.
- 2.5 LINTELS
  - A. New openings under 48" in width: Provide one 3 1/2" x 3 1/2" x 3 1/2" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on either side.
  - B. New openings 48" to 96" in width: Provide one 3 1/2" x 6" x 3/8" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on either side.
  - C. New openings over 96" in width: Consult the project structural engineer.

# PART 3 - EXECUTION

- 3.1 GENERAL
  - A. The Contractor shall be responsible for all openings, sleeves, trenches, etc., that he may require or create by demolition in floors, roofs, ceilings, walls, etc., and shall coordinate all such work with the General Contractor and all other trades. Coordinate with the General Contractor, any openings which he is to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the Contractor.
  - B. The Contractor shall plan his work ahead and shall place sleeves, frames or forms through the walls, floors and ceilings during the initial construction, where it is necessary for piping, ductwork, conduit, etc., to go throughout; however, when this is not done, the Contractor shall do all cutting and patching required for the installation of his work, or he shall pay other trades for doing this work when so directed by the Engineer. Any damage caused to the buildings by the workmen of the responsible Contractor must be corrected or rectified by him at his own expense.
  - C. The Contractor shall notify other trades in due time where he will require openings or chases in new concrete or masonry. He shall set all concrete inserts and sleeves for his work. Failing to do this, he shall cut openings for his work and patch same as required at his own expense.
  - D. The Contractor shall be responsible for properly shoring, bracing, supporting, etc., any existing and/or new construction to guard against cracking, settling, collapsing, displacing or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements shall be promptly and properly made good to the satisfaction of the Engineer.

E. All work improperly done or not done at all as required by the Mechanical Trades in this section, will be performed by the Contractor at the direction of the trade whose work is affected.

#### 3.2 SLEEVES

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
  - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
  - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeveseal system.
- D. Install sleeves for pipes passing through interior partitions.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
  - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
- F. Pipes Passing Through Waterproofing Membranes: Pipes passing through floor waterproofing membrane shall be installed through a 4-pound lead-flashing sleeve, or a 0.032-inch thick aluminum sleeve, each with an integral skirt or flange. Flashing sleeve shall be suitably formed, and the skirt of flange shall extend not less than 8 inches from the pipe and shall set over the floor membrane in a troweled coating of bituminous cement. The flashing sleeve shall extend up the pipe a minimum of 1 inch above the floor. The annular space between the flashing sleeve and the metal-jacket-covered insulation shall be sealed. At the Contractor's option, pipes passing through floor waterproofing membrane may be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing clamp device, and a pressure ring with brass bolts. Waterproofing membrane shall be clamped into space and sealant shall be placed in the caulking recess.
- G. Pipes Passing Through Roof: Pipes passing through the roof shall be installed where shown on the drawings. Any penetration in roof shall be approved by the Roofing Manufacturer.

# 3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space

between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

#### 3.4 ESCUTCHEONS

A. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used.

## 3.5 CUTTING

- A. All trades shall coordinate all openings in masonry walls with the General Contractor, and, unless otherwise indicated on the Architectural drawings, shall provide lintels for all openings required for the plumbing work (piping, wall boxes, etc.).
- B. No cutting is to be done at points or in a manner that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the engineer.
- C. Pipe openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe cut with a masonry saw.
- D. Openings in metal building walls shall be made in strict accord with building suppliers recommendations.

#### 3.6 PATCHING AND REPAIRING

- A. Patching and repairing made necessary by work performed under this division shall be included as part of the work and shall be done by skilled mechanics of the trade or trades for work cut or damaged, in strict accordance with the provisions herein before specified for work of like type to match adjacent surfaces and in a manner acceptable to the engineer.
- B. Where portions of existing lawns, shrubs, paving, etc. are disturbed for installation or work of this Division, such items shall be repaired and/or replaced to the satisfaction of the engineer.
- C. Where the installation or removal of piping, etc. requires or creates the penetration of fire or smoked rated walls, ceilings or floors, the space around such pipe, etc., shall be tightly filled with an approved non-combustible fire insulating material satisfactory to maintain the rating integrity of the wall, floor or ceilings affected.
- D. Piping passing through floors, ceilings and walls in finished areas, unless otherwise specified, shall be fitted with chrome plated brass escutcheons of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the pipe around which it is installed.
- E. Where pipes pass through exterior walls, the wall openings shall be sealed air and water tight. This shall include sealing on both sides of the wall to insure air and water does not enter or exit the wall cavity. This is especially critical on exterior walls where the wall cavity may be vented to the exterior.

END OF SECTION 22 05 17

SECTION 22 05 29 – HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

### PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Pipe and Equipment Hangers, Supports, and Associated Anchors
- 1.2 RELATED DOCUMENTS
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK
  - C. Section 220719 PLUMBING PIPING INSULATION
  - D. Section 221000 PLUMBING PIPING
- 1.3 REFERENCES
  - A. ANSI/ASME B31.1 Power Piping
- 1.4 SCOPE
  - A. This specification shall apply for the design and fabrication of all hangers, supports, anchors and guides. Where piping design is such that exceptions to this specification are necessary, the particular system shall be identified, and the exceptions approved by Engineer prior to installation. See drawings.
- 1.5 STRUCTURE
  - A. This section is intended to cover the structural requirements of the piping and equipment. It is not intended to imply that the building structure will support the loads imposed. The contractor shall review the structural drawings for where loads can be applied, what load can be supported and what structural reinforcing is required. Specific questions can be directed to the structural engineer.

# 1.6 DESIGN

- A. All supports and parts shall conform to the latest requirements of the ANSI Code for Pressure Piping B31.1.0, and MSS Standard Practice SP-58, SP-69 and SP-89 except as supplemented or modified by the requirements of this specification.
- B. Designs generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible.
- C. Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment connection.
- D. Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.
- E. Where possible, steel structural attachments shall be beam clamps. Other attachments shall be as scheduled.
- F. All rigid hangers shall provide a means of vertical adjustment after erection.
- G. Hanger rods shall be subject to tensile loading only. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing.

- H. Where horizontal piping movements are greater than ½ inch, or where the hanger load angularity from the vertical is greater than 4 degrees from the cold to hot position of the pipe, the hanger rod to structural attachment shall be by use of Anvil Fig. 47 and Fig. 299 or the hanger rod and structural attachments shall be offset in such manner that the rod is vertical in the hot position.
- I. Hangers shall be designed so that they cannot become disengaged by movements of the supported pipe.
- J. Hangers shall be spaced in accordance with ANSI B31.1.0
- K. Where practical, riser piping shall be supported independently of the connected horizontal piping.
  - 1. Pipe support attachments to the riser piping shall be riser clamp lugs. Welded attachments shall be of material comparable to that of the pipe, and designed in accordance with ANSI B31.1 codes.
- L. Supports, guides and anchors shall be so designed that excessive heat will not be transmitted to the building steel. The temperature of support parts shall be based on a temperature gradient of 100 degrees F per inch distance from the outside surface of the pipe.

#### PART 2 - PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

A. Anvil, B-Line, Elcen, Mason Industries, Advanced Thermal, Fee & Mason, Piping Specialties, MIRO Industries.

# 2.2 SHIELDS

- A. Shield for Insulated Piping 2 Inches and Smaller: galvanized steel shield over insulation in 180-degree segments, minimum 12 inches long at pipe support. See schedule for thickness.
- B. Shield for Insulated Piping 2 <sup>1</sup>/<sub>2</sub> Inches and Larger: Pipe covering protective saddles.
- C. Shields for Insulated Cold Water Piping 2 <sup>1</sup>/<sub>2</sub> Inches and Larger: Hard block nonconducting saddles in 90-degree segments, 12-inch minimum length, block thickness same as insulation thickness.
- D. Shields for Vertical Copper Pipe Risers: Sheet lead.

# 2.3 HANGER RODS

A. Threaded one end, threaded both ends, threaded continuously.

## 2.4 INSERTS

A. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

# 2.5 PIPE HANGERS, SUPPORTS AND ANCHORS

- A. Beam Clamps
  - 1. Beam clamps shall have malleable iron jaws, steel bolt or tie rod, nuts and jamb nuts.
  - 2. C-clamps will not be permitted unless retainer is provided.
- B. Finish

1. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

## PART 3 - EXECUTION

- 3.1 INSERTS
  - A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - B. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.
- 3.2 PIPE HANGERS AND SUPPORTS
  - A. Support horizontal piping indicated in schedule on drawings.
  - B. Install hangers to provide minimum  $\frac{1}{2}$  inch space between finished covering and adjacent work.
  - C. Place a hanger within 12 inches of each horizontal elbow.
  - D. Provide hangers with 1-1/2-inch minimum vertical adjustment.
  - E. Support riser piping independently of connected horizontal piping.
  - F. Support horizontal piping as follows:

Nominal Pipe Size	Single Rod Diameter	Thickness of Insulation Shield	Maximum Spacing Ferrous Piping	Copper Tubing	HDPE Piping
3/4" & Under	3/8"	16 gauge	6'	5'	2.5'
1"	3/8"	16 gauge	7'	6'	3'
1 1/4	3/8"	16 gauge	8'	8'	4'
1 1⁄2"&2"	3/8"	16 gauge	9'	8'	4'
2 1⁄2"&3"	1/2"	12 gauge	12'	8'	4'
4" & 5"	5/8"	12 gauge	14'	8'	4'
6"	3/4"	10 gauge	14'	8'	4'
8"	7/8"	8 gauge	14'	10'	5'

END OF SECTION 22 05 29

# SUBMITTAL

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAW-NGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	C E R T I F I C A T I O N	S A M P L E S	OTHER
Pipe Hangers	Х	х						
Supports	Х	Х						
Inserts		х						

# SECTION 22 05 53 – IDENTIFICATION OF PLUMBING PIPING AND EQUIPMENT

# PART 1 - GENERAL

# 1.1 SCOPE

- A. Identification of products installed under Division 21 and 22 including:
  - 1. Plastic Nameplates
  - 2. Plastic Tags
  - 3. Metal Tags
  - 4. Stencils and Paint
  - 5. Plastic Pipe Markers
  - 6. Plastic Tape Pipe Markers
  - 7. Underground Plastic Tape Pipe Markers

# 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK

## 1.3 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

## 1.4 SUBMITTALS

- A. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Submit product data and manufacturer's installation instructions.

## PART 2 - PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS
  - A. Seton
- 2.2 Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
- 2.3 Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.
- 2.4 Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2-inch square.
- 2.5 Metal Tags: Brass or aluminum with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.
- 2.6 Stencils: With clean cut symbols and letters of following size:

Outside Diameter of Insulation or Pipe	Length of Color Field	Size of Letters
3/4" - 1-1/4"	8"	1/2"
1-1/2" - 2"	8"	3/4"

2-1/2" - 6"	12"	1-1/4"
8" - 10"	24"	2-1/2"
Over 10"	32"	3-1/2"

- A. Stencil Paint: Semi-gloss enamel black unless otherwise indicated.
- 2.7 Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.
- 2.8 Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.
- 2.9 Underground Plastic Pipe Markers: Bright colored continuously printed plastic ribbon tape of not less than 6-inch-wide by 4 mil thick, manufactured for direct burial service.
  - A. Underground plastic piping to be installed with a tracer wire.

#### PART 3 - EXECUTION

- 3.1 PREPARATION
  - A. Degrease and clean surfaces to receive adhesive for identification materials and to accept stencil painting.

#### 3.2 INSTALLATION

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.
- B. Plastic or Metal Tags: Install with corrosive-resistant chain.
- C. Stencil Painting: Apply in accordance with manufacturer's instructions.
- D. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.
- E. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.
- F. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.
- G. Equipment: Identify plumbing equipment such as but not limited to pumps, water heaters, storage tanks, expansion tanks, water treatment devices etc. with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic or metal tags.
- H. Controls: Identify control panels and major control components outside panels with plastic nameplates.
- I. Valves: Identify valves in main and branch piping with tags.
- J. Piping: Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Stenciled painting may be used on insulation. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

#### 3.3 VALVES AND CHARTS

A. The Contractor under this Division shall attach a numbered brass tag to each valve installed under this Contract. Each number shall be prefixed with the "P" for plumbing valves. Tags shall be attached to the valves by means of brass "S" hooks. Tags shall be Seton Name Plate Co., C.H. Hanson Co. or Identifications.

B. A chart headed ""PLUMBING VALVE CHART" shall be prepared. Three original charts shall be prepared and approved by the engineer. One of each approved type chart shall be framed under glass and mounted on the wall in the main mechanical room where directed. Three photocopies of each chart shall be made and shall be submitted through normal shop drawing channels for approval and subsequent owner's files. Each chart shall be formatted as shown below: (All normally closed valves shall have a brass tag marked Normally Closed.)

# PLUMBING VALVE CHART PROJECT NAME DATE TAG NO. VALVE LOCATION VALVE TYPE/SIZE VALVE FUNCTION

END OF SECTION 22 05 53

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	S H O P D R A W I N G S	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A L	W I R I N G I A G R A M	C E R T I F I C A T I O N	S A M L E S	OTHER
Valve Chart	Х							
Valve Tags	Х	Х						
Stencils		Х						
Таре		Х						
Pipe Markers		Х						

# SECTION 22 06 00 – PLUMBING SYSTEMS DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems and equipment.
  - 2. Training in operation and maintenance of systems, subsystems and equipment.
  - 3. Demonstration and training DVDs.

#### 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK

#### 1.3 SUBMITTALS

- A. Instruction Program: Submit copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module
  - 1. At completion of training, submit training manual for Owner's use which includes receipts signed by the Owner acknowledging that training took place.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Demonstration and Training DVDs: Provide recording of all demonstrations and training given and submit DVD within ten days of end of each training module.
  - 1. Identification: Provide an applied label with the following:
    - a. Name of Project
    - b. Name of Engineer
    - c. Name of Contractor
    - d. Date DVD was recorded
    - e. Description of information recorded.
  - 2. Transcript: Prepared on 8-1/2-by 11-inch paper, punched and bound in heavyduty, three ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding DVD. Include name of Project and date of DVD on each page.

# 1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with operation and maintenance manual information.

#### PART 2 - PRODUCTS

- 2.1 DEMONSTRATION AND TRAINING PROGRAM
  - A. Provide program that includes individual training modules for each system and equipment not a part of a system as required by individual Specification Sections and as follows, but not limited to:
    - 1. Plumbing: Provide demonstration and training by showing Owner personnel the major components of the plumbing system as follows:
      - a. Domestic water meter and location of meter
      - b. Domestic water entrance to building and all related components
      - c. Domestic hot water heaters and location of each
      - d. Domestic hot water circulating pumps and location of each
      - e. Domestic water mixing valves and location of each
      - f. Domestic water mixing valves at emergency showers
      - g. Electronic flush valves and faucets
      - h. All plumbing fixture types
      - i. Overview of sanitary sewer system layout and major components such as cleanouts, manholes, grease trap, plaster trap, etc.
    - 2. Fire Protection: Provide demonstration and training by showing Owner personnel the major components of the fire protection sprinkler system as follows:
      - a. Building water entrance and all associated risers
      - b. Location of drain valves throughout the system
      - c. Location of spare sprinkler heads
      - d. Location of fire department connection
      - e. Location of fire protection vault

# PART 3 - EXECUTION

# 3.1 PREPARATION

A. Assemble materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

# 3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner personnel to adjust, operate, and maintain systems, subsystems, and equipment not a part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
- C. Schedule training with Owner, through Architect/Engineer, with at least ten days' advance notice.
- 3.3 DEMONSTRATION AND TRAINING DVDS
  - A. Engage a qualified individual to record demonstration and training DVDs. Record each training module separately. Include classroom instructions and demonstrations.

- B. DVD Format: Provide high-quality DVD in full-size cassettes.
- C. Narration: Describe scenes on DVD as DVD is recorded. Include description of items being viewed.
- D. Transcript: Provide typewritten transcript of the narration.

END OF SECTION 22 06 00

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAW-NGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	S A M P L E S	OTHER
Instruction Program	х							
Attendance Record	х							
Demonstration and Training DVDs	Х							

# SECTION 22 07 19 – PLUMBING PIPING INSULATION

PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Piping Insulation
  - B. Jackets and Accessories
- 1.2 RELATED WORK
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK
  - C. Section 220553 IDENTIFICATION OF PLUMBING PIPING AND EQUIPMENT
- 1.3 QUALITY ASSURANCE
  - A. Materials: Flame spread smoke developed rating of 25/50 in accordance with ASTM E84.
  - B. All pipe insulation shall be installed by mechanics specializing in this type of work. The finished product shall present a neat and workmanlike appearance. Insulation shall not be applied until all tests except operating tests have been completed, all foreign material, such as rust, scale, or dirt, has been removed and the surfaces are clean and dry. Insulation shall be clean and dry when installed and during the application of any finish.
  - C. The insulation, insulating materials and related items shall be delivered to the jobsite in the manufacturer's unopened containers. The containers shall have labels stating the manufacturer's name, contents, quantity and other pertinent data.

## PART 2- PRODUCTS

#### 2.1 ACCEPTABLE MANUFACTURERS

A. Insulations having the thermal and physical properties of the specific materials specified hereinafter, of any of the following manufacturers, or approved equal, are acceptable.

Armstrong	Knauf
Johns Mansville	Certain Teed/Saint Gobain
Owens Corning	Pittsburgh Corning
Rubatex	

B. The Engineer reserves the right to determine if the proposed insulating materials of any one manufacturer are acceptable in lieu of the specific insulation selected for the following applications.

# 2.2 INSULATION

- A. Type A glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.23 minimum at 75 degrees F; noncombustible.
- B. Type B cellular foam; flexible, plastic; 'k' value of 0.25 minimum at 75 degrees F; ASTM C534. APArmaflex W (white) or APArmaflex SS (black) or equal.
- C. Type C vinyl plastisol prefabricated assemblies with 1/8 minimum wall thickness. Trap wrap protective kit by Brocar, Truebro or approved equal.

# 2.3 JACKETS

- A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.
- B. PVC Jackets: One piece, premolded type.
- C. Canvas Jackets: UL listed treated cotton fabric, 6 oz/sq. yd.

### 2.4 ACCESSORIES

- A. Insulation Bands: 3/4-inch-wide; 0.015-inch-thick galvanized steel, stainless steel. 0.007-inch 0.18 thick aluminum.
- B. Metal Jacket Bands: 3/8-inch-wide; 0.015-inch-thick aluminum. 0.010-inch-thick stainless steel.
- C. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.
- D. Finishing Cement: ASTM C449.
- E. Fibrous Glass Cloth: Unthreaded; 9 oz/sq. yd weight.
- F. Adhesives: Compatible with insulation.
- G. Treated wooden blocks.

#### PART 3 - EXECUTION

#### 3.1 PREPARATION

A. Install materials after piping has been tested and approved.

# 3.2 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Continue insulation with vapor barrier through penetrations, except on fire rated walls.
- C. In exposed piping, locate insulation and cover seams in least visible locations.
- D. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used. Insert shall extend around bottom 120 degrees of pipe barrel and shall be included inside vapor barrier jacket where applied. See Section 220529 for shields and hangers.
- F. Neatly finish insulation at supports, protrusions, and interruptions.
- G. Jackets
  - 1. Indoor, Concealed Applications: Insulated pipes shall have standard jackets, with vapor barrier, factory-applied or field-applied. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. PVC jackets may be used.
  - 2. Indoor, Exposed Applications: For pipe exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications. Finish with canvas jacket; size for finish painting. Do not use PVC jackets.
  - 3. Flanges, Valves, Anchors and Fittings: Unless otherwise specified, all flanges, valves, anchors and fittings shall be insulated with factory premolded or field

fabricated segments of insulation of the same materials and thickness as the adjoining pipe insulation. When segments of insulation are used, elbows shall be provided with not less than three segments. For other fittings and valves, segments shall be cut to required curvatures, or nesting size sectional insulation shall be used. The segments of the insulation shall be properly placed and jointed with fire-resistant adhesive. After the insulation segments are firmly in place, fire-resistant vapor barrier coating shall be applied over the insulation in two coats with glass tape embedded between coats. The coating shall be applied to a total dry film thickness of 1/16 inch minimum. All glass tape seams shall be terminated neatly at the ends of the unions with insulating cement troweled on the bevel. For piping operating below ambient temperature, the beveled ends shall receive a coat of vapor barrier coating. Where anchors are used and secured directly to low temperature piping, they shall be insulated for a distance to prevent condensation, but not less than 6 inches from the surface of the pipe insulation. For jacket facing to receive finish painting, the factory applied jacket shall be as specified herein, except that the kraft paper shall be light colored with the kraft paper exposed. Field applied vapor barrier jacket shall conform to the above conditions where finish painting is required.

Piping	Туре	Pipe Size (inch)	Thickness (inch)					
Domestic Hot Water Supply/Recirculation	A/B	all	1					
Domestic Cold-Water	A/B	all	1					
Copper Water Piping Below Slab and Inside Walls	В	all	1/2					
Chrome Plated Piping to Handicapped Lavatories	С	all	1/2					
Chrome Plated Piping to Plumbing Fixtures		None						
Storm Water Piping	А	all	1					
END OF SECTION 22 07 19								

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAW-NGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	О < < <p>Р &lt; <p>L &lt; <p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p></p>	OTHER
Piping Insulation	х	х						

# SECTION 22 10 00 – PLUMBING PIPING AND VALVES

PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Pipe and Pipe Fittings
  - B. Valves
  - C. Sanitary Sewer Piping
  - D. Domestic Water Piping

# 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK
- C. Section 220200 EXCAVATION AND BACKFILLING FOR UNDERGROUND PIPING
- D. Section 220553 IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT
- E. Section 220719 PLUMBING PIPING INSULATION
- F. Section 221119 DOMESTIC WATER PLUMBING SPECIALTIES
- G. Section 221319 SANITARY AND STORM PIPING SPECIALTIES
- H. Section 224200 PLUMBING FIXTURES AND EQUIPMENT

# 1.3 QUALITY ASSURANCE

- A. Valves: Manufacturer's name and pressure rating marked on valve body.
- B. Welding Materials and Procedures: Conform to ASME Code.
- C. Welders Certification: In accordance with ANSI/ASME Section 9.
- D. Cast Iron Pipe: All cast iron pipe and fittings shall be marked with the collective trademark of the Cast Iron Soil Pipe Institute (CISPI) and shall be listed by NSF International.
- E. Hubless Cast Iron Couplings: All couplings for hubless cast iron soil pipe and fittings shall conform to CISPI 310 and be certified by NSF International.
- F. All drinking water system components that convey or dispense water for human consumption through drinking or cooking shall be "lead-free" in accordance with NSF/ANSI 61 and/or NSF/ANSI 372 standards and any and all state and local requirements.

# PART 2 - PRODUCTS

- 2.1 SANITARY SEWER PIPING, BURIED INSIDE AND OUTSIDE OF BUILDING.
  - A. Hub-and-spigot, Cast Iron Pipe and Fittings
    - 1. Pipe and Fittings: ASTM A 74, Service and extra-heavy classes.
    - 2. Gaskets: ASTM C 564, rubber.
    - 3. Calking Materials: ASTM B 29, pure lead and oakum or hemp fiber.
  - B. Hubless, Cast Iron Pipe and Fittings

- 1. Pipe and Fittings: ASTM A 888 or CISPI 301.,
- 2. CISPI, Hubless-Piping Couplings:
- 3. Standards: ASTM C 1277 and CISPI 310.
- 4. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
- C. PVC Pipe and Fittings (House Line):
  - 1. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
  - 2. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
  - 3. Adhesive Primer: ASTM F 656.
  - 4. Solvent Cement: ASTM D 2564
  - 5. Provide tracer wire for all non-metallic piping.
- 2.2 SANITARY WASTE AND VENT PIPING, INTERIOR, ABOVE GRADE
  - A. Hub-and-spigot, Cast Iron Pipe and Fittings
    - 1. Pipe and Fittings: ASTM A 74,Service class.
    - 2. Gaskets: ASTM C 564, rubber.
  - B. Hubless, Cast Iron Pipe and Fittings
    - 1. Pipe and Fittings: ASTM A 888 or CISPI 301.,
    - 2. CISPI, Hubless-Piping Couplings:
    - 3. Standards: ASTM C 1277 and CISPI 310.
    - 4. Description: Stainless-steel corrugated shield with stainless-steel bands and tightening devices; and ASTM C 564, rubber sleeve with integral, center pipe stop.
  - C. Copper Tube and Fittings
    - 1. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.
    - 2. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought copper, solder-joint fittings.
    - 3. Copper Flanges: ASME B16.24, Class 150, cast copper with solder-joint end.
    - 4. Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.
    - 5. Solder: ASTM B 32, lead free with ASTM B 813, water-flushable flux.
  - D. PVC Pipe and Fittings (shall not be used within air plenums)
    - 1. Solid-Wall PVC Pipe: ASTM D 2665, drain, waste, and vent.
    - 2. Cellular-Core PVC Pipe: ASTM F 891, Schedule 40.
    - 3. PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe.
    - 4. Adhesive Primer: ASTM F 656.
    - 5. Solvent Cement: ASTM D 2564.
    - 6. g.

### 2.3 WATER PIPING, INTERIOR

- A. Aboveground. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper; cast or wrought copper, solder-joint fittings; and brazed or soldered joints.
- B. Below slab. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B) water tube, annealed temper; wrought-copper, solder-joint fittings; and brazed joints.
- C. Cast-Copper, Solder-Joint Fittings: ASME B16.18, pressure fittings.
- D. Wrought-Copper, Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
- E. Piping Joining Materials
  - 1. Solder Filler Metals: ASTM B 32, lead-free alloys.
  - 2. Flux: ASTM B 813, water flushable.
  - 3. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.
- F.

#### 2.4 DIELECTRIC FITTINGS

- A. Dielectric Unions: ASSE 1079 Standard; 125 psig minimum pressure rating at 180 deg F; solder-joint copper alloy and threaded ferrous end connections.
- B. Dielectric Nipples: IAPMO PS 66 Standard: electroplated steel nipple complying with ASTM F 1545; 300 psig pressure rating at 225 deg F; male threaded or grooved end connections; inert and noncorrosive, propylene lining.

## 2.5 ESCUTCHEONS

A. Escutcheons shall be Beaton and Caldwell; Carpenter and Patterson; Fee and Mason or approved equivalent. Chromium-plated iron or chromium-plated brass, either one piece or split patterns, held in place by internal spring tension or set screw that completely covers opening.

## 2.6 GATE VALVES

- A. Class 125, RS, Bronze Gate Valves (up to 2 inches):
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Crane, NIBCO, Stockham, Watts.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 2. CWP Rating: 150 psig. Body Material: Bronze with integral seat and screw-in bonnet. Ends: Threaded and soldered joint. Stem: Bronze. Disc: Solid wedge; bronze. Packing: Asbestos free. Handwheel: Malleable iron, bronze, or aluminum.
- B. Class 125, OS&Y, Iron Gate Valves (over 2 inches):
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Crane, NIBCO, Stockham, Watts.
  - 2. Description:

 Standard: MSS SP-70, Type I. CWP Rating: 150 psig. Body Material: Gray iron with bolted bonnet. Ends: Flanged. Trim: Bronze. Disc: Solid wedge. Packing and Gasket: Asbestos free.

#### 2.7 BALL VALVES

- A. Two-Piece, Bronze Ball Valves (up to 2 inches):
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Crane, NIBCO, Milwaukee, Stockham, Watts.
  - 2. Description:
    - a. Standard: MSS SP-110. CWP Rating: 150 psig. Body Design: Two piece. Body Material: Bronze. Ends: Threaded and soldered. Seats: PTFE. Stem: Stainless steel. Ball: Stainless steel. Port: Full.

# 2.8 BUTTERFLY VALVES

- A. Iron, Single-Flange Butterfly Valves with Aluminum-Bronze Disc:
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Crane, NIBCO, Stockham, Watts.
  - 2. Description:
    - a. Standard: MSS SP-67, Type I. CWP Rating: 150 psig. Body Design: Lug type; suitable for bi-directional dead-end service at rated pressure without use of downstream flange. Body Material: ASTM A 126, cast iron or ASTM A 536, ductile iron. Seat: EPDM. Stem: One-or-two piece stainless steel. Disc: Aluminum bronze.

## 2.9 SWING CHECK VALVES

- A. Class 125, Bronze Swing Check Valves with Bronze Disc (up to 2 inches):
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Crane, NIBCO, Stockham, Watts.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 3. CWP Rating: 150 psig. Body Design: Horizontal flow. Body Material: ASTM B 62, bronze. Ends: Threaded or soldered. Disc: Bronze.
- B. Class 125, Iron Swing Check Valves with Metal Seats (over 2 inches):
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Crane, NIBCO, Stockham, Watts.
  - 2. Description:
    - a. Standard: MSS SP-71, Type I. CWP Rating: 150 psig. Body Design: Clear or full waterway. Body Material: ASTM A 126, gray iron with bolted

bonnet. Ends: Flanged or threaded. Trim: Bronze. Gasket: Asbestos free.

#### 2.10 SPRING LOADED CHECK VALVES

- A. Class 125, Lift Check Valves with Nonmetalic Disc::
  - 1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to the following:
    - a. Crane, NIBCO, Stockham, Watts.
  - 2. Description:
    - a. Standard: MSS SP-80, Type 2. CWP Rating: 150 psig. Body Design: Vertical flow. Body Material: ASTM B 61 or ASTM B 62, bronze. Ends: Threaded or soldered. Disc: NBR, PTFE.

## 2.11 RELIEF VALVES

- A. Bronze body, teflon seat, steel stem and springs, automatic, direct pressure actuated, capacities ASME certified and labeled.
- B. Manufactured by Apollo, Consolidated, Kunkel, Watts and Zurn.

#### 2.12 GAUGE COCKS

- A. Ashcroft No. 1092; 150 PSIG maximum working pressure; bronze; 1/4" screwed connections; tee handle.
- B. All pressure gauges shall be installed with a gauge cock.

#### 2.13 STRAINERS

- A. Strainers shall be Y type equal to Leslie, Illinois, or Mueller. Sizes 2 1/2" and larger shall be flanged; sizes 2" and smaller shall be screwed.
- B. Water strainers shall be cast iron or brass, designed for 125 lb. steam/200 lbs. WOG working pressure.
- C. Strainers shall have a free area of strainer screen a minimum of twice the area of the adjoining pipe. Strainer baskets shall be fabricated from stainless steel or Monel sheet metal; baskets shall have 0.045" (3/64") perforations for water service.

#### PART 3 - EXECUTION

- 3.1 PREPARATION
  - A. Ream pipe and tube ends. Remove burrs. Bevel plain end ferrous pipe.
  - B. Remove scale and dirt, on inside and outside, before assembly.
  - C. Prepare piping connections to equipment with flanges or unions.

### 3.2 INSTALLATION

- A. Pipe shall be cut accurately to measurements established at the jobsite and worked into place without springing or forcing, properly clearing all windows, doors, and other openings.
- B. Provide non-conducting dielectric connections wherever jointing dissimilar metals.
- C. Route piping in orderly manner and maintain gradient.
- D. Install piping to conserve building space and not interfere with use of space. Do not change the designed path of piping, add excessive turns or offsets, or change pipe sizes without first consulting the Engineer.

- E. Group piping whenever practical at common elevations.
- F. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- G. Provide clearance for installation of insulation and access to valves and fittings.
- H. Provide access where valves and fittings are not exposed.
- I. Slope water piping and arrange to drain at low points.
- J. Establish elevations of buried piping outside the building to ensure not less than 3 feet of cover.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- L. Prepare pipe, fittings, supports, and accessories not prefinished, ready for finish painting.
- M. Establish invert elevations, slopes for drainage to be 1/8 inch per foot one percent minimum. Maintain gradients.
- N. Install bell and spigot pipe with bell end upstream.
- O. Install valves with stems upright or horizontal, not inverted.
- P. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used.
- 3.3 EXCAVATION AND BACKFILL
  - A. See specification SECTION 220200 EXCAVATION AND BACKFILLING FOR UNDERGROUND PIPING.
  - B. As part of the work under these sections, provide all excavating and backfilling, including dewatering and shoring required for the introduction and completion of the work. The work performed under this heading must conform to surrounding grounds or finished grade and must be approved by the Engineer.
  - C. All excavation shall be classified in accordance with the General Conditions of these specifications.
  - D. Surplus material and materials unsuitable for use as fill or backfill of foundation or trench excavations shall be disposed of off the Owner's property at the Contractor's expense.
  - E. Borrow material, if required, may not be available on Owner's property and shall be the responsibility of the Contractor to import any required material at his expense.
  - F. Explosives and blasting shall not be permitted except by written permission of the Engineer.
  - G. Where adjacent surface areas are disturbed as a result of construction operations or the storage of materials, they shall be cleaned of all debris and restored to original conditions.
  - H. The Contractor shall be responsible for location in the field the excavation lines shown on the drawings. The location shall be approved by the Engineer before excavation is begun. The Contractor shall use reference points as shown on the drawings for locating control points for earthwork and construction. In the absence of reference points, the Contractor shall locate control points in accordance with the Engineer's instructions.

- I. Active utilities shown on the drawings shall be adequately protected from damage and removed or relocated only as indicated or specified. Where active utilities are encountered but are not shown on the drawings, the Engineer shall be advised; the work shall be adequately protected, supported or relocated as directed by the Architect. In-active and abandoned utilities encountered in excavating and grading operations shall be reported to the Architect; they shall be removed, plugged or capped as directed by the Architect.
- J. Trench Excavation: The bottom of the trenches shall be accurately graded to provide uniform bearing and support for the pipe or concrete trench as shown on the drawings. Pipe shall be supported at every point along its entire length. Unless otherwise indicated, excavation shall be by open cut and trench sides shall be vertical. The trench bottom shall follow a uniform grade as shown on the drawings in the direction of flow insofar as possible. Where the trench has been excavated below grade, either inadvertently or purposely, the trench shall be backfilled and thoroughly tamped so as to provide full length bearing for the pipe barrel.
- K. Laying Pipe: Laying of pipe on blocks, brick or wood to bring the pipe to a uniform invert shall not be permitted. Drainage lines shall be laid conform to the drawings. All pipe joints shall be inspected and approved prior to backfilling.

## 3.4 APPLICATION

- A. Use grooved mechanical couplings and fasteners only in accessible locations.
- B. Install unions downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper pipe system. Sweat solder adapters to pipe.
- D. Install ball and/or butterfly valves for shut-off and to isolate equipment, parts of systems, vertical risers and branch piping serving fixtures without a means of shut-off. Valves to be located in such a manner to be accessible for service personnel. Provide access panel(s) if required to access valves.
- E. Install ball valves for throttling, bypass, or manual flow control services.
- F. Provide spring loaded check valves on discharge of water pumps.
- G. Do not install above grade piping in areas subject to freezing. Where such an area is encountered, notify the engineer for instruction.

# 3.5 DISINFECTION OF DOMESTIC WATER PIPING SYSTEM

- A. Prior to starting work, verify system is complete, flushed and clean.
- B. Ensure PH of water to be treated is between 7.4 and 7.6 by adding alkali (caustic soda or soda ash) or acid (hydrochloric).
- C. Inject disinfectant, free chlorine in liquid, powder, tablet or gas form, throughout system to obtain 50 to 80 mg/L residual.
- D. Bleed water from outlets to ensure distribution and test for disinfectant residual at minimum 15 percent of outlets.
- E. Maintain disinfectant in system for 24 hours.
- F. If final disinfectant residual test less than 25 mg/L, repeat treatment.
- G. Flush disinfectant from system until residual equal to that of incoming water or 1.0 mg/L.
- H. Take samples no sooner than 24 hours after flushing, from outlets and from water entry, and analyze in accordance with AWWA C601.
- 3.6 SERVICE CONNECTIONS

- A. Provide new sanitary sewer service. Before commencing work check invert elevations required for sewer connections, confirm inverts and ensure that these can be properly connected with slope for drainage and cover to avoid freezing.
- D. Provide new water service complete with reduced pressure backflow preventer.

END OF SECTION 22 10 00

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	C A T A L O G D A T A	P A R T S L I S T S	OPERATING MANUAL	W I R I N G D I A G R A M	CERTIFICATION	SAMPLES	OTHER
Sanitary Piping	х	х						
Domestic Water Piping	х	х						
Valves	Х	Х						
Storm Piping	Х	Х						
Gas Piping	Х	Х						
Acid Waste Piping	Х	Х						
Compressed Air Piping	х	х						

# SECTION 22 11 19 – DOMESTIC WATER PLUMBING SPECIALTIES

## PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Water Hammer Arrestors
  - B. Hose Bibbs/Hydrants
  - C. Thermometers
  - D. Pressure Gauges
  - E. Trap Primers
  - F. Balancing Valves
  - G. Temperature-Actuated, Water Mixing Valves
  - H. Sight Flow Indicators
- 1.2 RELATED WORK
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK
  - C. Section 221000 PLUMBING PIPING
  - D. Section 224200 PLUMBING FIXTURES
- 1.3 REFERENCES
  - A. ANSI/ASSE 1012 Backflow Preventers with Immediate Atmospheric Vent
  - B. ANSI/ASSE 1011 Hose Connection Vacuum Breakers
  - C. ANSI/ASSE 1013 Backflow Preventers, Reduced Pressure Principle
  - D. ANSI/ASSE 1019 Wall Hydrants, Frost Proof Automatic Draining Anti-Backflow Types
  - E. ANSI A112.26.1 Water Hammer Arresters
  - F. PDI WH-201 Water Hammer Arresters

## 1.4 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
- B. All drinking water system components that convey or dispense water for human consumption through drinking or cooking shall be "lead-free" in accordance with NSF/ANSI 61 and/or NSF/ANSI 372 standards and any and all state and local requirements.

## PART 2 - PRODUCTS

# 2.1 WATER HAMMER ARRESTORS

- A. ANSI A112.26.1; sized in accordance with PDI WH-201, precharged suitable for operation in temperature range -100 to 300 degrees F and maximum 250 psig working pressure.
- B. Manufactured by Amtol, PPP, Sioux Chief, J.R. Smith, Watts and Zurn.
# 2.2 HOSE BIBBS

- A. ASME A112.18.1 for sediment faucets. Body Material: Bronze. Seat: Bronze, replaceable. Threaded or solder-joint inlet connection. Vacuum breaker: Integral nonremovable, drainable, hose-connection vacuum breaker complying with ASME 1011. Chrome plated where exposed.
- B. Manufactured by Josam, J.R. Smith, Prier, Watts, Woodford and Zurn.

## 2.3 THERMOMETERS

- A. Weiss No. 9VS type vari-angle 9" mercury filled heavy duty type; Marshalltown, Ashcroft, Marsh, or equivalent, Accuracy within 2% of scale span. Brass 3 1/2" (min.) stem complete with separable socker. Stem and socket must be of adequate length to give accurate temperature readings. Install in piping system in strict accordance with manufacturer's requirements. Increase pipe sizing at thermometer as required. Range 30 to 240 degrees F. for hot water piping, and 0 120 degrees F, for heat pump loop water, unless other standard range selected upon submittal. Contractor shall adjust case for readability from floor line.
- 2.4 PRESURE GAUGES
  - A. Weiss Series UG 1, Ashcroft, Marsh, Marshalltown or equivalent. 4 1/2" dial, range selected upon submittal; with maximum pointer; brass bourdon tube and socket; 1% accuracy.
  - B. All pressure gauges shall be installed with lever handle gauge cock and brass straight coil siphon tube.

## 2.5 ELECTRONIC TRAP-SEAL PRIMER SYSTEMS

- A. Trap primer shall be listed and certified to ASSE 1044 and equipped with solenoid actuating device, ASSE 1001 vacuum breaker, distribution manifold and proper electronic hardware.
- B. Trap primer shall be equipped with an ASSE 1010 arrester to protect the solenoid valve.
- C. Recessed or surface mounted cabinet to be provided as specified.
- D. Manufactured by Sioux Chief, PPP, Inc., and Zurn.

### 2.6 BALANCING VALVES

- A. Balancing valves shall be of the Lead Free, bi-direction, blow-out resistant, tight shutoff, ball design, with position indicator, memory device, checked metering ports with drip caps and integral drain ports opposite the metering ports. Provide a minimum of 24" of straight run of piping on each side of balancing valve assembly.
- B. Manufactured by Armstrong, Nibco, Taco, or Watts.
- 2.7 TEMPERATURE-ACTUATED, WATER MIXING VALVES
  - A. Valve shall be listed to ASSE 1017 and certified to CSA B125 and have an approach temperature of 5 degrees F. Valve shall have an outlet temperature range of 90 160 degrees F with a lockable temperature setting feature.
  - B. Body shall be constructed using Lead Free brass material and be corrosive resistant and feature a single-seat design for positive shut-off. Valve shall have standard union check stops.
  - C. Manufactured by Powers, Leonard, Watts.
- 2.8 SIGHT FLOW INDICATORS

- A. Description: Piping inline-installation device for visual verification of flow. Minimum pressure rating: 125 psig. Minimum temperature rating: 200 deg F.
- B. Construction: Brass, bronze or stainless-steel body, with sight glass and ball, flapper, or paddle wheel indicator, and threaded or flanged ends.
- C. Manufactured by Dwyer, Ernst Flow Industries, Flows.com, Kobold.

## 2.9 INSTALLATION

- A. General: Install plumbing specialty components, connections, and devices according to manufacturer's written instructions.
- B. Install balancing valves in locations where they can easily be adjusted.
- C. Install temperature-actuated, water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.
  - 1. Install cabinet-type units recessed in or surface mounted on wall as specified.
- D. Install Y-pattern strainers for water on supply side of each control valves, water pressurereducing valves, solenoid valves, and pumps.
- E. Install water-hammer arresters in water piping according to PDI-WH 201.
- F. Install hose bibbs with integral or field-installed vacuum breaker.
- G. Install trap seal primer valves with valve outlet piping pitched down toward drain trap a minimum of one percent and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.
- H. Fasten wall-hanging plumbing specialties securely to supports attached to building substrate if supports are specified and to building wall construction if no support is indicated.
- I. Fasten recessed, wall-mounting plumbing specialties to reinforcement built into walls.
- J. Secure supplies to supports or substrate.
- K. Install individual stop valve in each water supply to plumbing specialties. Use ball valve if specific valve is not indicated.
- L. Install water-supply stop valves in accessible locations.
- M. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.
- N. Include wood-blocking reinforcement for recessed and wall-mounting plumbing specialties.

## 2.10 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
  - 1. Install piping connections between plumbing specialties and piping specified in other Division 22 Sections.
  - 2. Install piping connections indicated between appliances and equipment specified in other Sections; connect directly to plumbing piping systems.
  - 3. Supply Runouts to Plumbing Specialties: Install hot- and cold-water-supply piping of sizes indicated, but not smaller than required by authorities having jurisdiction.

END OF SECTION 22 11 19

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAW-NGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	S A M P L E S	OTHER
Backflow Preventers	х	х						
Water Hammer Arrestors	Х	Х						
Hose Bibbs/Hydrants	Х	Х						
Thermometers	Х	Х						
Pressure Gauges	Х	Х						
Trap Primers	Х	Х						
Water Pressure Reducing Valve	Х	Х						
Balancing Valves	Х	Х						
Water Mixing Valves	Х	Х						
Sight Flow Indicators	Х	Х						

# SECTION 22 11 23 – DOMESTIC WATER PUMPS

PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Domestic Water Circulators
- 1.2 RELATED DOCUMENTS
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK
  - C. Section 221000 PLUMBING PIPING AND VALVES
- 1.3 QUALITY ASSURANCE
  - A. All drinking water system components that convey or dispense water for human consumption through drinking or cooking shall be "lead-free" in accordance with NSF/ANSI 61 and/or NSF/ANSI 372 standards and any and all state and local requirements.
  - B. Circulating pumps shall be rated to a maximum pressure of 145 PSI and temperature of 230 F and where applicable, bear the approved symbol of the required regulatory body (NSF/ANSI 61).
  - C. Electrical assemblies (circuitry, wiring terminals and internal connections) of the circulating pumps shall be certified and registered to bear the emblem of UL, CSA or ETL as required. Electrical assembly shall meet codes and standards established by national bodies.
  - D. The pumps shall be factory performance and hydrostatic tested as a complete unit prior to shipment. The testing shall be done in accordance with ISO 9906 Annex A.

## 1.4 WARANTY

A. The warranty period shall be a non-prorated period of 24 months from date of installation. Warranty shall cover pump, motor and terminal box as a complete unit.

# PART 2 - PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS
  - A. Armstrong, Bell & Gossett, Grunfos, TACO and WILO USA.
- 2.2 GENERAL CHARACTERISTICS
  - A. Statically and dynamically balance rotating parts.
  - B. Pumps to operate at 1750 rpm maximum unless specified otherwise.
  - C. Provide all pumps 1/3 hp and larger with H.O.A. starters with 120V control transformer. See Section 220100 for details.
  - D. Integral phase failure relay shall be provided as a part of all three phase motor starters. Relay shall shut motor down on phase loss or phase unbalance and automatically reset when normal phasing is restored. Phase failure relay shall have adjustable restart time capabilities. Mechanical contractor shall coordinate staggered restart times as required.

## 2.3 VARIABLE SPEED WET ROTOR CIRCULATOR PUMPS

- A. The pump shall be a maintenance-free, in-line, single stage, wet rotor type with the motor mounted directly to the pump chamber. The pump models shall be furnished as shown on the plans and installed in accordance with the recommendations of the manufacturer.
- B. Materials and Construction
  - 1. Circulating pumps shall be constructed with lead free, Stainless Steel, NSF-61 Annex G certified.
  - 2. Shafts shall be constructed of high quality stainless steel.
  - 3. Motor shall be a 4-pole permanent-magnet (PM motor) of the integrated variable speed drive design. Motor shall be cooled by the pumped fluid.
  - 4. Motor bearings shall be metal-impregnated carbon.
  - 5. Impellers with three-dimensional curved blades shall be constructed of polyphenylene (PPS) plastic, 40% glass filled, polyphenylene (PPE) plastic, 30% glass filled or polyether sulfone (PES), 30 % glass filled.
  - 6. Control terminal box shall be poly carbonate or other high-quality composite with graphical pump display.
- C. Controls, Operation and Diagnostics
  - 1. Wet rotor, glandless inline circulating pumps shall include electronic variable speed control to operate at constant/variable differential pressure control without external sensors. Automatic night setback control available as standard using "self-taught" technology.
  - 2. Pumps to include integrated synchronous motors using ECM technology with permanent magnetic rotors, special sensorless control electronics and single phase electronic converters.
  - 3. Pumps to include Infra-red interface for wireless communication with the optional infra-red monitor.
  - 4. Integrated overload motor protection shall protect the pump against over/under voltage, over temperature of motor and/or electronics, over current, locked rotor and dry run (no load condition).
  - 5. Fault contact terminals shall be included in the terminal box and are to be potentially free, normally closed contacts that open on the event of a failure.
  - 6. Interface modules will be included where specified, installed in the terminal box. The modules will allow BMS communication via LONworks, BACnet, MODbus, and 0 – 10-volt DC control of speed or head setpoint, external minimum speed, external off, dual pump communication and pump operation status.

# PART 3 - EXECUTION

## 3.1 PUMP INSTALLATION

- A. Install pumps in a manner to provide access to motors, impellers, couplings and accessories for periodic maintenance.
- B. Pumps shall be independently supported as well as associated piping so that pump is not supported by piping and piping is not supported by pump.
- C. The pump shall be installed with the motor shaft in a horizontal plane with no exceptions.

## 3.2 CONNECTIONS

- A. See drawings and other Division 22 specifications for installation requirements and arrangement of piping, fittings and specialties.
- B. Install all piping at pumps in a manner too allow for service and maintenance of pumps.
- C. At piping connections to pumps, install valves the same size as piping.
  - 1. For domestic water pumps, install check valve and throttling valve on discharge piping and shut-off valve and strainer on suction piping.

# 3.3 DEMONSTRATION

A. Provide owner's maintenance personnel training as required to adjust, operate and maintain pumps.

END OF SECTION 22 11 23

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAY-RGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	S A M P L E S	OTHER
Domestic Water Circulators	х	х	Х	х	Х			

# SECTION 22 13 19 – SANITARY AND STORM PIPING SPECIALTIES

PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Cleanouts
  - B. Floor Drains
  - C. Drainage Piping Specialties

## 1.2 RELATED WORK

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK
- C. Section 221000 PLUMBING PIPING
- D. Section 224200 PLUMBING FIXTURES

#### 1.3 REFERENCES

A. ASTM C478 - Precast Reinforced Concrete Manhole Sections

## 1.4 QUALITY ASSURANCE

- A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
- B. Products listed in schedule on drawings shall determine quality and grade required. If other than those listed in schedule are to be used, equivalent or parallel grade shall be used.
- C. All drains shall be constructed of the finest quality cast iron, coated with the manufacturer's standard protective paint and furnished with all items specified. Drain shall be as manufactured by Josam, Sioux Chief, Smith, Wade, Watts and Zurn.

## PART 2 - PRODUCTS

- 2.1 CLEANOUTS
  - A. Provide cleanouts as detailed and specified on Drawings. Cleanout types are as follows:
    - 1. Exposed Cast Iron Cleanouts
    - 2. Cast Iron Floor Cleanouts
    - 3. Cast Iron Wall Cleanouts
  - B. Manufactured by Josam, MIFAB, J.R. Smith, Sioux Chief, Watts, and Zurn.

## 2.2 FLOOR DRAINS

- A. Provide floor drains as detailed and specified on Drawings. Floor drain types are as follows:
  - 1. Cast Iron Floor Drains
  - 2. Manufactured by Josam, MIFAB, J.R. Smith, Sioux Chief, Watts, and Zurn.
- 2.3 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES
  - A. Open Drains (receptacles):

- 1. Description: Shop or field fabricated from ASTM A 74, Service class hub-andspigot cast-iron, soil-pipe fittings or Schedule 40 PVC. Include P-trap, hub-andspigot riser section: and where required, increaser fitting.
- B. Floor Drain, Trap-Seal Primer Fittings
  - 1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trapseal primer valve connection. Size: Same as floor drain outlet with NPS ½ side inlet.
- C. Air-Gap Fittings
  - 1. ASME A112.1.12, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping. Bronze or cast-iron body.

## PART 3 - EXECUTION

- 3.1 Install specialties in accordance with manufacturer's instructions to permit intended performance.
  - A. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:
    - 1. Size same as drainage piping up to NPS 4. Use NPS 4 for larger drainage piping unless larger cleanout is indicated.
    - 2. Locate at each change in direction of piping greater than 45 degrees.
    - 3. Locate at minimum intervals of 50 feet for piping NPS 4 and smaller and 100 feet for larger piping.
    - 4. Locate at base of each vertical soil and waste stack.
  - B. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.
  - C. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.
  - D. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.
    - 1. Position floor drains for easy access and maintenance.
    - 2. Install floor-drain flashing collar or flange so no leakage occurs between drain and adjoining flooring. Maintain integrity of waterproof membranes where penetrated.
  - E. Assemble open drain fittings and install with top of hub 1 inch above floor.
  - F. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.
    - 1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
    - 2. Size: Same as floor drain inlet.
  - G. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

## 3.2 PROTECTION

- A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.
- B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION 22 13 19

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

	S H O P D R A W I N	C A T A L O G D A	P A T S L I S	O P E R A T I N G M A N U	W I R I G I A G R	C E T I F I C A T I	S A M L	
	G	T	T S	A	A M	O N	E S	
ITEM DESCRIPTION		~	Ũ				U	OTHER
Manholes	x	х						
Grease Trap	х	Х						
Cleanouts	Х	х						
Floor Drains	х	х						
Roof Drains	х	Х						
Drainage Piping Specialties	Х	Х						

# SECTION 22 33 00 – ELECTRIC DOMESTIC WATER HEATERS

### PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Electric, Storage, Domestic Water Heaters
  - B. Expansion Tank

#### 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK
- C. Section 221000 PLUMBING PIPING AND VALVES
- 1.3 QUALITY ASSURANCE
  - A. Insure products and installation of specified products are in conformance with recommendations and requirements of the following organizations:
    - 1. National Sanitation Foundation (NSF)
    - 2. American Society of Mechanical Engineers (ASME)
    - 3. National Board of Boiler and Pressure Vessel Inspectors (NBBPVI)
    - 4. National Electrical Manufacturers' Association (NEMA)
    - 5. Underwriters Laboratories (UL)

#### 1.4 WARRANTY

- A. Provide five (5) year warranty on all electric, storage domestic water heaters, controls and other components.
- B. Provide five (5) year warranty on all electric, tankless domestic water heaters.
- C. Provide five (5) year warranty on all stand-alone storage tanks.

#### PART 2 - PRODUCTS

- 2.1 ELECTRIC, STORAGE, DOMESTIC WATER HEATER
  - A. Acceptable Manufacturers
    - 1. State, A.O. Smith, Lochinvar, PVI, Coates, Rheem or Precision electric water heater of size as shown on drawings.
  - B. Standard: UL 1453. Storage Tank Construction: ASME-code (where required), steel vertical arrangement.
    - 1. Tappings: Factory fabricated of materials compatible with tank and piping connections. Attach tappings to tank before testing.
      - a. NPS 2 and Smaller: Threaded ends according to ASME B1.20.1.
      - b. NPS 2-1/2 and Larger: Flanged ends according to ASME B16.5 for steel and stainless-steel flanges, and according to ASME B16.24 for copper and copper-alloy flanges.
    - 2. Pressure Rating: 150 psig.

- 3. Interior Finish: Comply with NSF 61 Annex G barrier materials for potable-water tank linings, including extending lining material into tappings.
- C. Factory-Installed Storage Tank Appurtenances:
  - 1. Anode Rod: Replaceable magnesium.
  - 2. Drain Valve: Corrosion-resistant metal complying with ASSE 1005.
  - 3. Insulation: Comply with ASHRAE/IESNA 90.1.
  - 4. Jacket: Steel with enameled finish.
  - 5. Heating Elements: Electric, screw-in or bolt-on immersion type arranged in multiples of three.
  - 6. Temperature Control: Adjustable thermostat.
  - 7. Safety Controls: High-temperature-limit and low-water cutoff devices or systems.
  - 8. Relief Valves: ASME rated and stamped for combination temperature-andpressure relief valves. Include one or more relief valves with total relieving capacity at least as great as heat input, and include pressure setting less than domestic-water heater working-pressure rating. Select one relief valve with sensing element that extends into storage tank.
- D. Provide ASME rating on all water heaters with an input rating of 200,000 Btuh and above.
- E. See schedule on drawing.

# 2.2 DIAPHRAGM - TYPE EXPANSION TANKS

- A. Acceptable Manufacturers
  - 1. Amtrol, State or Watts for potable water.
- B. Description
  - 1. Steel pressure-rated tank constructed with welded joints and factory-installed butyl-rubber diaphragm. Include air precharge to minimum system-operating pressure at tank.
- C. Construction:
  - 1. Tappings: Factory-fabricated steel, welded to tank before testing and labeling. Include ASME B1.20.1 pipe thread.
  - 2. Interior Finish: Comply with NSF 61 Annex barrier materials for potable-water tank linings, including extending finish into and through tank fittings and outlets.
  - 3. Air-Charging Valve: Factory installed.

## PART 3 - EXECUTION

# 3.1 DOMESTIC WATER HEATER INSTALLATION

- A. Install water heaters in accordance with manufacturer's instructions and to all relevant NFPA, ASME and NSP requirements.
- B. Electric, Storage Domestic-Water Heater Mounting: Install domestic-water heaters on concrete base. Comply with requirements for concrete base.
  - 1. Exception: Omit concrete bases for commercial domestic-water heaters if installation on stand, bracket, suspended platform, or directly on floor is indicated.
  - 2. Maintain manufacturer's recommended clearances.

- 3. Arrange units so controls and devices that require servicing are accessible.
- 4. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around the full perimeter of concrete base.
- 5. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
- 6. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
- 7. Install anchor bolts to elevations required for proper attachment to supported equipment.
- 8. Anchor domestic-water heaters to substrate.
- C. Install domestic-water heaters level and plumb, according to layout drawings, original design, and referenced standards. Maintain manufacturer's recommended clearances. Arrange units so controls and devices needing service are accessible.
  - 1. Install shutoff valves on domestic-water-supply piping to domestic-water heaters and on domestic-hot-water outlet piping.
- D. Install combination temperature-and-pressure relief valves in top portion of storage tanks. Use relief valves with sensing elements that extend into tanks. Extend water-heater reliefvalve outlet, with drain piping same as domestic-water piping in continuous downward pitch, and discharge by positive air gap onto closest floor drain.
- E. Install water-heater drain piping as indirect waste to spill by positive air gap into open drains or over floor drains.
- F. Install thermometer on outlet piping of domestic-water heaters.
- G. Assemble and install inlet and outlet piping manifold kits for multiple domestic-water heaters. Fabricate, modify, or arrange manifolds for balanced water flow through each domestic-water heater. Include shutoff valve and thermometer in each domestic-water heater outlet, and throttling valve in each domestic-water heater outlet.

END OF SECTION 22 33 00

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	C A T A L O G A T A	P A R T S L I S T S S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	S A M P L E S	OTHER
Electric Water Heaters	Х	Х	Х	Х	Х			
Expansion Tank	х	х	х	х				
Storage Tank	Х	Х						

# SECTION 22 42 00 – PLUMBING FIXTURES AND EQUIPMENT

### PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Water Closets
  - B. Urinals
  - C. Lavatories
  - D. Electric Water Coolers
  - E. Mop Basins
- 1.2 RELATED DOCUMENTS
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 220100 GENERAL PROVISIONS FOR PLUMBING WORK
  - C. Section 211000 PLUMBING PIPIING AND VALVES

# 1.3 GENERAL REQUIREMENTS

- A. All plumbing fixtures and their installation shall conform to the requirements of the Kentucky State Plumbing Code.
- B. Exposed metal work shall be bright chrome-plated brass except as noted.
- C. All fixtures shall be by the same manufacturer.
- D. All ADA accessible water closets provided with manual flush valve/trip lever shall have the flush valve handle/trip lever mounted on the wide(open) side of the water closet.
- E. All drinking water system components that convey or dispense water for human consumption through drinking or cooking shall be "lead-free" in accordance with NSF/ANSI 61 and/or NSF/ANSI 372 standards and any and all state and local requirements.
- F. Provide all plumbing fixtures complete with trim required, and connect in a manner conforming to the state and local plumbing codes. Certain fixtures will be furnished by others under other sections of these Specifications. Provide rough-in and final connections including all valves, traps, specialties, etc. required.
- G. Provide traps for all waste connections where not furnished with the fixture and or equipment; unions; and stops or shut-off valves for all water connections to all sinks and other items of equipment as required. All exposed pipe and metal, including that within cabinets, shall be chrome plated brass.

# PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

A. Acorn, Ancorn Aqua, American Standard, Bemis, Briggs/Proflo, Chicago, Clarion Bathware, Church, Component Hardware, Crane, Delany, Delta, Eljer, Elkay, Encon, Fiat, Guardian, Haws, Intersan, Jay R. Smith, Just, Kohler, Lawler, Leonard, Moen, Murdock, Mustee, Oasis, Olsonite, Powers, Sioux Chief, Sloan, Speakman, Stearn-Williams, Stingray Systems, Symmons, T&S Brass, Toto, Willoughby, Watersaver, Watts and Zurn. SEE SCHEDULES ON DRAWINGS.

- B. Products listed in schedule on drawings shall determine quality and grade required. If other than those listed in schedule are to be used, equivalent or parallel grade shall be used.
- PART 3 EXECUTION
- 3.1 EXAMINATION
  - A. Examine roughing-in for potable, hot- and cold-water supply piping systems; soil, waste, and vent piping systems; and supports. Verify that locations and sizes of piping and locations and types of supports match those indicated, before installing and connecting fixtures. Use manufacturer's roughing-in data when roughing-in data are not indicated.
  - B. Examine walls, floors, and cabinets for suitable conditions where fixtures are to be installed.
  - C. Do not proceed until unsatisfactory conditions have been corrected.
- 3.2 PLUMBING FIXTURE INSTALLATION
  - A. Assemble plumbing fixtures and trim, fittings, faucets, and other components according to manufacturers' written instructions.
  - B. Install fixtures level and plumb according to manufacturers' written instructions, roughingin drawings, and referenced standards.
  - C. Install floor-mounted, back-outlet water closets with fittings and gasket seals.
  - D. Install wall-hanging, back-outlet water closets with support manufacturer's tiling frame or setting gage.
  - E. Install toilet seats on water closets.
  - F. Install wall-hanging, back-outlet urinals with gasket seals.
  - G. Install flush valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for handicapped people to reach.
  - H. Fasten wall-hanging plumbing fixtures securely to supports attached to building substrate when supports are specified, and to building wall construction where no support is indicated.
  - I. Fasten recessed, wall-mounted fittings to reinforcement built into walls.
  - J. Fasten wall-mounted fittings to reinforcement built into walls.
  - K. Fasten counter-mounting plumbing fixtures to casework.
  - L. Secure supplies to supports or substrate within pipe space behind fixture.
  - M. Set shower receptors and mop basins in leveling bed of cement grout as specified by Architect.
  - N. Install individual stop valve in each water supply to fixture. Use gate or globe valve where specific stop valve is not specified.
  - O. Exception: Omit stop valves on supplies to emergency equipment, except when permitted by authorities having jurisdiction. When permitted, install valve chained and locked in OPEN position.
  - P. Install water-supply stop valves in accessible locations.
  - Q. Install faucet, laminar-flow fittings with specified flow rates and patterns in faucet spouts when faucets are not available with required rates and patterns. Include adapters when required.

- R. Install supply, flow-control fittings with specified flow rates in fixture supplies at stop valves.
- S. Install shower, flow-control fittings with specified maximum flow rates in shower arms.
- T. Install traps on fixture outlets. Omit traps on fixtures having integral traps. Omit traps on indirect wastes, except where otherwise indicated.
- U. Install disposers in sink outlets. Install switch where indicated, or in wall adjacent to sink if location is not indicated.
- V. Install escutcheons at wall, floor, and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons where required to conceal protruding pipe fittings.
- W. Seal joints between fixtures and walls, floors, and counters using sanitary-type, 1-part, mildew-resistant, silicone sealant. Coordinate this requirement with Architectural trades.

## 3.3 CONNECTIONS

- A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties. The following are specific connection requirements:
- B. Install piping connections between plumbing fixtures and piping systems and plumbing equipment specified in other Division 22 Sections.
- C. Supply and Waste Connections to Plumbing Fixtures: Refer to plumbing fixture schedules for fitting sizes and connection requirements for each plumbing fixture.
- D. Supply and Waste Connections to Equipment Specified in Other Sections: Connect equipment with supply inlets, supply stops, supply risers, and traps specified in this Section. Use fitting sizes required to match connected equipment. Connect fittings to plumbing piping.
- E. Arrange for electric-power connections to fixtures and devices that require power. Electric power is specified in Division 26 Sections and individual equipment sections.

#### 3.4 FIELD QUALITY CONTROL

- A. Verify that installed fixtures are categories and types specified for locations where installed.
- B. Check that fixtures are complete with trim, faucets, fittings, and other specified components.
- C. Inspect installed fixtures for damage. Replace damaged fixtures and components.
- D. Test installed fixtures after water systems are pressurized and demonstrate proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

#### 3.5 ADJUSTING AND CLEANING

- A. Operate and adjust faucets and controls. Replace damaged and malfunctioning fixtures, fittings, and controls.
- B. Operate and adjust disposers, hot-water dispensers, and controls. Replace damaged and malfunctioning units and controls.
- C. Adjust water pressure at drinking fountains, electric water coolers, faucets, shower valves, and flushometer valves having controls, to produce proper flow and stream.
- D. Replace washers and seals of leaking and dripping faucets and stops.

- E. Clean fixtures, faucets, and other fittings with manufacturers' recommended cleaning methods and materials. Include the following:
  - 1. Remove faucet spouts and strainers, remove sediment and debris, and reinstall strainers and spouts.
  - 2. Remove sediment and debris from drains.

# 3.6 PROTECTION

- A. Provide protective covering for installed fixtures and fittings.
- B. Do not allow use of fixtures for temporary facilities, except when approved in writing by Owner.

### END OF SECTION 22 42 00

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	C A T A L O G A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	S A M P L E S	OTHER
Water Closets	х	х						
Urinals	Х	Х		х				
Lavatories	Х	Х		Х				
Stainless Steel Sinks	Х	х		х				
Service Sinks	Х	Х		х				
Electric Water Coolers	Х	х		х	х			
Mop Basins	х	х		х				
Showers	х	х		х				
Shower Trim	х	х		х				

# **MECHANICAL INDEX**

# SECTION NUMBER

# DIVISION 23 – HEATING, VENTILATING AND AIR CONDITIONING

- 23 01 00 GENERAL PROVISIONS FOR MECHANICAL
- 23 05 17 SLEEVING, CUTTING, PATCHING AND REPAIRING
- 23 05 29 HANGERS AND SUPPORTS FOR PIPING AND EQUIPMENT
- 23 05 30 METAL FABRICATIONS AND STRUCTURAL STEEL
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# SECTION 23 01 00 – GENERAL PROVISIONS FOR MECHANICAL

#### PART 1 – GENERAL

#### 1.1 SUMMARY

- A. This section covers the general arrangement of the mechanical systems and related items to complete the work as shown on the drawings and as specified herein.
- B. The General and Special Conditions and all other Contract Documents are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- C. The Contractor shall familiarize himself with the work of all other trades, general type construction and the relationship of his work to other sections. He shall examine all working drawings, specifications and conditions affecting his work. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work and working conditions, verify all dimensions in the field and advise the Engineer of any discrepancy before performing any work.
- D. The work shall include complete testing of all equipment and piping at the completion of the work and making any minor connection changes or adjustments necessary for the proper functioning of the system and equipment.
- E. The Contractor shall perform all necessary temporary work during construction.
- F. Work under this section shall conform to all governing codes, ordinances and regulations of the City, County and State.
- G. The Contractor shall be responsible for all errors in fabrication, for the correct fitting, installation and erection of the various mechanical systems as shown on the drawings.

## 1.2 SCOPE

- A. This branch of the work includes coordination with all utility companies; agency review fees and all inspection fees; all labor, materials, tools, excavation and backfill and all equipment necessary for the installation of all Heating, Ventilating and Air Conditioning, System as shown on the Drawings and Specifications and/or as required for complete and operating systems. The work shall include starting, balancing and the necessary and required tests to insure the proper operation of the complete system.
- B. A complete and operating mechanical system shall be provided. See plans for diagrams and details.
- C. All work for this project must comply and be in strict accordance with the Kentucky Building Code, Kentucky Plumbing Code, Kentucky Boiler Code, NFPA, ADA, NEC and all local codes and regulations.
- D. In general (as a minimum) all materials and equipment must be installed in strict accordance with manufacturer's requirements; and provided with all required controls, internal fusing, relays, piping connections, electrical connections, ductwork connections, etc., to provide for complete and operable systems.

#### 1.3 PERMITS, FEES, CODES AND APPROVALS

- A. Permits and Fees
  - 1. All permits, tap on fees and agency review and inspection fees necessary for the complete HVAC, system shall be obtained by the Contractor from the authorities governing such work. The cost of all permits shall be borne by the Contractor.
- B. Codes

- 1. The minimum standard for all mechanical work shall be the current requirements of the Kentucky State Plumbing Law, Regulation and Code, Kentucky Building Code, ADA, International Mechanical Code, Kentucky Boiler Code, NFPA and local ordinances.
- C. Approvals
  - 1. All work must be approved by the Architect/Engineer, Owner and all related Code Agencies before final payment will be made.
  - 2. As a minimum, the following approval Certificates of Inspection and Approval shall be required:
    - a. HVAC Inspection
    - b. Local and State Building Inspections.
  - 3. Final payment will be contingent upon all Approval Certificates.
- 1.4 DRAWINGS AND SPECIFICATIONS
  - A. Contract drawings for work under this section are in part diagrammatic, intended to convey the scope of work and indicate the general arrangement of equipment, piping and the approximate size and location of equipment and outlets. The Contractor shall follow these drawings in laying out his work and shall verify spaces in which his work will be installed, indicating to the Engineer where any conflicts or overlapping of systems occur. Any item of work not clearly included, specified and/or shown, errors or conflict between Plans (Mechanical, Architectural, Structural or Electrical), Specifications, codes and field conditions, shall be clarified by a written request to the Architect by the Bidder before bidding; otherwise, the bidder shall, at his own expense, supply the proper labor and materials to include these items of work and to make good any damages or defects in his work caused by such error, omission or conflict. Under no circumstances shall a Contractor scale the Drawings for the location of equipment and work.
  - B. Where job conditions require reasonable changes in indicated locations and arrangement, proposed departures shall be submitted with detailed drawings to the Engineer for approval before any of the proposed work is commenced. All approved departures shall be made at no additional cost to the Owner.
  - C. The drawings and the specifications are intended to indicate complete and working systems, unless specifically indicated to the contrary. The work includes the furnishing, installing and connecting of a complete working installation in each case to the full extent set forth in the drawings and herein specified. The Contractor shall be responsible for the complete functioning system, unless specifically noted otherwise.
  - D. The drawings and specifications shall be considered as cooperative, work and material included in either, though not mentioned in both, shall be a part of the work to be accomplished and shall be carried out completely in as thorough manner as if covered by both.
  - E. Because of the small scale of the drawings, it is not possible to indicate all offsets, fittings and accessories that may be required. The Contractor shall carefully investigate the structural and finish conditions affecting all his work and shall arrange such work accordingly, furnishing such fittings, pipe, traps, valves and accessories as may be required to make a functional installation at no additional cost to the Owner.
  - F. Mechanical as built "Record Drawings" shall be kept up to date each day. "Record Drawings" shall be reviewed by Architect/Engineer each month with contractor's pay request review.
  - G. Any deviation in work as shown on plans and specifications must be approved in writing by Architect/Engineer prior to installation.

### 1.5 EXAMINATION OF SITE

- A. Bidders shall visit the site before submitting proposals to satisfy themselves as to the nature and scope of the work and any difficulties attending to the execution.
- B. The submission of a proposal will be construed as evidence that such an examination has been made. Later claims for labor, equipment, materials, etc., required for difficulties encountered which could have been foreseen had such an examination been made, will not be recognized.

#### 1.6 EQUIPMENT DESIGN AND INSTALLATION

- A. The design, manufacture, testing and method of installation of all apparatus and materials furnished under the requirements of these specifications shall conform to the applicable standard rules of the following. Where materials are not specifically referred to, but are required, they shall meet the requirements of the applicable code.
  - 1. NEMA -National Electrical Manufacturer's Assoc.
  - 2. UL -Underwriter's Laboratories, Inc.
  - 3. ASME -American Society of Mechanical Engineers
  - 4. ASTM -American Society of Testing Materials
  - 5. ASHRAE -American Society of Heating, Refrigerating and Air Conditioning Engineers
  - 6. BOCA -Building Officials & Code Administrators International, Inc.
  - 7. NFPA -National Fire Protection Association
  - 8. AWWA -American Water Works Association
  - 9. AWS -American Welding Society
  - 10. AMCA -Air Moving and Conditioning Assoc.
  - 11. ANSI -American National Standards Institute
  - 12. NEC -National Electrical Code
  - 13. AIEE -American Institute of Electrical Eng.
  - 14. ARI -Air Conditioning & Refrigeration Institute
  - 15. SMACNA -Sheet Metal and Air Conditioning Contractors National Assoc.
  - 16. LSDHBC -Local and/or State Division of Housing, Building and
  - 17. SPC -State Plumbing Code
  - 18. NPC -National Plumbing Code
  - 19. OSHA -Occupational Safety and Health Adm.
  - 20. EPA -Environmental Protection Agency
  - 21. DOE -U.S. Department of Energy
  - 22. IMC -International Mechanical Code
  - 23. IECC -International Energy Conservation Code
- B. Unless otherwise specified, equipment and materials of the same type and used for the same purpose, shall be products of the same manufacturer.
- 1.7 CAPACITIES, SIZES AND OPERATING CONDITIONS

Construction

- A. Capacities, sizes and conditions specified or shown on drawings shall be regarded as minimum allowable. If the Contractor proposes to furnish any equipment which would have to operate at other than specified conditions to produce final effects, all other directly or indirectly related components of the entire systems (as well as of the structure, finish and other systems in the building) must be properly coordinated to the satisfaction of the Engineer. That is: Operating conditions through the entire system must be such that no motor is overloaded, no equipment operates noisier, faster, or hotter than manufacturer's publication recommends and that no excess stress or demand is imposed on any component of any system or the structure; also that no quality, architectural feature, function or "end result" is affected adversely, in the opinion of the Architect.
- B. The Architect/Engineer reserves the right to determine if the contractor's proposed materials and equipment of any one manufacturer is acceptable in lieu of the specified material or equipment.
- C. Where materials and equipment are listed on Drawings and specifications as acceptable or equivalent, this does not relieve the contractor and/or manufacturer from providing and proving to Architect/Engineer that their materials and equipment are equivalent to items the Architect/Engineer used as a guide specification.
- D. The contractor and manufacturer must confirm to the Architect/Engineer that their equipment and materials will meet the space requirements of the project and that the equipment is easily accessible for maintenance and operation.

# 1.8 LAYOUT

- A. The Contractor's work lines and established heights shall be in strict accordance with drawings and specifications insofar as these drawings and specifications extend. The Contractor shall verify all dimensions shown and establish all elevations and detail dimensions not shown. He shall also correlate the time so that the work will proceed to the best advantage of the complete job as a unit. The Contractor shall be responsible for furnishing in ample time, any information required to revise footing elevations, build all chases and openings in floors, walls, partitions, ceilings, and roofs to provide clearance which may be required to accommodate the work. The contractor shall set all sleeves, anchor bolts and inserts required to accommodate his equipment before masonry is constructed.
- B. The Contractor shall layout his work well enough in advance to foresee any conflicts or interferences with work of other sections so that in case of interference, his layout may be altered to suit the conditions, prior to the installation of any work. This procedure will require constant coordination with all sections of the work.

# 1.9 DEMOLITION AND SCHEDULE

- A. All existing mechanical equipment noted on drawings and listed herein that is to be removed or demolished, shall be removed on schedule and disposed of as hereinafter directed.
- B. All items removed shall become the property of the contractor and shall be immediately disposed of off-site at contractor's expense except as noted on drawings unless otherwise directed by owner.
- C. All demolition shall be carefully accomplished in accordance with master construction schedule so as not to remove any item required for support operation during the planned schedule. No item shall be removed until full schedule is worked out with contractors according to owner's demands and agreed to in writing by the Engineer.
- D. Storage will be arranged during scheduling process. Contractors to provide own storage and security.

- E. Contractor doing the demolition of equipment must conform to the Clean Air Act of 1990. Refrigerant must be recovered from any air conditioning or refrigeration equipment prior to disconnecting and disposal. The contractor must own and use recovery equipment to meet this requirement. The contractor will be responsible for disposal of refrigerant, refrigerant oil or equipment.
- F. If pipe, insulation or equipment to remain is damaged in appearance or is unserviceable, remove damage or unserviceable portion and replace with new products of equal capacity and quality. All existing piping to remain shall be permanently capped, new or existing valves are not adequate.

# 1.10 ACCESSIBILITY

A. All equipment, valves, motors, damper operators, traps, unions and all other items which require adjustment, maintenance, repair and observation shall be installed in such a fashion that such maintenance, repair and observation can be readily achieved without undue difficulty. Where the drawings show these items in locations not conforming to the above, the Contractor shall advise the Architect/Engineer of this conflict prior to bid Date otherwise he shall, at his own expense, relocate such items as directed by the Architect/Engineer. Where such items are installed above inaccessible ceilings or in or behind walls, this contractor shall provide approved access panels unless otherwise directed in these Specifications.

# 1.11 ARCHITECTURAL DRAWING AND SPECIFICATIONS

- A. Each Contractor shall refer to the Architectural and Structural Drawings and Specifications for the general construction of the building, for floor and ceiling heights, for location of walls, partitions, beams etc., and shall be guided accordingly for the setting of all sleeves and equipment.
- B. Under no circumstances shall a Contractor scale the Drawings for the locations of equipment and work.

# 1.12 COOPERATION WITH OTHER CONTRACTORS

A. Each Contractor shall demand and examine all Drawings and Specifications pertaining to the construction before installing the work described and shown under these Drawings and Specifications. Each Contractor shall cooperate with all other contractors in locating piping, openings, chases and equipment in order to avoid conflict with any other contractor's work. It is the responsibility of all trades to examine all shop drawings of other trades that would require equipment to occupy the same space and plane within the building to eliminate any potential conflicts. No extra payment will be allowed for relocation of piping, and equipment not installed in accordance with the above instructions, and which interferes with work and equipment of other contractors.

## 1.13 INSTALLATION OF EQUIPMENT

- A. All appliances, materials and equipment shall be installed and connected in accordance with the best engineering practice and in accordance with manufacturer's instructions and recommendations. All auxiliary piping, special controls, water seals, valves, electrical connections, drains, etc., recommended by the manufacturer, required for proper operation, or required by code shall be furnished and installed complete.
- B. All equipment designed and constructed for indoor use shall not be shipped to the site until such time that the equipment is ready for permanent installation in a dry building or may be stored on site provided equipment is stored in a water and moisture tight storage building or job trailer. Covering equipment outdoors with plastic or tarp is not acceptable.

## 1.14 PROTECTION OF EQUIPMENT AND MATERIALS

A. No piping shall be installed in any part of the building where danger of freezing may exist without adequate protection being given, whether or not insulation is specified for the

particular piping. All damage resulting from leaking pipes shall be borne by the Contractor under this Division.

- B. All work, equipment and materials shall be protected at all times. All pipe and ductwork openings shall be closed with caps or plugs during construction. All equipment and accessories shall be tightly covered and protected against dirt, water or other injury during the period of construction.
- C. If the permanent HVAC equipment is used during construction period for temporary heating, cooling and ventilating, the equipment must be carefully protected, and filters changes at minimum of once a week. All return air and exhaust air ductwork used in temporary HVAC systems during construction period must be filtered at each opening to prevent construction dust from entering the ductwork system.
- D. Before the building is turned over to the Owner all of the equipment must be carefully cleaned of debris and dust, coils cleaned and flushed out, new filters installed, and all ductwork cleaned of debris and dust.

## 1.15 PROTECTION FROM MOVING PARTS

A. Belts, pulleys, chains, gears, couplings, projecting setscrews, keys and other rotating parts located so that any person can come in close proximity thereto shall be fully enclosed or properly guarded.

#### 1.16 CUTTING AND PATCHING

- A. All cutting and patching required in connection with the installation of this work, and work due to errors, defective work, ill-timed work or tardiness in properly designating size and location in sufficient time or by failure to notify other trades, shall be done under this section, but only in the manner directed by the Engineer so as to prevent or minimize damage to installed work. Damage as a result of cutting for installation, shall be repaired by mechanics skilled in the trade involved, at no additional expense to the Owner.
- B. No cutting of structural members will be permitted, except when prior permission of the Engineer has been obtained. This work must conform in every respect to the surrounding finish and to the quality of workmanship and materials used.
- C. Piercing of any waterproofing or roofing shall be done only by the trade involved. After the part piercing the waterproofing has been set in place, the opening made for this purpose shall be filled and made absolutely watertight to the satisfaction of the Engineer.
- D. See Section: 230510 SLEEVING, CUTTING, PATCHING AND REPAIRING -MECHANICAL

## 1.17 FIRE AND SMOKE-STOPPING

- A. Fire-stopping and smoke-stopping shall be provided around all piping and ductwork penetrations of fire rated and/or smoke-rated floors, walls, ceilings or other barriers.
- B. The materials used shall be UL 263 or UL 1479 classified and meet ASTM E814 standards and be rated for assemblies where applied.
- C. Clean surfaces to be in contact with penetration seal materials, of dirt, grease, oil, loose materials, rust or other substances that may affect proper fitting, adhesion, or the required fire resistance.
- D. Install penetration seal materials in accordance with manufacturer's instruction.
- E. Seal holes or voids may be penetrations to ensure an effective fire and/or smoke barrier.
- F. Protect materials from damage on surfaces subject to traffic.
- G. Stop insulation flush with wall on insulated pipe and seal edges.

- H. All exposed piping passing through floors, ceilings and walls in finished areas shall be fitted with a chrome plated escutcheon of sufficient outside diameter to amply cover the sleeved opening and ad inside diameter to closely fit the pipe around which it is installed.
- I. Galvanized sheet metal collars shall be provided around all ducts, equipment, etc., exposed in finished areas. Where such openings are finished and the space around the unit is small, the collar may be omitted with the approval of the Architect.

## 1.18 CONCRETE WORK AND ANCHOR BOLTS

- A. The Contractor under this Division shall provide all concrete bases, curbs and pads for all floor and ground mounted equipment unless otherwise indicated.
- B. The Contractor under this Division shall verify the sizes and locations of all supports, bases and pads prior to pouring of same to be certain that the installed units will be compatible.
- C. The Contractor under this Division shall set anchor bolts when required for the equipment prior to pouring of concrete. Sizes and exact locations of bolts shall be determined by the manufacturer's recommendations for the equipment served.
- D. Concrete work must be provided in strict accordance with Section 03 Concrete Work. As a minimum provide pads using 3500 psi concrete not less than 3.5 inches high reinforced with WI.4 x WI.4 welded wire fabric. Chamfer top and edge corners with 3/4" preformed chamfer strips. Subbases shall rest on structural floor and shall be reinforced with steel rods and interconnected with floor reinforcing bars by tie bars hooked at both ends or suitable dowels. Slope top to floor drain if drain is provided in pad.

# 1.19 ACCESS PANELS

- A. The Mechanical Contractor shall furnish all other access panels needed for access to valves, open receptacles, vents, fire dampers, mechanical units, etc., in inaccessible locations installed under this Division of the work.
- B. Access panels shall have a minimum size of 12" x 12" and shall be centered beneath equipment for accessibility and maintenance. Access panels must be of adequate size to service, observe, remove and maintain equipment.
- C. Access panels shall be equal to the types specified under the Architectural Specifications. As a minimum the access panels shall be equivalent to Cesco Products style FB/FB SS, Besco, Inryco/Milcor, Phillips or equivalent, 14 gauge with vandal proof lock and frame as selected by Architect.
- D. Ceiling Types
  - 1. In areas with suspended acoustical tile ceilings (installed on exposed metal grid suspension system so that the tile may be readily removed), equipment, valves, etc., install above these ceilings will be considered to be accessible.
  - 2. All plastered ceilings or ceilings having concealed spline type of suspension system will be considered as not removable for accessibility to equipment; therefore, access panels will be required.
  - 3. See Architectural Drawings and Specifications for the types of ceilings throughout the building.
- E. Access panels shall be installed by sub-contractor specialized in access panel installation.
- 1.20 CONNECTION TO EQUIPMENT SPECIFIED IN OTHER SECTIONS
  - A. Examine all Contract Documents and be thoroughly familiar with all items of equipment in other sections or by Owner, unless otherwise specified or indicated on Drawings. Rough-

in for and make final connections to all equipment which requires any of the services specified in this Section and including furnishing and install all valves, P-traps, unions, vacuum breakers and all other specialties as required to make all work and equipment final and operating. It is the intent of the Contract Drawings to detail and indicate all such equipment; however, be responsible for notifying Architect/Engineer in writing of major discrepancies seven (7) days prior to Bid Date; otherwise, all such connections shall be made at no extra cost.

B. Unless specified otherwise, all conduit, wiring and connections for power to mechanical equipment will be provided by Electrical Contractor. Be responsible for correct sequences of operation of all mechanical equipment after all wiring has been completed.

# 1.21 OPERATING INSTRUCTIONS

- A. After all tests have been completed and work accepted by the Owner, a competent representative shall, at a time determined by the Engineer, present verbal and visual instructions to the Owner's personnel in the proper operation of his respective system. For this purpose, each section of work shall be demonstrated and explained to the Owner's personnel and sufficient time allotted for instructions. See Specification Section 230600.
- 1.22 SAFETY
  - A. The contractor and his subcontractors for the project shall comply with all applicable Federal, State, and local laws governing safeguards, safety devices, and protective equipment and shall take all other needed actions which they may determine or which the Department may determine to be reasonably necessary to protect the life and health of all employees and personnel on the project, provide for the safety of the public and protect all property affected by the performance of the work covered by the contract.
  - B. As provided in KRS Chapter 338 in the Kentucky Occupational Safety and Health Act and in subsequent regulations and standards promulgated by the Kentucky Occupational Safety and Health Standards Board, neither the Contractor nor his subcontractors shall require any laborer or mechanic employed in performance of the contract to work in surroundings or under working conditions which are unsanitary, hazardous, or dangerous to his health and safety.
  - C. The contractor shall not remove or disturb any suspected hazardous materials, including asbestos-containing materials, lead based paints, electrical equipment containing PCB's, or any other except as instructed in this contract. If any material not covered by the contract is encountered, notify the Engineer immediately.
- 1.23 TESTS GENERAL
  - A. All tests required to establish the adequacy, quality, safety, completed status and suitable operation of each system and all components thereof shall be made in the presence of and to the satisfaction of the Engineer or his authorized representative and other representatives of State and local Government. All instruments, labor and expert service necessary to conduct these tests shall be supplied by the Contractor; power and fuel will be furnished by the Owner.
  - B. The final inspection and tests are to be made only after the Engineer is satisfied that the work described in these specifications has been completely installed in accordance with the true spirit and intent of these specifications and that complete preliminary tests were made which indicate adequacy, quality, completion and satisfactory operation. The acceptance of the work herein specified, shall not in any way prejudice the Owner's right to demand replacement of defective material and/or workmanship.
- 1.24 CLEANING

- A. General: Clean all piping and equipment systems as required to leave the piping and equipment clean and free from scale, silt, contamination, etc., as normally required and as specified herein.
- B. Utilities and Equipment: The Contractor shall provide all necessary temporary materials and equipment to clean the piping and equipment installed under this specification. No permanent equipment shall be used for storage, mixing, settling, compressing, pumping, etc., without the approval of the Architect. The Contractor shall supply a separate and independent source of clean, dry, oil-free air for the blowdown of systems requiring this method of cleaning.
- C. Use of Chemicals: No chemicals, wetting or drying agents shall be used to clean systems or equipment where the materials of the system undergo any changes in their physical or structural characteristics. In case of any doubt as to the compatibility of any materials to the cleaning solution used, the Contractor shall obtain prior written approval for the use of the solution from the manufacturer of the equipment. Piping systems, equipment and sub-assemblies shall be cleaned after completion of welding, machining, threading, testing and any other operations capable of contaminating the system piping or equipment. After cleaning, the permanent strainers shall be removed, cleaned and replaced. Temporary strainers shall be periodically removed, cleaned and replaced during cleaning in lines ahead of equipment to protect against particles becoming lodged in the equipment.
- D. After the Architect/Engineer has complete examination, this Contractor shall remove all stickers, tags, etc., and shall thoroughly clean all equipment, fixtures, and materials installed under his section of the work.
- E. Surplus material, rubbish and equipment resulting from the work shall be removed from the building and premises by the Contractor upon completion of the work in accordance with the General Conditions.
- F. All equipment shall be thoroughly cleaned to "Factory New" condition prior to turning over to owner. Touch up or completely repaint equipment as required.
- G. Keep all nameplates on equipment clean and exposed for easy reading.

## 1.25 WARRANTY AND SERVICE

All equipment shall be warranted for a period of at least one (1) year from the date of Α. acceptance, as evidenced by date of substantial completion for the entire project or for the last phase of the project, whichever occurs later, against defective materials, design, and workmanship. In addition to the equipment warranty, the Contractor shall provide all repair and adjustment service necessary for the proper operation of the entire system for a period of one (1) year after the date of acceptance, as evidenced by the date of substantial completion for the entire project or for the last phase of the project, whichever occurs later. Upon receipt of notice from the Owner's representative of failure of any part of the warranted system or equipment during the warranty period, the affected part shall be replaced promptly with a new part without cost to the Owner. Upon failure to take action within 24 hours after being notified, the work will be accomplished by the Engineer at the expense of the Contractor. See General Conditions and individual equipment specifications. Note that the warranty period of time specified in this section represents the minimum warranty period required for work performed under specification Division 21, 22 and 23. Where the General Conditions and/or individual equipment/system specifications require a warranty period of longer duration or earlier start date than specified in this paragraph, the longer duration/earlier start date shall supersede for those portions of work covered by that specification. In the event the contractor is notified of warranty issues but does not correct or address the warranty issues prior to the end of the specified warranty period, the contractor will not be relieved of the responsibility to correct the deficient items after the warranty end date has passed.

B. Make a minimum of two (2) service calls during guarantee period, free of charge, to check with Owner and to check and repair malfunctioning equipment which was installed. Service calls shall be in middle and end of guarantee period and as required to maintain systems operation. Dates shall be listed in operating and maintenance manuals, along with contractor's name and phone number.

# 1.26 ELECTRIC MOTORS

- A. All motors shall be designed, tested and applied in accordance with the applicable standards listed hereinbefore. Motors shall be of sufficient size for the duty to be performed and shall not exceed the full load rating when the driven equipment is operating at specified capacity. Unless otherwise specified, all motors shall be high efficiency type and shall have open frames and continuous-duty classification based on 50 degrees C. ambient temperature. Polyphase motors shall be squirrel-cage type, having normal-starting-torque and low-starting-current characteristics. Motors shall meet NEMA high efficiency standards MGI 1.41.2 for energy efficient polyphase squirrel-cage motor. Efficiency shall be in accordance with MGI 1.2.55. When motor horse powers required differ from those indicated on the drawings, the Contractor shall make the necessary adjustments to the wiring, disconnect devices, starters and branch-circuit protection at no additional cost to the Owner.
  - Motors shall be rated for continuous duty capable of driving the connected loads without exceeding temperature limitations of the motor insulation. Special Class A moisture-resisting insulation (designed to operate in a 122-degree F. ambient without exceeding a temperature rise rating designated by NEMA for the type of enclosure used) shall be utilized in each motor.
- B. Unless otherwise indicated or specified, the electrical components required to operate mechanical equipment, such as, motors, float and pressure switches, solenoid valves, and other devices functioning to control the mechanical equipment, shall be furnished as part of the mechanical equipment, shall be complete and operable, and shall be included under this section of the specifications. All motor starters not part of a motor control center shall be included under this Section and shall be the hand off auto type with 3 over-loads on 3 phase units and 120V control transformer. Conduit and wires required for external electrical connections shall be furnished and are specified under DIVISION 26 ELECTRICAL. Integral phase failure relay shall be provided as a part of all three phase motor starters. Relay shall shut motor down on phase loss or phase unbalance and automatically reset when normal phasing is restored. Phase failure relay shall have adjustable restart time capabilities. Mechanical contractor shall coordinate staggered restart times as required.

# 1.27 DRIVES

- A. Each belt-connected motor-driven unit or fan shall be provided with a variable pitch V-belt drive.
- B. Sheaves shall be of cast iron or of steel, statically and dynamically balanced, bored to fit properly on the shafts and secured with key of proper size. Sheaves having set screws alone will not be permitted. Sheaves shall be variable pitched and shall be designed to give the required rpm at approximately the mid-position of adjustment. Pitch diameters of sheaves shall be not less than 3.0 inches for "A" section belts; 5.4 inches for "B" section belts; 9.0 inches for "C" section belts; and 13.0 inches for "D" section belts.
- C. Belts shall be selected for a minimum service factor of 1.5 (based on motor nameplate horsepower) and selected and matched in sets for equal tension.
- D. All other drives shall be as described under the respective equipment paragraph of these Specifications, as applicable.
- 1.28 AS-BUILT DRAWINGS

- A. The Contractor shall deliver to the Engineer at the completion of the work, one (1) print of "As-Built" drawings, showing legibly and accurately, mechanical and piping systems with equipment locations shown as actually installed. Changes in original plans shall be neatly shown in red pencil. Each print shall be signed by the sub-contractor who has done the work.
- B. During construction the Contractor shall retain a set of blue line drawings on the site for recording all changes. These drawings shall be available for inspection by the Engineer.

# 1.29 TESTS

- A. The Architect/Engineer shall be notified by the Contractor under this Division forty-eight (48) hours in advance of any tests so that the Architect/Engineer or his representative may be present when the tests are run. Leaks or imperfections found shall be corrected and a new test shall be run to the satisfaction of the Architect/Engineer. Upon successful completion of the test, pipe covering may be applied, and piping may be concealed. A successful test, even if witnessed, however, does not relieve the Contractor under this Division of the responsibility for any failure during the guarantee period.
- B. After pipe fabrication has been completed, all water piping shall be subjected to a hydrostatic test of 100 psi and proven tight and free of leaks for a 24-hour period. Tests shall be applied to the piping before being attached to any equipment which would be damaged by the test pressure. Damage to equipment caused by testing shall be repaired or replaced without additional cost to the Owner.
- C. Exterior water piping shall be tested in strict compliance with local water company. The minimum hydrostatic test pressure is 1 1/2 times the water pressure serving the site.
- D. No insulation, paint, backfill or other prohibitive covering shall be applied to piping prior to the above tests.
- E. Provide all temporary equipment, materials, valves, gauges, etc., required for the preceding tests.
- F. The expense of all tests shall be borne by the Contractor under this Division.
- G. In addition to the testing specified above the contractor shall perform the following HVAC systems tests and place the system(s) in operation to demonstrate that all features of the system(s) including instrumentation, controls and equipment function as specified for final acceptance.
  - 1. At such time as the Engineer determines that the new heating, ventilating and cooling system is ready to be placed into service, the Contractor shall place the new equipment in operation and demonstrate that the safety devices are in proper working order to the satisfaction of the Engineer.
  - 2. The Contractor shall then maintain operation and demonstrate each system's capability of producing at full load capacity. Within 24 hours after the systems have been satisfactorily tested, Owner operating personnel will relieve the Contractor of the operations and the Contractor shall continue his work on a joint occupation basis.
  - 3. Depending on the status of the work, the Contractor may at his option conduct other required tests concurrent with, prior to, or following the system testing, providing the Engineer is satisfied the installation is in conformance with the specifications. However, all features of the system(s) shall be tested individually for proper operation at partial and full load conditions and collectively where normal operations require the several components to operate concurrently to constitute an acceptable system.
  - 4. Final acceptance of the entire installation will be based on an acceptable demonstration that all components, local and remote, respond to safety manual

and Automatic System controls. During this test the Contractor shall cause simulated perturbations for which the control system is designed to respond. All control, monitor and readout points in the system shall function properly before final acceptance is made.

# 1.30 CONTRACTOR FURNISHED DRAWINGS, DESCRIPTIVE DATA AND MANUALS

- A. Approval of Materials and Equipment: Within 30 days of receipt of notice to proceed, and before starting installation, the Contractor shall submit to the Architect for approval, in triplicate, lists of materials, fixtures and equipment to be incorporated in the work. If departures from the contract drawings are deemed necessary by the Contractor, details of such departures, including changes in related portions of the project and the reasons therefore shall be submitted with drawings. Where such departures require piping or equipment to be supported otherwise than shown, the details submitted shall include loadings and type and kinds of frames, brackets, stanchions, or other supports necessary. Approved departures shall be supported by sufficient descriptive material, such as catalog cuts, diagrams, and other data published by the manufacturer, as well as evidence of compliance with safety and performance standards, to demonstrate conformance to the specification requirements; catalog numbers alone will not be acceptable.
- B. Conformance to Agency Requirements: Where materials or equipment are specified to be constructed and/or tested in accordance with the standards of the American Society of Mechanical Engineers, the Air Moving and Conditioning Association, or the American Society of Heating, Refrigerating and Air Conditioning Engineers, or to be approved by the Underwriters' Laboratories, Inc., the Contractor shall submit proof that the items furnished under this specification conform to such requirements. A certificate or published statement by the manufacturer will be sufficient evidence that the item conforms to the specified requirements. In lieu of such stamp, certificate, or statement, the Contractor may submit written certificate from any nationally recognized testing agency adequately equipped and competent to perform such services, stating that the items have been tested and that the units conform to the requirements listed hereinbefore, including methods of testing, of the specified agencies.
- C. Shop Drawings
  - 1. In accordance with the General Conditions, shop drawings shall be submitted on all units of prefabricated materials. Shop drawings shall show, in detail, all parts of the work, fully dimensioned and shall also indicate construction, concealed and other jointing, thickness of materials, method of anchoring and attachment to other materials. Where required for certain work, submit setting and bending diagrams and mark same to correspond with the design drawings, identifying locations of various items. Show types, sizes and locations of sleeves and inserts.
  - 2. The Contractor shall check all shop drawings for completeness and for correctness before submitting the drawings. If major corrections are required on the drawings, the Contractor shall return the drawings to the originator and have the changes made. The Contractor shall indicate his corrections on the prints in green pencil and sign all prints and other material sent to the Engineer.
  - 3. Detail and Erection Drawings: Detail and erection drawings for equipment, piping and other items of this nature shall be carefully prepared in accord with standard practice and shall show erection plans and member details with all individual parts identified on both the detail sheets and erection plans. All identification markings shall be carefully preserved until after the erection process is completed.

- 4. Material Data: The Contractor shall submit descriptive data, as required, on pipe, fittings and valves to be incorporated into the work. This data shall be in sufficient detail to allow the Engineer to determine that the pipe, fittings and valves meet the requirements of the contract drawings and specifications or that they are an acceptable equal to that specified. All data shall be in the form of manufacturer's or supplier's literature concerning the product and shall indicate catalog number, conditions of use, application instructions, and/or other information as applicable.
- 5. Equipment Data: The Contractor shall submit descriptive data on all items of equipment to be furnished and installed under this contract. These submittals shall consist of manufacturer's published catalog information which completely describes component materials, configuration and rough-in data for mechanical and electrical equipment shall also include cuts, diagrams, characteristic curves and capacity information as applicable. Where more than one item of equipment is employed in the same system, the submittal of equipment data will include special diagrams showing the electrical wiring, interconnecting piping, related controls and relation and operation of the various items of equipment for the entire system.
- D. Operating Instructions and Maintenance Manuals, Etc.
  - 1. At completion of the contract, the Owner shall be provided with three (3) bound copies of operations and maintenance instructions, recommended list of spare parts required for a period of one (1) year and a list of any special tools required to maintain the equipment for the various items of the mechanical equipment. Where special tools are required, the Contractor shall furnish two (2) of each such tools to the Owner at no additional contract cost.
  - 2. MANUAL SHALL INCLUDE ALL APPROVED SHOP DRAWINGS OF EQUIPMENT REQUIRING OPERATION AND MAINTENANCE INFORMATION.
  - 3. MANUAL SHALL BE ORGANIZED WITH APPROVED SHOP DRAWING FOLLOWED BY ALL RELATED OPERATION AND MAINTENANCE MATERIAL.
  - 4. EQUIPMENT SHALL BE IDENTIFIED IN ACCORDANCE WITH THE DRAWING NOMENCLATURE AND INCLUDE SUPPLIER OF SAID EQUIPMENT.
  - 5. Instructions shall be included for routine checking of all items requiring continued maintenance.
  - 6. Schematic drawings with actual pieces of mechanical equipment, etc., shall be included; where manufacturer's parts numbers only are applicable, they shall be included.
  - 7. Detailed operating instructions for mechanical equipment shall be included, as well as general maintenance procedures to be followed on such equipment. Manufacturers maintenance and operation manuals will be required where such are normally available with the equipment, but as such information is often of a general nature and applicable to various models of equipment, such information shall be supplemented by specified typed directions for the particular piece of equipment applicable to this project.
- E. Materials, Equipment and Appliances
  - 1. Materials: All materials, equipment, products and incidentals to be furnished by the Contractor shall be new, unless otherwise specified, undamaged and the first line quality product of the manufacturer and/or supplier, except when competitive grades fully meet the standards specified in the various technical sections of these specifications.

- 2. Standard Products: Except as otherwise approved by the Engineer, the equipment and appliances to be furnished under these specifications shall be the standard products of manufacturers regularly engaged in the production of such equipment and shall be the manufacturer's latest standard design. Where two or more units of the same type and class of equipment are required, the units shall be the product of the same manufacturer and shall be identical insofar as possible. The component parts of the products need not be products of one manufacturer.
- 3. Manufacturer's Directions: Where manufacturer's instructions or recommendations are applicable to the installation or application of materials, the Contractor shall adhere to strict conformance with such instructions or recommendations unless specifically noted to the contrary in these specifications. Where such directions are in conflict with the drawings and specifications, the Contractor shall inform the Engineer of such conflict and request instructions.
- 4. Samples: The Contractor shall furnish, for approval, samples of materials, profiles, designs, finishes, etc., which are either required by the various sections of specifications or which the Engineer may request from time to time. Samples shall be clearly identified with adequate information for the Engineer's evaluation.
- 5. Materials and Equipment Delivered to Jobsite: All items of materials, equipment, supplies and miscellaneous items to be incorporated into the work shall be delivered to the jobsite with labels, tags, nameplates and/or containers which clearly indicate the manufacturer's item or catalog number or conformance with the applicable standards stipulated in the technical sections of the specifications. Any item which cannot be verified in the field shall not be included in the work until its identity can be established by the Engineer.
- F. Equipment and Material Substitutions
  - 1. Should the Contractor elect to use and install materials which have been approved for use other than specified, he shall be required to make any necessary changes, perform all work and furnish any additional materials and ancillary equipment required to make such substituted materials or equipment function or perform as that specified, at no cost to the Owner. This includes structural, electrical and/or other affected trades.

## 1.31 DEFINITIONS

- A. Mechanical Contractor: Any contractor whether bidding or working independently or under the supervision of a general contractor and/or construction manager and who installs any type of mechanical work.
- B. Mechanical Sub-Contractor: Any contractor contracted to or employed by the mechanical contractor for any work required by the mechanical contractor.
- C. Engineer: The consulting mechanical/electrical engineers either consulting to the owners, architects, other engineers, etc.
- D. A-E: Shall construe architect and/or engineer. In all situations that involve an architect, it shall construe architect, in all others, engineer.
- E. Furnish: Deliver to the site in good condition and turn over to contractor responsible for installation.
- F. Provide: Furnish and install in complete working order.
- G. Install: Install equipment furnished by others.
- H. Indicated: Shown on the drawings or addenda thereto.

I. Contract Documents: All documents pertinent to the quality and quantity of work to be performed on the project. Includes but not limited to: plans, specifications, instructions to bidders, general and special conditions, addenda, alternates, list of materials, list of subcontractors, unit prices, shop drawings, field orders, change orders, cost breakdown, periodical payment requests, etc.

# 1.32 INTENT

- A. It is the intention of these specifications and all associated drawings to call for finished work, tested and ready for operation. Wherever the word "provide" is used, it shall mean "furnish and install complete and ready for use".
- B. Details not usually shown or specified, but necessary for the proper installation and operation of systems, equipment, materials, etc., shall be included in the work, the same as if herein specified or indicated.

PART 2 - PRODUCTS

NOT APPLICABLE

PART 3 - EXECUTION

NOT APPLICABLE

# END OF SECTION 23 01 00

# SECTION 23 05 17 – SLEEVING, CUTTING, PATCHING AND REPAIRING FOR MECHANICAL

## PART 1 - GENERAL

- 1.1 SUMMARY
  - A. This section includes requirements for the Mechanical Contractor related to sleeving, cutting, patching, and repairing associated with mechanical work.
- 1.2 WORK INCLUDED
  - A. Sleeves
  - B. Sleeve Seals
  - C. Grout
  - D. Escutcheons
  - E. Lintels
- 1.3 RELATED DOCUMENTS
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 230100 GENERAL PROVISIONS FOR MECHANICAL WORK

## PART 2 - PRODUCTS

- 2.1 SLEEVES
  - A. Cast-Iron Wall Pipes: Cast or fabricated of cast or ductile iron and equivalent to ductileiron pressure pipe, with plain ends and integral water stop unless otherwise indicated.
  - B. Galvanized-Steel Wall Pipes: ASTM A 53/A 53M, Schedule 40, with plain ends and welded steel collar; zinc coated.
  - C. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, with plain ends.
  - D. PVC-Pipe Sleeves: ASTM D 1785, Schedule 40.
  - E. Galvanized-Steel-Sheet Sleeves: 0.0239-inch minimum thickness, round tube closed with longitudinal joint.
- 2.2 SLEEVE-SEAL SYSTEMS
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. Advance Products & Systems, Inc.
    - 2. Metraflex Company (The).
    - 3. Proco Products, Inc.
  - B. Description: Modular sealing-element unit, designed for field assembly, for filling annular space between piping and sleeve.
    - 1. Sealing Elements: EPDM-rubber or NBR interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
    - 2. Pressure Plates: Carbon steel, Plastic, or Stainless steel.
3. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, or Stainless steel of length required to secure pressure plates to sealing elements.

# 2.3 GROUT

- A. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- B. Characteristics: Non-shrink; recommended for interior and exterior applications.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

## 2.4 ESCUTCHEONS

- A. Escutcheons shall be Beaton and Caldwell; Carpenter and Patterson; Fee and Mason or approved equivalent. Chromium-plated iron or chromium-plated brass, either one piece or split patterns, held in place by internal spring tension or set screw that completely covers opening.
- 2.5 LINTELS
  - A. New openings under 48" in width: Provide one 3 1/2" x 3 1/2" x 3 1/2" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on either side.
  - B. New openings 48" to 96" in width: Provide one 3 1/2" x 6" x 3/8" steel angle for each 4" of masonry width. Lintel shall have 8" bearing on either side.
  - C. New openings over 96" in width: Consult the project structural engineer.

# PART 3 - EXECUTION

- 3.1 GENERAL
  - A. The Contractor shall be responsible for all openings, sleeves, trenches, etc., that he may require or create by demolition in floors, roofs, ceilings, walls, etc., and shall coordinate all such work with the General Contractor and all other trades. Coordinate with the General Contractor, any openings which he is to provide before submitting a bid proposal in order to avoid conflict and disagreement during construction. Improperly located openings shall be reworked at the expense of the Contractor.
  - B. The Contractor shall plan his work ahead and shall place sleeves, frames or forms through the walls, floors and ceilings during the initial construction, where it is necessary for piping, ductwork, conduit, etc., to go throughout; however, when this is not done, the Contractor shall do all cutting and patching required for the installation of his work, or he shall pay other trades for doing this work when so directed by the Engineer. Any damage caused to the buildings by the workmen of the responsible Contractor must be corrected or rectified by him at his own expense.
  - C. The Contractor shall notify other trades in due time where he will require openings or chases in new concrete or masonry. He shall set all concrete inserts and sleeves for his work. Failing to do this, he shall cut openings for his work and patch same as required at his own expense.
  - D. The Contractor shall be responsible for properly shoring, bracing, supporting, etc., any existing and/or new construction to guard against cracking, settling, collapsing, displacing or weakening while openings are being made. Any damage occurring to the existing and/or new structures, due to failure to exercise proper precautions or due to action of the elements shall be promptly and properly made good to the satisfaction of the Engineer.

E. All work improperly done or not done at all as required by the Mechanical Trades in this section, will be performed by the Contractor at the direction of the trade whose work is affected.

### 3.2 SLEEVES

- A. Install sleeves for piping passing through penetrations in floors, partitions, roofs, and walls.
- B. For sleeves that will have sleeve-seal system installed, select sleeves of size large enough to provide 1-inch annular clear space between piping and concrete slabs and walls.
  - 1. Sleeves are not required for core-drilled holes.
- C. Install sleeves in concrete floors, concrete roof slabs, and concrete walls as new slabs and walls are constructed.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
    - a. Exception: Extend sleeves installed in floors of mechanical equipment areas or other wet areas 2 inches above finished floor level.
  - 2. Using grout, seal the space outside of sleeves in slabs and walls without sleeveseal system.
- D. Install sleeves for pipes passing through interior partitions.
  - 1. Cut sleeves to length for mounting flush with both surfaces.
  - 2. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation.
  - 3. Seal annular space between sleeve and piping or piping insulation; use joint sealants appropriate for size, depth, and location of joint.
- E. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials.
- F. Pipes Passing Through Waterproofing Membranes: Pipes passing through floor waterproofing membrane shall be installed through a 4-pound lead-flashing sleeve, or a 0.032-inch thick aluminum sleeve, each with an integral skirt or flange. Flashing sleeve shall be suitably formed, and the skirt of flange shall extend not less than 8 inches from the pipe and shall set over the floor membrane in a troweled coating of bituminous cement. The flashing sleeve shall extend up the pipe a minimum of 1 inch above the floor. The annular space between the flashing sleeve and the metal-jacket-covered insulation shall be sealed. At the Contractor's option, pipes passing through floor waterproofing membrane may be installed through a cast iron sleeve with caulking recess, anchor lugs, flashing clamp device, and a pressure ring with brass bolts. Waterproofing membrane shall be clamped into space and sealant shall be placed in the caulking recess.
- G. Pipes Passing Through Roof: Pipes passing through the roof shall be installed where shown on the drawings. Any penetration in roof shall be approved by the Roofing Manufacturer.
- H. Openings for ductwork, fixtures, equipment, etc. through floors, walls, ceiling and roofs, shall be located and sized by the Contractor under this division who shall provide and set necessary lintels, sleeves and sheet metal forms for all such openings.
- I. Galvanized sheet metal collars shall be provided around all ducts, equipment, etc., exposed in finished areas. Where such openings and finished and the space around the penetration is small, the collar may be omitted with the approval of the Architect/Engineer.

### 3.3 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at service piping entries into building.
- B. Select type, size, and number of sealing elements required for piping material and size and for sleeve ID or hole size. Position piping in center of sleeve. Center piping in penetration, assemble sleeve-seal system components, and install in annular space between piping and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make a watertight seal.

### 3.4 ESCUTCHEONS

A. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used.

## 3.5 CUTTING

- A. All rectangular or special shaped openings in plaster, stucco or similar materials, including gypsum board, shall be framed by means of plaster frames, casing beads, wood or metal angle members as required. The intent of this requirement is to provide smooth even termination of wall, floor and ceiling finishes as well as to provide a fastening means for grilles, diffusers, lighting fixtures, etc.
- B. All trades shall coordinate all openings in masonry walls with the General Contractor, and, unless otherwise indicated on the Architectural drawings, shall provide lintels for all openings required for the plumbing work (piping, wall boxes, etc.).
- C. No cutting is to be done at points or in a manner that will weaken the structure and unnecessary cutting must be avoided. If in doubt, contact the engineer.
- D. Pipe openings in slabs and walls shall be cut with core drill. Hammer devices will not be permitted. Edges of trenches and large openings shall be scribe cut with a masonry saw.
- E. Openings in metal building walls shall be made in strict accord with building suppliers recommendations.

# 3.6 PATCHING AND REPAIRING

- A. Patching and repairing made necessary by work performed under this division shall be included as part of the work and shall be done by skilled mechanics of the trade or trades for work cut or damaged, in strict accordance with the provisions herein before specified for work of like type to match adjacent surfaces and in a manner acceptable to the engineer.
- B. Where portions of existing lawns, shrubs, paving, etc. are disturbed for installation or work of this Division, such items shall be repaired and/or replaced to the satisfaction of the engineer.
- C. Where the installation or removal of piping, etc. requires or creates the penetration of fire or smoked rated walls, ceilings or floors, the space around such pipe, etc., shall be tightly filled with an approved non-combustible fire insulating material satisfactory to maintain the rating integrity of the wall, floor or ceilings affected.
- D. Piping passing through floors, ceilings and walls in finished areas, unless otherwise specified, shall be fitted with chrome plated brass escutcheons of sufficient outside diameter to amply cover the sleeved openings and an inside diameter to closely fit the pipe around which it is installed.

E. Where pipes pass through exterior walls, the wall openings shall be sealed air and water tight. This shall include sealing on both sides of the wall to insure air and water does not enter or exit the wall cavity. This is especially critical on exterior walls where the wall cavity may be vented to the exterior.

END OF SECTION 23 05 17

SECTION 23 05 29 – HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

### PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Pipe and Equipment Hangers, Supports, and Associated Anchors

### 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 230100 GENERAL PROVISION FOR MECHANICAL WORK
- C. Section 230719 HVAC PIPING INSULATION
- D. Section 232113 HYDRONIC PIPING AND VALVES
- 1.3 REFERENCES
  - A. ANSI/ASME B31.1 Power Piping
- 1.4 SCOPE
  - A. This specification shall apply for the design and fabrication of all hangers, supports, anchors and guides. Where piping design is such that exceptions to this specification are necessary, the system shall be identified, and the exceptions approved by Engineer prior to installation. See drawings.
- 1.5 STRUCTURE
  - A. This section is intended to cover the structural requirements of the piping and equipment. It is not intended to imply that the building structure will support the loads imposed. The contractor shall review the structural drawings for where loads can be applied, what load can be supported and what structural reinforcing is required. Specific questions can be directed to the structural engineer.

# 1.6 DESIGN

- A. All supports and parts shall conform to the latest requirements of the ANSI Code for Pressure Piping B31.1.0, and MSS Standard Practice SP-58, SP-69 and SP-89 except as supplemented or modified by the requirements of this specification.
- B. Designs generally accepted as exemplifying good engineering practice, using stock or production parts, shall be utilized wherever possible.
- C. Accurate weight balance calculations shall be made to determine the required supporting force at each hanger location and the pipe weight load at each equipment connection.
- D. Pipe hangers shall be capable of supporting the pipe in all conditions of operation. They shall allow free expansion and contraction of the piping, and prevent excessive stress resulting from transferred weight being induced into the pipe or connected equipment.
- E. Where possible, steel structural attachments shall be beam clamps. Other attachments shall be as scheduled.
- F. All rigid hangers shall provide a means of vertical adjustment after erection.
- G. Hanger rods shall be subject to tensile loading only. At hanger locations where lateral or axial movement is anticipated, suitable linkage shall be provided to permit swing.

- H. Where horizontal piping movements are greater than ½ inch, or where the hanger load angularity from the vertical is greater than 4 degrees from the cold to hot position of the pipe, the hanger rod to structural attachment shall be by use of Anvil Fig. 47 and Fig. 299 or the hanger rod and structural attachments shall be offset in such manner that the rod is vertical in the hot position.
- I. Hangers shall be designed so that they cannot become disengaged by movements of the supported pipe.
- J. Hangers shall be spaced in accordance with ANSI B31.1.0
- K. Where practical, riser piping shall be supported independently of the connected horizontal piping.
  - 1. Pipe support attachments to the riser piping shall be riser clamp lugs. Welded attachments shall be of material comparable to that of the pipe, and designed in accordance with ANSI B31.1 codes.
- L. Supports, guides and anchors shall be so designed that excessive heat will not be transmitted to the building steel. The temperature of support parts shall be based on a temperature gradient of 100 degrees F per inch distance from the outside surface of the pipe.

### PART 2 - PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Anvil, Elcen, Mason Industries, Advanced Thermal, Fee & Mason, Piping Specialties, MIRO Industries.

# 2.2 SHIELDS

- A. Shield for Insulated Piping 2 Inches and Smaller: galvanized steel shield over insulation in 180-degree segments, minimum 12 inches long at pipe support. See schedule for thickness.
- B. Shield for Insulated Piping 2 <sup>1</sup>/<sub>2</sub> Inches and Larger: Pipe covering protective saddles.
- C. Shields for Insulated Cold Water Piping 2 <sup>1</sup>/<sub>2</sub> Inches and Larger: Hard block nonconducting saddles in 90-degree segments, 12-inch minimum length, block thickness same as insulation thickness.
- D. Shields for Vertical Copper Pipe Risers: Sheet lead.

# 2.3 HANGER RODS

A. Threaded one end, threaded both ends, threaded continuously.

## 2.4 INSERTS

A. Inserts: Malleable iron case or galvanized steel shell and expander plug for threaded connection with lateral adjustment, top slot for reinforcing rods, lugs for attaching to forms; size inserts to suit threaded hanger rods.

# 2.5 PIPE HANGERS, SUPPORTS AND ANCHORS

- A. BEAM CLAMPS
  - 1. Beam clamps shall have malleable iron jaws, steel bolt or tie rod, nuts and jamb nuts.
  - 2. C-clamps will not be permitted unless retainer is provided.
- 2.6 FINISH

A. Prime coat exposed steel hangers and supports. Hangers and supports located in crawl spaces, pipe shafts, and suspended ceiling spaces are not considered exposed.

# PART 3 - EXECUTION

- 3.1 INSERTS
  - A. Provide inserts for suspending hangers from reinforced concrete slabs and sides of reinforced concrete beams.
  - B. Where concrete slabs form finished ceiling, provide inserts to be flush with slab surface.
- 3.2 PIPE HANGERS AND SUPPORTS
  - A. Support horizontal piping indicated in schedule on drawings.
  - B. Install hangers to provide minimum ½ inch space between finished covering and adjacent work.
  - C. Place a hanger within 12 inches of each horizontal elbow.
  - D. Provide hangers with 1-1/2-inch minimum vertical adjustment.
  - E. Support riser piping independently of connected horizontal piping.
  - F. Support horizontal piping as follows:

Nominal Pipe Size	Single Rod Diameter	Thickness of Insulation Shield	Maximum Spacing Ferrous Piping	Copper Tubing	HDPE Piping
3/4" & Under	3/8"	16 gauge	6'	5'	2.5'
1"	3/8"	16 gauge	7'	6'	3'
1 1/4	3/8"	16 gauge	8'	8'	4'
1 ½"&2"	3/8"	16 gauge	9'	8'	4'
2 ½"&3"	1/2"	12 gauge	12'	8'	4'
4" & 5"	5/8"	12 gauge	14'	8'	4'
6"	3/4"	10 gauge	14'	8'	4'
8"	7/8"	8 gauge	14'	10'	5'

END OF SECTION 23 05 29

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAW-NGS	C A T A L O G A T A	PARTS LISTS	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	S A M P L E S	OTHER
Pipe Hangers	х	х						
Supports	х	х						
Inserts		Х						

# SECTION 23 05 30 – METAL FABRICATIONS AND STRUCTURAL STEEL

### PART 1 - GENERAL

### 1.1 DESCRIPTION

A. Work included: Provide all miscellaneous metal and metal fabrications, complete, in place, as shown on the drawings, specified herein, or needed for a complete and proper installation and not specifically called for under other sections of these specifications.

## 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 230100 GENERAL PROVISIONS FOR MECHANICAL WORK

### 1.3 QUALITY ASSURANCE

- A. Standards: Comply with standards specified herein.
- B. Qualifications of personnel: Use adequate numbers of skilled workmen who are thoroughly trained and experienced in the necessary crafts and who are completely familiar with the specified requirements and the methods needed for proper performance of the work of this section.
- C. Welding: Perform all shop and field welding required in connection with the work of this section, adhering strictly to the current pertinent recommendations of the American Welding Society.

### 1.4 PRODUCT HANDLING

- A. Protection: Use all means necessary to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades.
- B. Replacement: In the event of damage, immediately make all repairs and replacements necessary to the approval of the Engineer and at no additional cost to the owner.

# PART 2 - PRODUCTS

#### 2.1 MATERIALS AND COMPONENTS

- A. Metal surfaces, general: For fabrication of the work of this section which will be exposed to view, use only those materials which are smooth and free from surface blemishes including pitting, seam marks, roller marks, rolled trade names, and roughness.
- B. Standards: All materials shall comply with:
  - 1. Steel plates, shapes, and bars: ASTM A36.
  - 2. Steel plates to be bent or cold formed: ASTM A283, Grade C.
  - 3. Steel tubing, hot-formed, welded, or seamless: ASTM A501.
  - 4. Steel bars and bar-size shapes: ASTM A306, Grade 65, or ASTM A36.
  - 5. Cold-finished steel bars: ASTM A108, grade as selected by the fabricator.
  - 6. Cold-rolled carbon steel sheets: ASTM A336.
  - 7. Galvanized carbon steel sheets: ASTM A526, with ASTM A525, G90 zinc coating.
  - 8. Gray iron castings: ASTM A48, Class 30.

9. Non-shrink nonferrous grout: CE CRD C588.

### 2.2 FASTENERS

- A. General: Provide zinc-coated fasteners for exterior use and where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Standards: All fasteners shall comply with:
  - 1. Bolts and nuts: Regular hexagon-head type, ASTM A307, Grade A.
  - 2. Lag bolts: Square-head type, Fed. Spec. FF-B-561.
  - 3. Machine screws: Cadmium plated steel.
  - 4. Masonry anchorage devices: Expansion shields.

### 2.3 PAINT PRIMER

A. Standard primer: SSPC Paint System Guide No. 7.00.

## 2.4 FABRICATION

- A. Workmanship
  - 1. Use materials of size and thickness shown or, if not shown, of required size and thickness to produce strength and durability in the finished product.
  - 2. Work to dimensions shown or accepted on the shop drawings, using proven details of fabrication and support.
  - 3. Use type of materials shown or specified for the various components of the work.
  - 4. Form exposed work true to line and level, with accurate angles and surfaces and with straight sharp edges.
  - 5. Ease the exposed edges to a radius of approximately 1/32" unless otherwise shown.
  - 6. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work.
  - 7. Weld corners and seams continuously, complying with AWS recommendations. At exposed connections, grind exposed welds smooth and flush; match and blend with adjoining surfaces.
  - 8. Form exposed connections with hairline joints, flush and smooth.
  - 9. Provide for anchorage of the type shown. Coordinate with supporting structure. Fabricate and space the anchoring devices to provide adequate support for intended use.
  - 10. Cut, reinforce, drill, and tap miscellaneous metal work as indicated to receive finish hardware and similar items.

### 2.5 SHOP PAINTING

- A. Shop paint miscellaneous metal work, except members or portions of members to be embedded in concrete or masonry, surfaces and edges to be field welded, and galvanized surfaces, unless otherwise specified.
- B. Remove scale, rust, and other deleterious materials before applying shop coat.
- C. Use painting methods which will result in full coverage of joints, corners, edges, and exposed surfaces.
- 2.6 MISCELLANEOUS METAL FABRICATIONS

# A. Rough Hardware

- 1. Provide bent or otherwise custom fabricated bolts, plates, anchors hangers, dowels, and other miscellaneous steel and iron shapes as required for framing and supporting woodwork, and for anchoring or securing woodwork to concrete and other structures.
- 2. Manufacture or fabricate items of sizes, shapes, and dimensions required.
- 3. Provide malleable iron washers for heads and nuts which bear on wood structural connections; elsewhere furnish steel washers.
- B. Loose bearing and leveling plates:
  - 1. Provide loose bearing and leveling plates for steel items bearing on concrete construction, made flat, free from warps or twists, and of required thickness and bearing area.
  - 2. Drill plates to receive anchor bolts and for grouting as required.

## PART 3 - EXECUTION

# 3.1 INSPECTION

A. Examine the areas and conditions under which miscellaneous metal items are to be installed, and correct conditions detrimental to the proper and timely completion of the work. Do not proceed until unsatisfactory conditions have been corrected.

## 3.2 INSTALLATION

- A. Setting loose plates:
  - 1. Clean concrete bearing surfaces free from bond- reducing materials, and roughen to improve bond to surfaces. Clean the bottom surface of bearing plates.
  - 2. Set loose leveling and bearing plates on wedges, or other adjustable devices.
  - 3. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shim; but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
  - 4. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.
- B. Fastening to in-place construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction including threaded fasteners for concrete inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- C. Cutting, fitting, and placement:
  - 1. Perform cutting, drilling, and fitting required for installation of miscellaneous metal fabrications.
  - 2. Set work accurately in location, alignment, and elevation, and make plumb, level, true, and free from rack, measured from established lines and levels.
  - 3. Provide temporary bracing or anchors in formwork for items which are to be built into concrete or similar construction.
  - 4. Fit exposed connections accurately together to form tight hairline joints.
  - 5. Weld connections which are not to be left as exposed joints, but cannot be shop welded because of shipping size limitations.

- 6. Grind exposed joints smooth, and touch up shop paint coat. Do not weld, cut, or abrade the surfaces of exterior units which have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- D. Field Welding: Comply with AWS code for procedures of manual shielded metal-arc welding, appearance and quality of weld made, and methods in correcting welding work.
- E. Touch up painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting. Apply by brush or spray to provide minimum dry film thickness of 0.051 mm (2.0 mils).

# END OF SECTION 23 05 30

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	S A M P L E S	OTHER
Metal Fabrication	Х	Х						

# SECTION 23 05 48 – VIBRATION CONTROL FOR HVAC

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. This specification includes vibration isolation, equipment balancing requirements and sound level criteria for equipment spaces and exterior mounted equipment.
- B. Mechanical and electrical equipment and associated piping and ductwork shall be mounted on vibration isolators as specified and/or required to minimize transmission of vibration and structure-borne noise to building structure or spaces.
- C. All rotating equipment shall be balanced both statically and dynamically. The equipment when mounted and placed in operation shall not exceed a self-excited vibration velocity of 0.10 inches per second in the vertical, horizontal or axial directions when measured with a vibration meter on the bearing caps or at the equipment mounting feet if the bearings are concealed.
- D. All electrical motors shall comply with the balancing requirements of NEMA Standard HG-1-4.23.

# 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 230100 GENERAL PROVISIONS FOR MECHANICAL WORK
- 1.3 SHOP DRAWINGS
  - A. Shop drawings shall be submitted as required in Section 230100: GENERAL PROVISIONS FOR MECHANICAL WORK. See Submittal Sheet.
  - B. Shop drawings for neoprene mounts, or pads and spring isolators with neoprene components shall contain a certification that the neoprene compound complies with the industry standards for physical properties.
  - C. All steel frames, steel bases and rails and vibration isolation units except those installed as part of the packaged equipment prior to shipment shall be furnished by one vibration isolation manufacturer.
  - D. All submittals for equipment bases and equipment and piping isolation shall be in one brochure. The isolation units including steel base for each piece of equipment and connected piping shall be grouped together. Each isolation unit in the group shall show the equipment location, weight supported, type unit specified, and type unit selected. Data for each spring isolator shall include outside diameter, deflection, operating spring height, solid spring height and the ratio of outside diameter to the operating height. Submittal shall include detail drawings, cut sheets and catalog data showing foundations, bases and isolators for all equipment. Certifications required for isolation materials shall be placed on all submittal drawings and catalog sheets containing neoprene items. The sound power levels in Db with reference to 10 - 12 watts, in the nine frequency bands between 31 and 8000 Hertz, exterior to the equipment as it effects the equipment space sound level shall be included with the data submitted for approval of the equipment. The sound power levels of the equipment with the resultant sound pressure levels for a room acoustics factor of 0.15 shall be plotted on an octave band analysis chart containing the broad band and pure tone Db sound pressure levels specified. When the equipment sound levels exceed the specification levels in any of the frequencies, the submittal shall

include the sound attenuating enclosure or other method proposed to reduce the equipment sound level to that specified, with supporting data.

E. The submittals for equipment mounted at the exterior of the building, or generating outside noise, shall include sound level calculations showing equipment sound level limitations based on the requirements hereinbefore specified and applicable sound level ordinances. The equipment sound pressure levels in all nine frequency bands between 31 and 8000 Hertz shall be included in the data. Where required to comply with the sound level limitations, the sound attenuation method proposed, with supporting data, shall be included with the equipment submittal.

## 1.4 EQUIPMENT SOUND ATTENUATION

A. The sound pressure levels in occupied spaces generated by any mechanical and electrical equipment as transmitted by the building structure, supply or return duct borne, duct breakout or airborne through mechanical room wall and ceiling shall not exceed the following:

Octave Band Hertz

Mid Frequency	63	125	250	500	1000	2000	4000
Sound Pressure Level dB	57	48	41	35	31	29	28

- B. The maximum allowable sound pressure levels shall be reduced by 5 Db in any octave band where field tests indicate pure tone generation.
- C. When equipment sound levels exceed the specified noise criteria removable acoustical enclosures, alterations to the equipment, or other approved means shall be provided to reduce the noise level to that specified. Ventilation openings in enclosures shall be provided with sound traps, access openings, observation ports and lights shall be provided where required for normal operation, observation and servicing.
- D. Equipment sound power levels may be obtained by laboratory tests measured in accordance with ASHRAE Standard No. 35-36 or by field testing. All equipment sound power tests shall be certified for compliance with the specified test procedure and accuracy by the test personnel and a responsible official of the test company.
- E. Mechanical equipment installed within or outside the building shall comply with all local, city, state and OSHA sound level requirements.
- F. Test instruments shall be calibrated for accuracy by an approved testing laboratory or by the manufacturer. Certificates showing degree of accuracy shall be furnished to the Engineer.
- G. All labor, instruments and appliances required for the tests shall be furnished by the Contractor.

## 1.5 VIBRATION

- A. Isolation system shall be stable during starting and stopping of equipment without excessive transverse or eccentric movement.
- B. The installed vibration isolation system shall have a maximum lateral motion under startup and shut-down conditions of 0.25 inch. Motions in excess shall be restrained by approved spring type mountings.
- C. All electrical and piping connections shall be sufficiently flexible to permit proper isolation.
- D. Isolation components shall be selected for the lowest operating speed of the equipment.
- E. Isolators, including springs, exposed to weather shall be hot dip galvanized after fabrication.

- F. Isolators shall be selected and located to produce uniform loading and deflection even when equipment weight is not evenly distributed.
- G. The type of isolation, base and minimum deflection shall be as required for each specific application when supported on a solid concrete slab, 6 inches total thick minimum. Vibration isolators with a deflection greater than the minimum specified shall be submitted for approval if they are needed to meet the noise criteria.

# PART 2 - PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS
  - A. Mason Industries, Amber/Booth Company, Vibration Elimination Co., Inc.
- 2.2 ELASTOMERIC ISOLATORS
  - A. Elastomeric isolators shall be one of the following:
    - 1. Neoprene isolation mounts of the straight-line deflection curve type. The isolation mounts shall be manufactured with bolt holes for bolting to equipment base. Bottom steel plates for mounting to subbase shall be provided where required to prevent movement of equipment. These isolators shall be molded in black oil-resistant neoprene and color coded. All metal parts shall be embedded in neoprene.
    - 2. Neoprene pads shall be of cross-ribbed or waffle design, 5/16-inch minimum thickness. Where concentrated load bearing is encountered, steel bearing plates shall be bonded to the neoprene pads. The neoprene pads shall be sized for a load of 50 psi.

# 2.3 SPRING ISOLATORS

- A. Spring isolators shall be free-standing, laterally stable without any housing and complete with 1/4-inch-thick neoprene acoustical friction pads between the base plate and the support.
- B. All mountings shall have leveling bolts. Coil outside diameters shall be not less than 0.8 of the operating height.
- C. Spring shall have an additional travel to solid equal to 50% of the operating deflection.
- D. The horizontal stiffness of spring isolators shall be not less than 0.8 of the vertical (axial) stiffness.
- E. Springs shall be designed and installed so that the ends remain parallel during and after deflection to operating height.

## 2.4 SUSPENSION TYPE ISOLATION

- A. Suspension type spring isolation for piping system or equipment hangers shall be a combination of spring and neoprene in series. The spring and elastomer combination shall be encased in a structurally stable steel bracket. Spring diameters shall be large enough to permit a 15-degree angular misalignment of the rod without rubbing on the hanger box.
- B. Suspension type elastomeric isolators shall be double deflection. Isolators shall be mounted in an open steel bracket with openings for hanger rod connections. The hanger rod shall be separated from contact with the hanger bracket by a neoprene grommet. The neoprene isolator shall have a minimum deflection of 0.35 inch.
- C. Where required, pipe hangers shall be equipped with a method of holding the piping at a fixed elevation during installation and a secondary adjustment to transfer the load to the spring and maintain the same elevation. Deflection shall be clearly indicated by a permanent pointer and scale.

D. Duct isolation hangers shall consist of spring and neoprene grommet or mount encased in a steel bracket with suitable means of connecting to ducts and building structure.

# 2.5 FOUNDATIONS FOR MACHINERY

- A. Subbases of 3500 PSI concrete not less than 4 inches high shall be provided for all floor and ground mounted mechanical equipment. Subbases shall rest on structural floor and shall be reinforced with steel rods and interconnected with floor reinforcing bars by tie bars hooked at both ends or suitable dowels. A minimum clearance of 1 percent of the maximum base dimension or 1 inch shall be provided between subbases and all steel bases and steel saddles with equipment in operation.
- B. Each electric motor shall be mounted on the same foundation as the driven machine.
- C. Foundations for machines shall be a minimum of 2500 psi concrete with all exposed surfaces, steel troweled smooth and corners beveled.
- D. Machines shall be secured to steel bases with anchor bolts of ample size. All machines having baseplates shall be grouted under the full area of the baseplate with a non-shrinking, premixed grout.

### 2.6 FLEXIBLE CONNECTIONS

- A. Flexible hose shall be designed for an operating temperature of 50 degrees F above the maximum system design temperature and for a working pressure of not less than 125 psig or 150 percent of the system operating pressure whichever is greater.
- B. Metal flexible hose shall be Grade E phosphor bronze, monel or stainless steel corrugated tube covered with comparable bronze or stainless braid restraining and pressure cover. Stainless steel grade shall be 304. Live lengths of flexible metal hose shall generally be not less than recommended by the manufacturer for continuous vibration application.

#### PART 3 - EXECUTION

- 3.1 Provide equipment and piping vibration isolation where required by equipment manufacturer and where called for on drawings.
- 3.2 Type of vibration isolators to be provided shall be based as follows:
  - 1. Static deflection up to 1/4 inch single deflection neoprene mounting or pads.
  - 2. Static deflection 5/16 inch to 3/8 inch double deflection neoprene mountings.
  - 3. Static deflection above 3/8 inch spring isolators.
- 3.3 Furnish vibration isolation for all piping connected to equipment mounted on vibration isolation. Equipment that has internally isolated units (compressors, etc.) shall be considered separately as to isolation requirements.

### 3.4 FLEXIBLE CONNECTIONS

- A. Flexible connections shall be provided for all connections indicated on drawings, manufactured of materials suitable for the operating temperatures and pressures of the fluid or gas it is conveying.
- B. Flexible hose shall be installed in accordance with the manufacturer's recommendations including placement in the pipe line without damage, misalignment or change in its normal length. Prior to filling the system, the alignment and length shall be checked by loosening the flange bolts to determine the installation conditions. The piping installation shall be corrected if necessary and the flexible hose replaced if damaged, at no cost to the Owner.

# END OF SECTION 23 05 48

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAY-ZGS	C A T A L O G A T A	P A R T S L I S T S S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	S A M P L E S	OTHER
Elastomeric Isolators	х	Х	х					
Suspension Type Isolators	х	х	х					
Spring Isolators	х	х	х					
Flexible Connections	х	Х	х					
Vibration Isolation Curbs	X	X	X					

# SECTION 23 05 53 - IDENTIFICATION OF HVAC PIPING AND EQUIPMENT

## PART 1 - GENERAL

## 1.1 SCOPE

- A. Identification of products installed under Division 23 including:
  - 1. Plastic Nameplates
  - 2. Plastic Tags
  - 3. Metal Tags
  - 4. Plastic Pipe Markers
  - 5. Plastic Tape Pipe Markers
- 1.2 RELATED DOCUMENTS
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 230100 GENERAL PROVISIONS FOR MECHANICAL WORK

## 1.3 REFERENCES

A. ANSI/ASME A13.1 - Scheme for the Identification of Piping Systems.

# 1.4 SUBMITTALS

- A. Submit list of wording, symbols, letter size, and color coding for mechanical identification.
- B. Submit valve chart and schedule, including valve tag number, location, function, and valve manufacturer's name and model number.
- C. Submit product data and manufacturer's installation instructions.

# PART 2 - PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS
  - A. Seton
- 2.2 Color: Unless specified otherwise, conform with ANSI/ASME A13.1.
- 2.3 Plastic Nameplates: Laminated three-layer plastic with engraved black letters on light contrasting background color.
- 2.4 Plastic Tags: Laminated three-layer plastic with engraved black letters on light contrasting background color. Tag size minimum 1-1/2-inch square.
- 2.5 Metal Tags: Brass or aluminum with stamped letters; tag size minimum 1-1/2-inch diameter with smooth edges.
- 2.6 Plastic Pipe Markers: Factory fabricated, flexible, semi-rigid plastic, preformed to fit around pipe or pipe covering; minimum information indicating flow direction arrow and fluid being conveyed.
- 2.7 Plastic Tape Pipe Markers: Flexible, vinyl film tape with pressure sensitive adhesive backing and printed markings.

PART 3 - EXECUTION

3.1 PREPARATION

A. Degrease and clean surfaces to receive adhesive for identification materials and to accept stencil painting.

### 3.2 INSTALLATION

- A. Plastic Nameplates: Install with corrosive-resistant mechanical fasteners, or adhesive.
- B. Plastic or Metal Tags: Install with corrosive-resistant chain.
- C. Stencil Painting: Apply in accordance with manufacturer's instructions.
- D. Plastic Pipe Markers: Install in accordance with manufacturer's instructions.
- E. Plastic Tape Pipe Markers: Install complete around pipe in accordance with manufacturer's instructions.
- F. Underground Plastic Pipe Markers: Install 6 to 8 inches below finished grade, directly above buried pipe.
- G. Equipment: Identify HVAC equipment such as but not limited to air handing equipment, condensing units, chillers, pumps, storage tanks, expansion tanks, water treatment devices etc. with plastic nameplates. Small devices, such as in-line pumps, may be identified with plastic or metal tags.
- H. Controls: Identify control panels and major control components outside panels with plastic nameplates.
- I. Valves: Identify valves in main and branch piping with tags.
- J. Piping: Identify piping, concealed or exposed, with plastic pipe markers or plastic tape pipe markers. Stenciled painting may be used on insulation. Tags may be used on small diameter piping. Identify service, flow direction, and pressure. Install in clear view and align with axis of piping. Locate identification not to exceed 20 feet on straight runs including risers and drops, adjacent to each valve and "T", at each side of penetration of structure or enclosure, and at each obstruction.

#### END OF SECTION 23 05 53

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	S H O P D R A W I N G S	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A L	W I R I N G I A G R A M	C E R T I F I C A T I O N	S A M L E S	OTHER
Valve Chart	Х							
Valve Tags	х	х						
Stencils		х						
Таре		Х						
Pipe Markers		Х						

SECTION 23 05 93 - TEST, ADJUSTING, AND BALANCING FOR HVAC

### PART 1 – GENERAL SPECIFICATIONS

- 1.1 DESCRIPTION OF WORK
  - A. The total system balance shall be performed by an independent test and balance firm that specializes in testing and balancing of HVAC systems.
  - B. This specialty firm shall perform the following:
    - 1. On-going job site inspections of equipment, controls and metering devices during construction to verify conformance with design specifications.
    - 2. Air System Balance
      - a. Supply Air Systems (including VAV boxes and Air Handler)
      - b. Exhaust Air System (Including Exhaust Fan)
    - 3. Hydronic System Balance
      - a. Hot Water System (including Hot Water Pumps)
    - 4. Control Systems Verification

### 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 230100 GENERAL PROVISINS FOR MECHANICAL WORK
- 1.3 DEFINITIONS
  - A. ASHRAE: American Society of Heating, Refrigerating and Air Conditioning Engineers.
  - B. HVAC: Heating, Ventilating and Air Conditioning.
  - C. NAS: National Account Services. An enhanced program of testing and balancing offering an expanded range of services including a Quality Assurance Guaranty.
  - D. TAB: Testing, Adjusting and Balancing of HVAC systems to meet design objectives and obtain optimum system performance.
  - E. TBE: Test and Balance Engineer is an individual certified by AABC or NEBB as having a degree in engineering and 3 years of test and balance experience, or, 5 years of background in the air conditioning field and 5 years continuous field experience in testing and balancing work.
- 1.4 REFERENCES
  - A. 2011 ASHRAE Handbook, HVAC Applications, Chapter 38, Testing, Adjusting and Balancing.
- 1.5 AGENCY QUALIFICATIONS
  - A. Testing and Balancing (TAB) Agency shall be a member of the AABC or NEBB.
  - B. A certified Test-and-Balance Engineer (TBE) shall be responsible for certification of the total work of this section.

C. All work shall be performed in accordance with AABC National Standards. If these specifications set forth more stringent requirements than the AABC National Standards, these specifications shall prevail.

### 1.6 QUALIFICATION SUBMITTALS

- A. Testing and Balancing (TAB) Agency shall submit a company resume listing personnel and project experience in the field of air and hydronic system balancing.
- B. TAB Agency shall furnish all necessary calibrated instrumentation to adequately perform the specified products. TAB Agency shall submit an inventory and calibration data of all instruments and devices in possession of the balancing agency, to enable the Owner, or his representative, to evaluate the balancing agency's performance capability.
- C. The TAB Agency shall, upon acceptance of the contract, submit to the Owner, or the Owner's representative, a "Quality Assurance Guaranty".
- D. Within 30 days after acceptance of the contract, the TAB Agency shall submit to the Design Engineer a working agenda which will include procedures for testing and balancing each type of air and water flow system. The Test and Balance Report format will also be submitted indicating data to be recorded.

### 1.7 NOTIFICATION AND SCHEDULING

- A. A pre-balance conference shall be held prior to job start as scheduled by the Tab Agency. Attendees at the meeting shall include representatives of the Test and Balance (TAB) Agency, General Contractor, Mechanical Sub Contractor, Control Sub Contractor, Owner and Mechanical Engineer.
- B. The schedule for testing and balancing the HVAC system shall be established by the General Contractor, and/or Owner's representative, in coordination with the TAB Agency on a critical path network.
- C. The TAB Agency is responsible for initiating this continuing coordinating to determine schedule for final testing and balancing services.
- D. It will be necessary for the TAB Agency to perform its services in close coordination with the Mechanical Contractor, with all scheduling and deficiencies reported through the General Contractor, and/or Owner's representative.
- E. Before testing and balancing commences, the TAB Agency shall receive notification in writing from the Mechanical Contractor that the system is operational, complete and ready for balancing.
- F. A completed system means more than just physical installation. The Mechanical Contractor shall certify that all prime movers; fans, pumps, refrigeration machines, boilers, etc., are installed in good working order, and that full load performance has been preliminarily tested.
- G. The Mechanical Contractor shall certify in writing that all equipment has been checked, started and adjusted by the manufacturer and operated for the specified period.

# 1.8 COORDINATION WITH OTHER TRADES

- A. To bring the HVAC system into a state or readiness for testing adjusting and balancing, the Mechanical Contractor shall perform the following:
  - 1. Air Distribution Systems
    - a. Ensure that all splitters, extractors, volume, smoke and fire dampers are properly located and functional. Dampers serving requirements of smoke, minimum and maximum outside, return, relief, and exhaust air

shall provide tight closure and full opening, with a smooth and free operation.

- b. Verify that all supply, return, exhaust, and transfer grilles, registers, diffusers, and high-pressure terminal units are installed and operational.
- c. Ensure that air handling systems, units, and associated apparatus, such as heating and cooling coils, filter sections, access doors, etc. are blanked and/or sealed to eliminate excessive bypass or leakage of air.
- d. Ensure that all fans (supply, return, relief, and exhaust) are operating and free of vibration. All fans and drives shall be checked for proper fan rotation and belt tension. Overload protection shall be of proper size and rating. A record of motor current and voltage shall be made to verify that the motors do not exceed nameplate rating.
- e. Make any necessary changes to the sheaves, belts, and dampers, as required by the TAB Agency, at no additional cost to Owner.
- f. Install clean filters prior to testing.
- 2. Water Circulating Systems
  - a. Check all pumps to verify pump alignment and rotation.
  - b. Ensure that systems are clean, with the proper strainer screens installed for normal operation.
  - c. Check all pump motors for current and voltage, to ensure that motors do not exceed nameplate rating.
  - d. Provide overload protection of proper size and rating.
  - e. Ensure that all water circulating systems shall be clean, full and free of air, that expansion tanks are set for proper water level, and that all air vents are installed at high points of systems and are operating.
  - f. Check and set operating temperature of heat exchangers to design requirements.
- B. The Temperature Control Subcontractor Shall Perform the Following:
  - 1. Verify that all control components are installed in accordance with project requirements and are functional, including all electrical interlocks, damper sequences, air and water resets, and fire and freeze stats.
  - 2. Verify that all controlling instruments are calibrated and set for design operating conditions.
  - 3. Calibrate room thermostats after installation and before the thermostat control verification tests are performed. The Test and Balance (TAB) Agency shall verify the accuracy of final settings by taking temperature readings. The readings shall be in a typical conditioned space for each separately controlled zone.
  - 4. The Control Contractor shall allow sufficient time in the project to provide assistance and instruction to the TAB Agency in the proper use and setting of control components such as, but not limited to, computers, static pressure controllers, or any other device that may need set points changed so that the testing and balancing work can be performed.
- C. The General Contractor and/or Owner's representative, Mechanical Contractor, Temperature Control Subcontractor, and the suppliers of the HVAC equipment shall all cooperate with the TAB Agency to provide all necessary data on the design and proper

application of the system components. In addition, they shall furnish all labor and materials required to eliminate any system deficiencies.

- D. In coordination with the General Contractor and/or Owner's representative, the TAB Agency shall arrange for an area of ample size and convenient location for storage of tools, equipment, and other items as required.
- PART 2 PRODUCTS (Not applicable)

## PART 3 - EXECUTION

### 3.1 ON-GOING JOB SITE INSPECTIONS

- A. During construction, the balancing agency shall inspect the installation of pipe systems, sheet metal work, temperature controls, and other component parts of the HVAC systems. Inspections shall be conducted a minimum of 3 times. (Typically this is performed when 60% of the duct work is installed and again when 90% of the total system is installed and prior to insulation of the piping.)
- B. The balancing agency shall submit a written report of each inspection to the Owner or owner's representative, and the contractors responsible for correcting noted deficiencies.
- C. Check for necessary balancing hardware (dampers, flow meters, valves, pressure taps, thermometer wells, etc.) to determine if they are installed properly and readily accessible.
- D. Identify and evaluate any variations from system design.
- E. Identify and report possible restrictions in systems (closed fire dampers, long runs of flexible duct, poorly designed duct fittings, etc.).

## 3.2 AIR SYSTEM TEST AND BALANCE PROCEDURES

- A. Fan Speeds: Test and adjust fan RPM to achieve design CFM requirements.
- B. Current and Voltage: Measure and record motor current and voltage.
- C. Pitot Tube Traverse: Perform a Pitot tube traverse of main supply and return ducts to obtain total CFM. If a Pitot tube traverse is not practical, the summation of the outlets or inlets may be used. An explanation of why a traverse was not made must appear on the appropriate data sheet.
- D. Outside Air: Test and adjust system minimum outside air by Pitot tube traverse. If a Pitot tube traverse is not practical, the percentage of outside air may be determined by calculations from the return air, outside air, and mixed air temperature. Make allowances for heat of compression and motor heat where applicable.
- E. Static Pressure: Test and record system static pressures, including suction and discharge static pressure profile of each fan.
- F. Air Temperature: Take wet bulb and dry bulb air temperatures on the entering and leaving side of each cooling coil. Dry bulb temperatures shall be taken on the entering and leaving side of each heating coil.
- G. Zone Ducts (supply and return): Adjust zone ducts to within design CFM requirements. At least one zone balancing damper shall be completely open.
- H. Main Ducts: Adjust main ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
- I. Branch Ducts: Adjust branch ducts to within design CFM requirements. Multi-diffuser branch ducts shall have at least one outlet or inlet volume damper completely open.
- J. Tolerance test and balance each diffuser, grille, and register to within 10 percent of design requirement.

- K. Identification: Identify the location and area of each grille, diffuser, register, and terminal box. This information shall be recorded on air outlet data sheets.
- L. Description: Record the size and type of each diffuser, grille, and register on air outlet data sheets.
- M. Minimizing Drafts: Adjust all diffusers, grilles, and registers to minimize drafts in all areas.
- N. Exhaust Fans: Measure exhaust fan static pressure, total CFM, makeup air and fan RPM. Measure motor operating voltage and amperage.
- O. Measure exhaust fan static pressures, total CFM, makeup air and fan RPM.
- P. Measure motor operating voltage and amperage.
- Q. Record the specified against the actual supplied horsepower and electrical characteristics of all motors.

# 3.3 HYDRONIC SYSTEM TEST AND BALANCE PROCEDURES

- A. Water Treatment: Examine the water in the system to determine if the water has been treated and cleaned. If it has not, request that the mechanical contractor clean and treat the water.
- B. Strainers: Ensure that mechanical contractor to cleans all strainers.
- C. Air Vents: Check all air vents at the high points of the water system and determine if they are installed and operating.
- D. Valves: Set all balancing valves and automatic temperature control valves to the full open position for balancing.
- E. Pumps: Adjust water pump to meet design GPM requirements. Check pumps for proper operation. Pumps shall be free of vibration and cavitation. Measure and record operating current and voltage.
- F. Central Plant: Adjust water flow from the central plant if applicable.
- G. Tolerances: Proceed to balance all chilled-water and hot water coils to within 10% of design requirements.
- H. Marking: Mark all settings and record all data after completing the flow readings and coil adjustments.
- I. Primary/Secondary Pumping System: If a primary-secondary pumping system is employed, the TAB Agency shall ensure that a proper balance is obtained between primary and secondary loops and that sufficient flow is always maintained in the secondary loop.

## 3.4 CONTROL SYSTEMS VERIFICATION

- A. Verify that all control devices are properly connected.
- B. Verify that all dampers, valves and other controlled devices are operated by the intended controller.
- C. Verify that all dampers and valves are in the position indicated by the controller (open, closed or modulating).
- D. Verify the integrity of valves and dampers in terms of tightness of close-off and full-open positions. This includes dampers in multizone units.
- E. Check that all valves are properly installed in the piping system in relation to direction of flow and location.
- F. Check the calibration of all controllers.

- G. Verify the proper application of all normally open and normally closed valves.
- H. Check the location of all thermostats and humidistats for potential erratic operation from outside influences such as sunlight, drafts or cold walls.
- I. Check the locations of all sensors to determine whether their position will allow them to sense only the intended temperatures or pressures of the media. Control Contractor will relocate as deemed necessary by the TAB Agency.
- J. Check the sequence of operation that any control mode is in accordance with approved shop drawings. Verify that only minimum simultaneous heating and cooling occurs.
- K. Verify that all controller set points meet the design intent.
- L. Check all dampers for free travel.
- M. Verify the operation of all interlock systems.
- N. Perform all system verification to assure the safety of the system and its components.

### 3.5 SYSTEM PERFORMANCE VERIFICATION

- A. At the time of final inspection, the Test and Balance (TAB) Agency shall recheck, in the presence of the Owner's Representative, specific and random selections of data, air quantities, and air motion recorded in the Certified Report.
- B. Points and areas for recheck shall be selected by the Owner's Representative.
- C. Measurement and test procedures shall be the same as approved for work forming basis of Certified Report.
- D. Selections for recheck, specific plus random, will not normally exceed 25 percent of the total number tabulated in the report, except that special air systems may require a complete recheck for safety reasons.
- E. If random tests elicit a measured flow deviation of ten percent or more from that recorded in the Certified Report listings, by ten percent or more of the selected recheck stations, the report is rejected, all systems shall be readjusted and tested, new data recorded, new Certified Report submitted, and new inspection tests made, all at no additional cost to Owner.
- F. Following system verification of the Certified Report by the Owner's Representative, the settings of all valves, splitters, dampers, and other adjustment devices shall be permanently marked by the TAB Agency, so that adjustment can be restored if disturbed at any time. Devices shall not be marked until after system verification.
- G. Opposite Season Test
  - 1. The Testing and Balancing (TAB) Agency shall perform an inspection of the HVAC system during the opposite season from that in which the initial adjustments were made. The TAB Agency shall make any necessary modifications to the initial adjustments to produce optimum system operation.

## 3.6 RECORD AND REPORT DATA

- A. The Test and Balance Report shall be complete with logs, data and records as required herein. All logs, data and records shall be typed on white bond paper and bound. The report shall be certified accurate and complete by the Testing and Balancing (TAB) Agency's certified Test and Balance Engineer.
- B. Copies of the Test and Balance Report are required and shall be submitted to the Owner, or the Owner's representative.
- C. The report shall contain the following general data in a format selected by the TAB Agency.

- 1. Project number.
- 2. Contract number.
- 3. Project title.
- 4. Project location.
- 5. Project architect.
- 6. Project mechanical engineer.
- 7. Test and balance agency.
- 8. Test and Balance Engineer.
- 9. General contractor.
- 10. Mechanical subcontractor.
- 11. Date tests were performed.
- 12. Certification.
- D. The Test and Balance Report shall be recorded on report forms conforming to the recommended forms in AABC National Standards. At a minimum, the report shall include:
  - 1. Preface: A general discussion of the system, any abnormalities and problems encountered.
  - 2. Instrumentation List: The list of instruments including type, model, manufacturer, serial number, and calibration dates.
  - 3. Air Handling Equipment
    - a. Manufacturer, model number, and serial number.
    - b. All design and manufacturer related data.
    - c. Total actual CFM by traverse if practical, if not practical, the sum of the outlets may be used, or a combination of each of these procedures. For specific systems, such as ones with diversity, see the AABC National Standards.
    - d. Suction and discharge static pressure of each fan, as applicable.
    - e. Outside air and return air total CFM.
    - f. Actual operating current, voltage, and brake horsepower of each fan motor.
    - g. Final RPM of each fan.
    - h. Fan and motor sheave manufacturer, model, size, number of grooves, and center distance.
    - i. Belt size and quantity.
    - j. Static pressure controls' final operating set points.
  - 4. Pumps
    - a. Manufacturer, size, and serial number.
    - b. All design and manufacturer's related data.
    - c. Pump operating suction and discharge pressure and final total dynamic head.

- d. No flow (pump discharge valve closed) suction and discharge pressure and corresponding total dynamic head. This procedure is to determine actual impeller size.
- e. Rated and actual operating current, voltage, and brake horsepower of each pump motor.
- f. Submit pump curve showing design, operating, and no-flow points of operation.
- 5. Coils
  - a. Manufacturer.
  - b. All design and manufacturer's related data.
  - c. Rated and actual water pressure drop through each coil and related GPM.
  - d. Rated and actual static pressure drop across each coil.
  - e. Entering and leaving water temperatures.
  - f. Wet bulb and dry bulb temperatures entering and leaving each cooling coil; dry bulb temperatures entering and leaving each heating coil.

END OF SECTION 23 05 93

# SECTION 23 06 00 – MECHANICAL SYSTEMS DEMONSTRATION AND TRAINING

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
  - 1. Demonstration of operation of systems, subsystems and equipment.
  - 2. Training in operation and maintenance of systems, subsystems and equipment.
  - 3. Demonstration and training recordings.

### 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 230100 GENERAL PROVISION FOR MECHANICAL WORK

### 1.3 SUBMITTALS

- A. Instruction Program: Submit copies of outline of instructional program for demonstration and training, including a schedule of proposed dates, times, length of instruction time, and instructors' names for each training module. Include learning objective and outline for each training module
  - 1. At completion of training, submit training manual for Owner's use which includes receipts signed by the Owner acknowledging that training took place.
- B. Attendance Record: For each training module, submit list of participants and length of instruction time.
- C. Demonstration and Training Videos: Provide recording of all demonstrations and training given and submit video within ten days of end of each training module.
  - 1. Identification: Provide an applied label with the following:
    - a. Name of Project
    - b. Name of Engineer
    - c. Name of Contractor
    - d. Date video was recorded
    - e. Description of information recorded.
  - 2. Transcript: Prepared on 8-1/2-by 11-inch paper, punched and bound in heavyduty, three ring, vinyl-covered binders. Mark appropriate identification on front and spine of each binder. Include a cover sheet with same label information as the corresponding video recording. Include name of Project and date of video recording on each page.

### 1.4 COORDINATION

- A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
- B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.

C. Coordinate content of training modules with operation and maintenance manual information.

### PART 2 - PRODUCTS

- 2.1 DEMONSTRATION AND TRAINING PROGRAM
  - A. Provide program that includes individual training modules for each system and equipment not a part of a system as required by individual Specification Sections and as follows, but not limited to:
    - 1. HVAC: Provide demonstration and training by showing Owner personnel the major components of the HVAC system as follows:
      - a. VAV Boxes
      - b. Exhaust Fans and location of each
      - c. Instrumentation and Controls overview

## PART 3 - EXECUTION

### 3.1 PREPARATION

A. Assemble materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

### 3.2 INSTRUCTION

- A. Engage qualified instructors to instruct Owner personnel to adjust, operate, and maintain systems, subsystems, and equipment not a part of a system.
- B. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at the start of each season.
- C. Schedule training with Owner, through Architect/Engineer, with at least ten days' advance notice.
- 3.3 DEMONSTRATION AND TRAINING RECORDINGS
  - A. Engage a qualified individual to record demonstration and training video(s). Record each training module separately. Include classroom instructions and demonstrations.
  - B. Format: Provide high-quality DVD or thumb drive. Cloud storage is unacceptable.
  - C. Narration: Describe scenes on video while recording. Include description of items being viewed.
  - D. Transcript: Provide typewritten transcript of the narration.

END OF SECTION 23 06 00

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAW-NGS	C A T A L O G A T A	PARTS LISTS	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	S A M P L E S	OTHER
Instruction Program	х							
Attendance Record	x							
Demonstration and Training DVDs	x							

# SECTION 23 07 19 - HVAC PIPING INSULATION

PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Piping Insulation
  - B. Jackets and Accessories
- 1.2 RELATED WORK
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 230100 GENERAL PROVISIONS FOR MECHANICAL WORK
  - C. Section 230553 IDENTIFICATION OF HVAC PIPING AND EQUIPMENT
- 1.3 QUALITY ASSURANCE
  - A. Materials: Flame spread smoke developed rating of 25/50 in accordance with ASTM E84.
  - B. All pipe insulation shall be installed by mechanics specializing in this type of work. The finished product shall present a neat and workmanlike appearance. Insulation shall not be applied until all tests except operating tests have been completed, all foreign material, such as rust, scale, or dirt, has been removed and the surfaces are clean and dry. Insulation shall be clean and dry when installed and during the application of any finish.
  - C. The insulation, insulating materials and related items shall be delivered to the jobsite in the manufacturer's unopened containers. The containers shall have labels stating the manufacturer's name, contents, quantity and other pertinent data.

## PART 2- PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

A. Insulations having the thermal and physical properties of the specific materials specified hereinafter, of any of the following manufacturers, or approved equal, are acceptable.

Armstrong	Knauf
Johns Mansville	Certain Teed/Saint Gobain
Owens Corning	Pittsburgh Corning

Rubatex

B. The Engineer reserves the right to determine if the proposed insulating materials of any one manufacturer are acceptable in lieu of the specific insulation selected for the following applications.

### 2.2 INSULATION

- A. Type A glass fiber insulation; ANSI/ASTM C547; 'k' value of 0.23 minimum at 75 degrees F; noncombustible.
- B. Type B cellular foam; flexible, plastic; 'k' value of 0.25 minimum at 75 degrees F; ASTM C534. APArmaflex W (white) or APArmaflex SS (black) or equal.
- C. Type C calcium silicate.

- 1. Preformed Pipe Sections: Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
- 2. Flat-, curved-, and grooved-block sections of noncombustible, inorganic, hydrous calcium silicate with a non-asbestos fibrous reinforcement. Comply with ASTM C 533, Type I.
- 3. Prefabricated Fitting Covers: Comply with ASTM C 450 and ASTM C 585 for dimensions used in preforming insulation to cover valves, elbows, tees, and flanges.
- 4. Calcium Silicate insulation is preferred over fiberglass in mechanical and heating plant applications, where piping is more subject to abuse.

## 2.3 JACKETS

- A. Vapor Barrier Jackets: Kraft reinforced foil vapor barrier with self-sealing adhesive joints.
- B. PVC Jackets: One piece, premolded type.
- C. Canvas Jackets: UL listed treated cotton fabric, 6 oz/sq. yd.

# 2.4 ACCESSORIES

- A. Insulation Bands: 3/4-inch-wide; 0.015-inch-thick galvanized steel, stainless steel. 0.007-inch 0.18 thick aluminum.
- B. Metal Jacket Bands: 3/8-inch-wide; 0.015-inch-thick aluminum. 0.010-inch-thick stainless steel.
- C. Insulating Cement: ANSI/ASTM C195; hydraulic setting mineral wool.
- D. Finishing Cement: ASTM C449.
- E. Fibrous Glass Cloth: Untreaded; 9 oz/sq. yd weight.
- F. Adhesives: Compatible with insulation.
- G. Treated wooden blocks.

### PART 3 - EXECUTION

- 3.1 PREPARATION
  - A. Install materials after piping has been tested and approved.

#### 3.2 INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Continue insulation with vapor barrier through penetrations, except on fire rated walls.
- C. In exposed piping, locate insulation and cover seams in least visible locations.
- D. On insulated piping with vapor barrier, insulate fittings, valves, unions, flanges, strainers, flexible connections, and expansion joints.
- E. Provide an insert, not less than 6 inches long, of same thickness and contour as adjoining insulation, between support shield and piping, but under the finish jacket, on piping 2 inches diameter or larger, to prevent insulation from sagging at support points. Inserts shall be cork or other heavy density insulating material suitable for the planned temperature range. Factory fabricated inserts may be used. Insert shall extend around bottom 120 degrees of pipe barrel and shall be included inside vapor barrier jacket where applied. See Section 230529 for shields and hangers.

- F. Neatly finish insulation at supports, protrusions, and interruptions.
- G. Jackets
  - 1. Indoor, Concealed Applications: Insulated pipes shall have standard jackets, with vapor barrier, factory-applied or field-applied. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass cloth and adhesive. PVC jackets may be used.
  - 2. Indoor, Exposed Applications: For pipe exposed in mechanical equipment rooms or in finished spaces, insulate as for concealed applications. Finish with canvas jacket; size for finish painting. This jacketing must be properly applied with lagging adhesive, such that the outer surface is smooth and free of wrinkles. Do not use PVC jackets. All chilled water piping insulation shall be completely sealed so that a perfect vapor barrier is achieved.
  - 3. Indoor, Field-Applied Jacket Schedule: Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket. Piping jacket shall be Stainless Steel, Type 304 or Type 316, Smooth 2B Finish: 0.020 inch thick.
  - 4. Outdoor, Field-Applied Jacket Schedule: Install jacketing on all piping to be installed outside the building per the following: foil faced, UV-resistant vapor barrier and weather barrier membrane, self-stick, self-healing, with a zero-perm rating; for use on exterior duct, piping, and vessels. Jacketing shall be a high strength foil/polymer laminate coated with self-healing, self-adhering rubberized asphalt. Jacketing shall not require 'slip joints' and shall expand and contract with the system without rupture or leakage. Jacketing shall be for use as UV protection, weather protection, vapor barrier, and mechanical protection; and simple 'peel and stick' installation.
  - 5. Flanges, Valves, Anchors and Fittings: Unless otherwise specified, all flanges, valves, anchors and fittings shall be insulated with factory premolded or field fabricated segments of insulation of the same materials and thickness as the adjoining pipe insulation. When segments of insulation are used, elbows shall be provided with not less than three segments. For other fittings and valves. segments shall be cut to required curvatures, or nesting size sectional insulation shall be used. The segments of the insulation shall be properly placed and iointed with fire-resistant adhesive. After the insulation segments are firmly in place, fire-resistant vapor barrier coating shall be applied over the insulation in two coats with glass tape embedded between coats. The coating shall be applied to a total dry film thickness of 1/16 inch minimum. All glass tape seams shall be terminated neatly at the ends of the unions with insulating cement troweled on the bevel. For piping operating below ambient temperature, the beveled ends shall receive a coat of vapor barrier coating. Where anchors are used and secured directly to low temperature piping, they shall be insulated for a distance to prevent condensation, but not less than 6 inches from the surface of the pipe insulation. For jacket facing to receive finish painting, the factory applied jacket shall be as specified herein, except that the kraft paper shall be light colored with the kraft paper exposed. Field applied vapor barrier jacket shall conform to the above conditions where finish painting is required.

# INSULATION APPLICATION AND THICKNESS (inches)

PIPE SYSTEM	TYPE	TEMP	Pipe I	Diameter F	Range (inche	es)	
		RANGE DEG F	<1	1 - 1.5	1.5 - 4	4 - <8	≥8
				Insulation	Thickness (	inches)	
CONVENTIONAL	NONE	55-			NONE		
HEAT PUMP		110					
GEOTHERMAL HEAT PUMP	A/B	32- 110	0.5	0.5	0.5	0.5	0.5
CONDENSATE DRAIN	В		0.5	0.5	0.5	0.5	0.5
REFRIGERANT	В		0.5	1.0	1.0	1.0	1.0
HIGH PRESS STEAM (76 - ? PSIG)	A/C	320 - 500	4.5	5.0	5.0	5.0	5.0
MED PRESŚ STEAM (21 - 75 PSIG)	A/C	260 - 320	3.0	4.0	4.5	4.5	4.5
LOW PRESS STEAM (0 - 20 PSIG)	A	201 - 260	2.5	2.5	2.5	3.0	3.0
STEAM CONDENSATE	А	180 - 250	2.5	2.5	2.5	3.0	3.0
HEATING HOT WATER	A/B	120 - 200	1.5	1.5	2.0	2.0	2.0
CHILLED WATER	A/B	40 - 55	1.0	1.5	1.5	2.0	2.0
DOMESTIC WATER	A/B	55 - 70	1.5	1.5	1.5	1.5	1.5

END OF SECTION 23 07 19
# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	C E R T I F I C A T I O N	SAMPLES	OTHER
Piping Insulation	х	х						

# SECTION 23 09 00 - INSTRUMENTATION AND CONTROL FOR HVAC

PART 1 - GENERAL

#### 1.1 SUMMARY

- A. This Section includes control equipment for HVAC systems and components, including control components for terminal heating and cooling units not supplied with factory-wired controls.
- B. The existing system is a Harshaw Trane Control system. All work is to be compatible with the existing control system. Mechanical Contractor is responsible to ensure that the new VAV boxes are integrated to existing controls. Must include matching graphics, points, sequences, etc. as existing system.
- C. Refer to drawings for Sequence of Operation for requirements that relate to this Section.

#### 1.2 ACTION SUBMITTALS

- A. Product Data: For each control device indicated.
- B. Shop Drawings:
  - 1. Schematic flow diagrams.
  - 2. Power, signal, and control wiring diagrams.
  - 3. Details of control panel faces.
  - 4. Damper schedule.
  - 5. DDC System Hardware: Wiring diagrams, schematic floor plans, and schematic control diagrams.
- C. Control System Software: Schematic diagrams, written descriptions, and points list.
- 1.3 CLOSEOUT SUBMITTALS
  - A. Operation and maintenance data.
  - B. Software and firmware operational documentation.
- 1.4 WARRANTY
  - A. Warrant work as follows:
    - 1. Warrant labor and materials for specified control system free from defects for a period of 12 months after final acceptance. Control system failures during warranty period shall be adjusted, repaired, or replaced at no additional cost or reduction in service to Owner. Respond during normal business hours within 24 hours of Owner's warranty service request.
    - 2. Work shall have a single warranty date, even if Owner receives beneficial use due to early system start-up. If specified work is split into multiple contracts or a multi-phase contract, each contract or phase shall have a separate warranty start date and period.
    - 3. If Engineer determines that equipment and systems operate satisfactorily at the end of final start-up, testing, and commissioning phase, Engineer will certify in writing that control system operation has been tested and accepted in accordance with the terms of this specification. Date of acceptance shall begin warranty period.
    - 4. Provide updates to operator workstation or web server software, project-specific software, graphic software, database software, and firmware that resolve Contractor-identified software deficiencies at no charge during warranty period. If

available, Owner can purchase in-warranty service agreement to receive upgrades for functional enhancements associated with above-mentioned items. Do not install updates or upgrades without Owner's written authorization.

### 1.5 QUALITY ASSURANCE

- A. Installer shall have an established working relationship with Control System Manufacturer of no less than 20 years.
- B. Installer shall have successfully completed Control System Manufacturer's control system training. Upon request, Installer shall present record of completed training including course outlines.
- C. Installer shall have a local office within 50 miles of the project site capable of providing 24/7 support.
- D. Work, materials, and equipment shall comply with the most restrictive of local, state, and federal authorities' codes and ordinances or these plans and specifications. As a minimum, the installation shall comply with current editions in effect 30 days prior to receipt of bids of the following codes:
  - 1. National Electric Code (NEC)
  - 2. International Building Code (IBC)
    - a. Section 719 Ducts and Air Transfer Openings
    - b. Section 907 Fire Alarm and Detection Systems
    - c. Section 909 Smoke Control Systems
    - d. Chapter 28 Mechanical
  - 3. International Mechanical Code (IMC)

## PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
- 2.2 CONTROL SYSTEM
  - A. Manufacturers:
    - 1. HARSHAW TRANE
  - B. Other manufacturers wishing to bid this project shall submit to the engineer a list of completed projects, comparable in size and type of equipment, for which they have successfully completed. Included with this list shall be owner contact info, job size, and date installed.
  - C. The Contractor shall use only operator workstation software, controller software, custom application programming language, and controllers from the corresponding manufacturer and product line unless Owner approves use of multiple manufacturers.
  - D. Other products specified herein (such as sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.
- 2.3 DESCRIPTION
  - A. General: The control system shall consist of a high-speed, peer-to-peer network of DDC controllers and a web-based operator interface. Depict each mechanical system and building floor plan by a point-and-click graphic. A web server with a network interface card shall gather data from this system and generate web pages accessible through a

conventional web browser on each PC connected to the network. Operators shall be able to perform all normal operator functions through the web browser interface.

- B. The system shall directly control HVAC equipment as shown on the plans. Each zone controller shall provide occupied and unoccupied modes of operation by individual zone. Furnish energy conservation features such as optimal start and stop, night setback, request-based logic, and demand level adjustment of setpoints as specified.
- C. System shall use the BACnet protocol for communication to the operator workstation or web server and for communication between control modules. Schedules, setpoints, trends, and alarms specified in the Sequences of Operation shall be BACnet objects.

#### 2.4 PERFORMANCE STANDARDS

A. System shall conform to the following minimum standards of the existing Trane Controls system as installed by HARSHAW TRANE.

# 2.5 COMMUNICATIONS

- A. Control products, communication media, connectors, repeaters, hubs, and routers shall comprise a BACnet internetwork. Controller and operator interface communication shall conform to ANSI/ASHRAE Standard 135, BACnet.
- B. Install new wiring and network devices as required to provide a complete and workable control network.
- C. Each controller shall have a communication port for temporary connection to a laptop computer or other operator interface. Connection shall support memory downloads and other commissioning and troubleshooting operations.
- D. Internetwork operator interface and value passing shall be transparent to internetwork architecture.
  - 1. An operator interface connected to a controller shall allow the operator to interface with each internetwork controller as if directly connected. Controller information such as data, status, and control algorithms shall be viewable and editable from each internetwork controller.
  - 2. Inputs, outputs, and control variables used to integrate control strategies across multiple controllers shall be readable by each controller on the internetwork. Program and test all cross-controller links required to execute control strategies specified on the plans. An authorized operator shall be able to edit cross-controller links by typing a standard object address or by using a point-and-click interface.
- E. Controllers with real-time clocks shall use the BACnet Time Synchronization service. System shall automatically synchronize system clocks daily from an operator-designated controller via the internetwork. If applicable, system shall automatically adjust for daylight saving and standard time.

## 2.6 OPERATOR INTERFACE

- A. Existing control system to be utilized. Web server shall reside on high-speed network with building controllers. Each standard browser connected to server shall be able to access all system information.
- B. Operator Workstation: Controls to be integrated to existing system and operation method.

## 2.7 DDC EQUIPMENT

- A. Controller Communication BACnet.
  - 1. All controllers to be integrated to existing controls system.

- B. Control Units: Modular, comprising processor board with programmable, nonvolatile, random-access memory; local operator access and display panel; integral interface equipment; and backup power source.
  - 1. Units monitor or control each I/O point; process information; execute commands from other control units, devices, and operator stations; and download from or upload to operator workstation.
  - 2. All DDC controllers for this project shall be native BACnet. Systems using LONworks or other proprietary protocols shall not be permitted.
  - 3. Stand-alone mode control functions operate regardless of network status. Functions include the following:
    - a. Global Communications.
    - b. Discrete/digital, analog, and pulse I/O.
    - c. Monitoring, controlling, or addressing data points.
    - d. Software applications, scheduling, and alarm processing.
    - e. Testing and developing control algorithms without disrupting field hardware and controlled environment.
- C. Local Control Units: Modular, comprising processor board with electronically programmable, nonvolatile, read-only memory; and backup power source.
  - 1. Units monitor or control each I/O point, process information, and download from or upload to operator workstation or diagnostic terminal unit.
  - 2. Stand-alone mode control functions operate regardless of network status. Functions include the following:
    - a. Global Communications.
    - b. Discrete/digital, analog, and pulse I/O.
    - c. Monitoring, controlling, or addressing data points.
  - 3. Local operator interface provides for download from or upload to operator workstation.
- D. I/O Interface: Hardwired inputs and outputs may tie into system through controllers. Protect points so that shorting will cause no damage to controllers.
  - 1. Binary Inputs: Allow monitoring of on-off signals without external power.
  - 2. Pulse Accumulation Inputs: Accept up to 10 pulses per second.
  - 3. Analog Inputs: Allow monitoring of low-voltage (0- to 10-V dc), current (4 to 20 mA), or resistance signals.
  - 4. Binary Outputs: Provide on-off or pulsed low-voltage signal, selectable for normally open or normally closed operation.
  - 5. Analog Outputs: Provide modulating signal, either low voltage (0- to 10-V dc) or current (4 to 20 mA).
  - 6. Tri-State Outputs: Provide two coordinated binary outputs for control of threepoint, floating-type electronic actuators.
  - 7. Universal I/Os: Provide software selectable binary or analog outputs.
- E. Power Supplies: Transformers with Class 2 current-limiting type or overcurrent protection; limit connected loads to 80 percent of rated capacity. DC power supply shall

match output current and voltage requirements and be full-wave rectifier type with the following:

- 1. Output ripple of 5.0 mV maximum peak to peak.
- 2. Combined 1 percent line and load regulation with 100-mic.sec. response time for 50 percent load changes.
- 3. Built-in overvoltage and overcurrent protection and be able to withstand 150 percent overload for at least 3 seconds without failure.
- F. Power Line Filtering: Internal or external transient voltage and surge suppression for workstations or controllers with the following:
  - 1. Minimum dielectric strength of 1000 V.
  - 2. Maximum response time of 10 nanoseconds.
  - 3. Minimum transverse-mode noise attenuation of 65 dB.
  - 4. Minimum common-mode noise attenuation of 150 dB at 40 to 100 Hz.

# 2.8 UNITARY CONTROLLERS

- A. Unitized, capable of stand-alone operation with sufficient memory to support its operating system, database, and programming requirements, and with sufficient I/O capacity for the application. BACnet communication protocol.
  - 1. Configuration: Local keypad and display; diagnostic LEDs for power, communication, and processor; wiring termination to terminal strip or card connected with ribbon cable; memory with bios; and 72 hour battery backup.
  - Operating System: Manage I/O communication to allow distributed controllers to share real and virtual object information and allow central monitoring and alarms. Perform scheduling with real-time clock. Perform automatic system diagnostics; monitor system and report failures.
  - 3. Enclosure: Dustproof rated for operation at 32 to 120 deg F (0 to 50 deg C).

## 2.9 ANALOG CONTROLLERS

- A. Step Controllers: 6- or 10-stage type, with heavy-duty switching rated to handle loads and operated by electric motor.
- B. Electric, Outdoor-Reset Controllers: Remote-bulb or bimetal rod-and-tube type, proportioning action with adjustable throttling range, adjustable set point, scale range minus 10 to plus 70 deg F (minus 23 to plus 21 deg C), and single- or double-pole contacts.
- C. Electronic Controllers: Wheatstone-bridge-amplifier type, in steel enclosure with provision for remote-resistance readjustment. Identify adjustments on controllers, including proportional band and authority.

## 2.10 ELECTRONIC SENSORS

- A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.
- B. Thermistor Temperature Sensors and Transmitters:
  - 1. Accuracy: Plus or minus 0.5 deg F (0.3 deg C) at calibration point.
  - 2. Wire: Twisted, shielded-pair cable.
  - 3. Insertion Elements in Ducts: Single point, minimum 8 inches (200 mm) long.

- 4. Averaging Elements in Ducts: minimum 36 inches (915 mm) long, flexible; use where prone to temperature stratification or where ducts are larger than 10 sq. ft. (1 sq. m).
- 5. Room Sensor Cover Construction: Manufacturer's standard covers.
- 6. Outside-Air Sensors: Watertight inlet fitting, shielded from direct sunlight.
- 7. Room Security Sensors: Stainless-steel cover plate with insulated back and security screws.

### 2.11 THERMOSTATS/ZONE SENSORS

- A. Provide thermostats/zone sensor as manufactured by the control system manufacturer.
- B. Zone sensors shall have setpoint adjustment and occupancy override capability.
- C. Zone sensors shall have sufficient space to house the VRV manufacturers thermistor within the enclosure.
- D. Room Thermostat Cover Construction: Manufacturer's standard covers.

#### 2.12 ACTUATORS

- A. Electric Motors: Size to operate with sufficient reserve power to provide smooth modulating action or two-position action.
  - 1. Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."
  - 2. Permanent Split-Capacitor or Shaded-Pole Type: Gear trains completely oil immersed and sealed. Equip spring-return motors with integral spiral-spring mechanism in housings designed for easy removal for service or adjustment of limit switches, auxiliary switches, or feedback potentiometer.
  - Nonspring-Return Motors for Valves Larger Than NPS 2-1/2 (DN 65): Size for running torque of 150 in. x lbf (16.9 N x m) and breakaway torque of 300 in. x lbf (33.9 N x m).
  - 4. Spring-Return Motors for Valves Larger Than NPS 2-1/2 (DN 65): Size for running and breakaway torque of 150 in. x lbf (16.9 N x m).
  - 5. Nonspring-Return Motors for Dampers Larger Than 25 Sq. Ft. (2.3 sq. m): Size for running torque of 150 in. x lbf (16.9 N x m) and breakaway torque of 300 in. x lbf (33.9 N x m).
  - 6. Spring-Return Motors for Dampers Larger Than 25 Sq. Ft. (2.3 sq. m): Size for running and breakaway torque of 150 in. x lbf (16.9 N x m).
- B. Electronic Actuators: Direct-coupled type designed for minimum 60,000 full-stroke cycles at rated torque.
  - 1. Dampers: Size for running torque cBASulated as follows:
    - a. Parallel-Blade Damper with Edge Seals: 7 inch-lb/sq. ft. (86.8 kg-cm/sq. m) of damper.
    - b. Opposed-Blade Damper with Edge Seals: 5 inch-lb/sq. ft. (62 kg-cm/sq. m) of damper.
    - c. Parallel-Blade Damper without Edge Seals: 4 inch-lb/sq. ft (49.6 kgcm/sq. m) of damper.
    - d. Opposed-Blade Damper without Edge Seals: 3 inch-lb/sq. ft. (37.2 kgcm/sq. m) of damper.

- e. Dampers with 2- to 3-Inch wg (500 to 750 Pa) of Pressure Drop or Face Velocities of 1000 to 2500 fpm (5 to 13 m/s): Increase running torque by 1.5.
- 2. Coupling: V-bolt and V-shaped, toothed cradle.
- 3. Overload Protection: Electronic overload or digital rotation-sensing circuitry.
- 4. Fail-Safe Operation: Mechanical, spring-return mechanism. Provide external, manual gear release on nonspring-return actuators.
- 5. Run Time: 12 seconds open, 5 seconds closed.
- 2.13 DAMPERS
  - A. Dampers: AMCA-rated, opposed-blade design; 0.108-inch- (2.8-mm-) minimum thick, galvanized-steel or 0.125-inch- (3.2-mm-) minimum thick, extruded-aluminum frames with holes for duct mounting; damper blades shall not be less than 0.064-inch- (1.6-mm-) thick galvanized steel with maximum blade width of 8 inches (200 mm) and length of 48 inches (1220 mm).
    - 1. Secure blades to 1/2-inch- (13-mm-) diameter, zinc-plated axles using zincplated hardware, with oil-impregnated sintered bronze or nylon blade bearings, blade-linkage hardware of zinc-plated steel and brass, ends sealed against spring-stainless-steel blade bearings, and thrust bearings at each end of every blade.
    - 2. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).
    - 3. Edge Seals, Low-Leakage Applications: Use inflatable blade edging or replaceable rubber blade seals and spring-loaded stainless-steel side seals, rated for leakage at less than 10 cfm per sq. ft. (50 L/s per sq. m) of damper area, at differential pressure of 4-inch wg (1000 Pa) when damper is held by torque of 50 in. x lbf (5.6 N x m); when tested according to AMCA 500D.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation.
  - 1. Install averaging elements in ducts and plenums in crossing or zigzag pattern.
- B. Install lockable guards on thermostats in the following locations:
  - 1. Entrances.
  - 2. Public areas.
  - 3. Where indicated.
- C. Install automatic dampers according to Section 233300 "Ductwork Accessories."
- D. Install damper motors on outside of duct in warm areas, not in locations exposed to outdoor temperatures.
- E. Install labels and nameplates to identify control components according to Section 230553 "Identification for HVAC Piping and Equipment."
- F. Install duct volume-control dampers according to Section 233113 "Ductwork and Ductwork Insulation".
- 3.2 ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install raceways, boxes, and cabinets according to Section 260533 "Raceways and Boxes for Electrical Systems."
- B. Install building wire and cable according to Section 260519 "Low-Voltage Electrical Power Conductors and Cables."
- C. Install signal and communication cable according to Section 271500 "Communications Horizontal cabling."
  - 1. Conceal cable, except in mechanical rooms and areas where other conduit and piping are exposed.
  - 2. Install exposed cable in raceway.
  - 3. Install concealed cable in raceway.
  - 4. Plenum rated cable may be installed in concealed accessible areas.
  - 5. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
  - 6. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
  - 7. Number-code or color-code conductors for future identification and service of control system, except local individual room control cables.
  - 8. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.
- D. Connect manual-reset limit controls independent of manual-control switch positions. Automatic duct heater resets may be connected in interlock circuit of power controllers.
- E. Connect hand-off-auto selector switches to override automatic interlock controls when switch is in hand position.
- 3.3 FIELD QUALITY CONTROL
  - A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust field-assembled components and equipment installation, including connections, and to assist in field testing. Report results in writing.
  - B. Perform the following field tests and inspections and prepare test reports:
    - 1. Operational Test: After electrical circuitry has been energized, start units to confirm proper unit operation. Remove and replace malfunctioning units and retest.
    - 2. Test and adjust controls and safeties.
    - 3. Test calibration of controllers by disconnecting input sensors and stimulating operation with compatible signal generator.
    - 4. Test each point through its full operating range to verify that safety and operating control set points are as required.
    - 5. Test each control loop to verify stable mode of operation and compliance with sequence of operation. Adjust PID actions.
    - 6. Test each system for compliance with sequence of operation.
    - 7. Test software and hardware interlocks.
  - C. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.
- 3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain HVAC instrumentation and controls.

# PART 4 - SEQUENCES OF CONTROL

- 4.1 STANDARD VARIABLE AIR VOLUME BOXES
  - A. Sequence of Operations
    - 1. Building Automation System Interface:
      - a. The Building Automation System (BAS) shall send the controller Occupied and Unoccupied commands. The BAS may also send a Heat/Cool mode, priority shutdown commands, space temperature and/or space temperature setpoint. If communication is lost with the BAS, the VAV controller shall operate using its local setpoints.
      - b. Occupancy Mode:
        - i) The occupancy mode shall be communicated or hardwired to the VAV via a binary input. Valid Occupancy modes for the VAV shall be:
      - c. Occupied:
        - i) Normal operating mode for occupied spaces or daytime operation. When the unit is in the occupied mode the VAV shall maintain the space temperature at the active occupied heating or cooling setpoint. Applicable ventilation and airflow setpoints shall be enforced. The occupied mode shall be the default mode of the VAV.
      - d. Occupied Standby:
        - i) The occupancy sensor shall be used to indicate that the space is unoccupied, even though the BAS has scheduled the space as occupied. In the occupied standby mode, the active cooling and heating setpoints shall be relaxed (see cooling and heating mode) and the ventilation airflow setpoints shall be lowered (see VAV schedule).
      - e. Unoccupied:
        - i) Normal operating mode for unoccupied spaces or nighttime operation. When the unit is in unoccupied mode the VAV controller shall maintain the space temperature at the stored unoccupied heating or cooling setpoint regardless of the presence of a hardwired or communicated setpoint. When the space temperature exceeds the active unoccupied setpoint the VAV shall modulate fully closed.
      - f. Occupied Bypass:
        - i) Mode used to temporarily place the unit into the occupied operation. Tenants shall be able to override the unoccupied mode from the space sensor. The override shall last for a maximum of 4 hours (adj.). The tenants shall be able to cancel the override from the space sensor at any time. During the override the unit shall operate in occupied mode.
      - g. Heat/Cool Mode:

- i) The Heat/Cool mode shall be set by a communicated value or automatically by the VAV. In standalone or auto mode the VAV shall compare the primary air temperature with the configured auto changeover setpoint to determine if the air is "hot" or "cold". Heating mode it implies the primary air temperature is hot. Cooling mode it implies the primary air temperature is cold.
- h. Heat/Cool Setpoint:
  - i) The space temperature setpoint shall be determined either by a local (e.g., thumbwheel) setpoint, the VAV default setpoint or a communicated value. The VAV shall use the locally stored default setpoints when neither a local setpoint nor communicated setpoint is present. If both a local setpoint and communicated setpoint exist, the VAV shall use the communicated value.
- i. Cooling Mode:
  - i) When the unit is in cooling mode, the VAV controller shall maintain the space temperature at the active cooling setpoint by modulating the airflow between the active cooling minimum airflow setpoint to the maximum cooling airflow setpoint. Based on the VAV controller occupancy mode, the active cooling setpoint shall be one of the following:

Setpoint	Default Value
Occupied Cooling Setpoint	74.0 deg. F
Unoccupied Cooling Setpoint	85.0 deg. F
Occupied Standby Cooling Setpoint	76.0 deg. F
Occupied Min Cooling Airflow Setpoint Schedule	See VAV
Occupied Max Cooling Airflow Setpoint Schedule	See VAV

ii) The VAV shall use the measured space temperature and the active cooling setpoint to determine the requested cooling capacity of the unit. The outputs will be controlled based on the unit configuration and the requested cooling capacity.

# j. Heating Mode:

i) When the unit is in heating mode, the VAV controller shall maintain the space temperature at the active heating setpoint by modulating the airflow between the active heating minimum airflow setpoint to the maximum heating airflow setpoint. Based on the VAV controller occupancy mode, the active heating setpoint shall be one of the following:

Setpoint	Default Value
Occupied Heating Setpoint	70.0 deg. F
Unoccupied Heating Setpoint	60.0 deg. F
Occupied Standby Heating Setpoint	68.0 deg. F

Occupied Min Heating Airflow Setpoint Schedule	See VAV
Occupied Max Heating Airflow Setpoint Schedule	See VAV

- ii) The VAV controller shall use the measured space temperature and the active heating setpoint to determine the requested heating capacity of the unit. The outputs will be controlled based on the unit configuration and the requested heating capacity.
- iii) Reheat Control:
  - a) Reheat will only be allowed when the primary air temperature is 5.0 deg. F below the configured reheat enable setpoint of 70.0 deg. F (adj.). The reheat shall be enabled when the space temperature drops below the active heating setpoint and the minimum airflow requirements are met. During reheat the VAV shall operate at its minimum heating airflow setpoint and energize the heat as follows:
- iv) Proportional Hot Water Reheat:
  - a) If the space temperature is below the heating setpoint the hot water reheat valve shall modulate as required to maintain the active heating setpoint.
- 4.2 POINTS LIST
  - A. See points list.

	I	Hard Poi	war ints	e	Software Points						
Point Name	AI	A O	ві	B O	AV	вv	Loop	Sched	Trend	Alar m	Show On Graphic
Airflow	x								х		х
Discharge Air Temp	x								х		х
Zone Setpoint Adjust	x										х
Zone Temp	x								х		х
Zone Damper		x							х		х
Zone Override			x						х		х
Reheating Stage 1				x					х		х
Reheating Stage 2				х					х		х
Airflow Setpoint					x				х		х
Cooling Setpoint					x				х		х
DAT Heating Limit					x						
Heating Setpoint					x				х		х
Heating Mode						x			х		

		Hard Poi	lwar ints	e	Software Points						
Point Name	AI	A O	BI	B O	AV	вv	Loop	Sched	Trend	Alar m	Show On Graphic
Schedule								x			
High Discharge Air Temp										х	
High Zone Temp										х	
Low Discharge Air Temp										х	
Low Zone Temp										х	
Totals	4	1	1	2	4	1	0	11			
Total Hardware	(8)				Total Software (21)						

END OF SECTION 23 09 00

# SECTION 23 21 13 – HYDRONIC PIPING AND VALVES

PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Pipe and pipe fittings
  - B. Valves
- 1.2 RELATED DOCUMENTS
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 230100 GENERAL PROVISION FOR MECHANICAL WORK
  - C. Section 230719 HVAC PIPING INSULATION
  - D. Section 232118 HYDRONIC PIPING SPECIALTIES
- 1.3 WELDING AND BRAZING
  - A. Welders Qualification
    - 1. Welder's qualifications shall specify results of test, or retest, positions qualified and type of welding in which qualified.
    - 2. All welds shall be of sound metal thoroughly fused to the base metal at all points, free from cracks; and reasonably free from oxidation, blow holes, and non- metallic inclusions. No fins or weld metal shall project within the pipe; and should they occur shall be removed. All pipe beveling shall be done by machine. The surface of all parts to be welded shall be thoroughly cleaned free from paint, oil, rust or scale, at the time of welding except that a light coat of oil may be used to preserve the beveled surfaces from rust.
    - 3. All pipe and fittings shall be carefully aligned with adjacent parts and this alignment must be preserved in a rigid manner during the process of welding.
    - 4. It is required that all welding of piping covered by this specification, regardless of conditions of service, be installed as follows:
      - Pipe welding shall comply with the provision of the latest revisions of the applicable code whether ASME "Boiler Construction Code", ANSI "Code for Pressure Piping", AWS and/or Kentucky KRS-236 "Boiler Safety Law". The contractor shall make arrangements for inspection visits by the state boiler inspector as required by KRS-236.
      - b. The Contractor's welding procedure shall clearly set forth P-numbers of parent metal to be welded, rod or filter metal to be used and positions required.
      - c. Before any pipe welding is performed, the Contractor shall submit to the Architect a copy of his welding procedure specifications together with proof of its qualification as outlined and required by the most recent issue of the code having jurisdiction.
      - d. Before any operator shall perform any pipe welding, the Contractor shall also submit to the Architect, the operator's qualification record in conformance with provisions of the Code having jurisdiction, showing that

the operator was tested under the approved procedure specification submitted by the Contractor.

- e. Welding work shall not be performed by welders who are not approved by the Architect and any such work performed shall be summarily removed and replaced without further recourse by the Contractor.
- f. Standard Procedure Specifications and operators qualified by the National Certified Pipe Welding Bureau shall be considered as conforming to the requirements of the specifications.
- g. Each manufacturer or Contractor shall be responsible for the quality of welding done by his organization and shall repair any work not in accordance with these specifications.
- h. Brazing, when specified or indicated on the contract drawings, shall be in accordance with Part UB of Section VIII of the ASME Code. Filler metal shall conform to AWS B260, Class B AG-1 or B AG-2. Procedure and performance qualification requirements for brazing shall be the same as for welding, as required above.

# PART 2 - PRODUCTS

- 2.1 HOT WATER PIPING, ABOVE GROUND
  - A. Steel Pipe: ASTM A53, A106 or A120, Schedule 40, black.
    - 1. Fittings: ANSI/ASTM B16.3, malleable iron or ASTM A234, forged steel welding type fittings, or grooved mechanical fittings.
    - 2. Joints: Screwed for pipes up to 2 inch, or ANSI/AWS D1.1, welded for pipes over 2 inch, or grooved mechanical couplings.
  - B. Copper Tubing: ASTM B75, B88 OR B251, Type L, hard drawn.
    - 1. Fittings: ANSI/ASME B16.23 cast brass or ANSI/ASME B16.29 wrought copper, or grooved mechanical fittings.
    - 2. Joints: ASTM B32, solder, Grade 95TA, or grooved mechanical couplings.
- 2.2 EQUIPMENT DRAINS, CONDENSATE DRAINS AND OVERFLOWS
  - A. Steel Pipe: ASTM A53 or A120, Schedule 40 galvanized.
    - 1. Fittings: Galvanized cast iron, or ANSI/ASTM B16.3 malleable iron.
    - 2. Joints: Screwed, or grooved mechanical couplings.
  - B. Stainless Steel Pipe: ASTM A312, Type 304/304L, full finish annealed pipe, certified for use with Vic Press 304<sup>™</sup> joints.
    - 1. Fittings: Precision cold drawn austenitic stainless steel, Type 304/304L, complete with synthetic rubber grade EPDM O-rings.
    - 2. Joints: Vic Press 304<sup>™</sup>.
  - C. Copper Tubing: ASTM B88, Type L, M or DWV hard drawn.
    - 1. Fittings: ANSI/ASME B16.18 bronze sand castings, ANSI B16.22 wrought copper, ANSI/ASME B16.23 cast brass, or ANSI/ASME B16.29 solder wrought copper.
    - 2. Grooved joint fittings, as manufactured by Victaulic, or equal, shall be manufactured to copper tubing sizes, with grooved ends designed to accept grooved end couplings of the same manufacturer. Flaring of tube and fitting ends to IPS dimensions is not allowed.

- 3. Joints: ASTM B32, solder, Grade 95TA or grooved joints with EPDM gaskets.
- D. PVC Pipe: ASTM D1785, Schedule 40 and Schedule 80.
  - 1. Fittings: ASTM D2466 for Schedule 40 pipe, or ASTM D2467 for Schedule 80 pipe.
  - 2. Joints: ASTM D2564 and ASTM D2855, solvent weld.

#### 2.3 FLANGES, UNIONS, AND COUPLINGS

- A. Pipe Size 2 Inches and Under: 150 psig malleable iron unions for threaded ferrous piping; 300 psig stainless steel, threaded type with Vic Press 304<sup>™</sup> ends for stainless steel pipe; bronze unions for copper pipe, soldered joints.
- B. Pipe Size Over 2 Inches: 150 psig forged steel slip-on flanges for ferrous piping; bronze flanges for copper piping; 1/16-inch-thick preformed neoprene bonded to asbestos.
- C. Grooved and Shouldered Pipe End Couplings: Ductile iron housing clamps to engage and lock, designed to permit some angular deflection, contraction, and expansion, where required; C-shape elastomer composition sealing gasket for operating temperature range from -30 degrees F to 250 degrees F; steel bolts, nuts, and washers; galvanized couplings for galvanized pipe.
  - 1. IPS Steel Piping:
    - a. Rigid Type: Couplings housings cast with offsetting, angle-pattern bolt pads shall be used to provide system rigidity and support and hanging in accordance with ANSI B31.1 and B31.9. Victaulic Style 107H, GruvLok Figure 7402.
    - b. Flexible Type: Use in locations where vibration attenuation and stress relief are required. Victaulic Style 177, GruvLok Figure 7001.
    - c. Flange Adapter: Flat face, for direct connection to ANSI Class 125 or 150 flanged components. Victaulic Style 741, GruvLok Figure 7012 or Figure 7788.
  - 2. Hard Copper Tube: Housings cast with offsetting, angle-pattern bolt pads. Housings coated with copper colored alkyd enamel. Manufactured to copper tube dimensions, with Grade "EHP" EPDM QuickVic type gasket or equal with a maximum temperature rating of 250 deg F. Victaulic Style 607 QuickVic, GruvLok Figure 6402.

### 2.4 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder joint, plain or weld-neck and connections that match piping system materials.

# 2.5 ESCUTCHEONS

A. Escutcheons shall be Beaton and Caldwell; Carpenter and Patterson; Fee and Mason or approved equivalent. Chromium-plated iron or chromium-plated brags, either one piece or split patterns, held in place by internal spring tension or set screw that completely covers opening.

# 2.6 PROTECTIVE COATING FOR PIPE AND FITTINGS

A. Protective Coating for Pipe and Fittings: Metallic pipe and fittings, except cast iron and copper, that are installed underground shall be provided with a field- or shop-applied coal-tar coating and wrapping or a shop-applied extruded polyethylene sheath. The coating shall consist of a coat of coal-tar primer, a coat of coal-tar enamel, a second coat of coal-tar enamel, a second wrapper of coal-tar saturated felt, and a wrapper of Kraft paper applied in the order named and conforming to the requirements of AWWA Standard C203 for materials, thicknesses, methods of application, tests, and handling,

except that interior lining will not be required. Upon completion of satisfactory tests hereinafter specified, the joints shall be hand-wrapped with hot-applied preformed coaltar tape. Preparation of surface and hand-applied wrapping shall be done in such a manner that a covering equal in effectiveness to that of the shop-applied coating will be produced. When extruded polyethylene sheath is used for the protective coating, fittings and joints shall be covered in the manner and with the materials recommended by the manufacturer of the sheath.

# 2.7 BALL VALVES

- A. Up to 2 Inches:
  - 1. 150 psig WSP/600 psig WOG, conventional port bronze two-piece body, hard chrome plated forged brass ball, Teflon seats and stuffing box ring, lever handle, adjustable stem packing nut, blow-out proof stem, solder or threaded ends.
  - 2. Forged brass two-piece body, chrome plated brass ball and stem, Teflon seats, lever handle, Vic Press 304<sup>™</sup> ends, 300 PSIG CWP, Victaulic Series 589.
  - 3. Manufactured by Crane, GruvLok, Nibco, Stockham, Victaulic, or Watts.
- B. Over 2 Inches:
  - 1. 200 psig CWP, cast steel body, chrome plated steel ball, Teflon seat and stuffing box seals, lever handle.
  - 2. 300 psig CWP, ductile iron body, chrome plated carbon steel ball and stem, Teflon seat, lever handle.
  - 3. Manufactured by Crane, GruvLok, Nibco, Stockham, Victaulic, or Watts.
- C. Ball valves shall have extended stem assembly to clear thickness of pipe insulation.
- 2.8 PLUG COCKS
  - A. Up to 2 Inches: 175 psig WOG, semi-steel, lubricated, Teflon packing, threaded ends, with one wrench operator for every ten plug cocks.
  - B. Over 2 Inches: 175 psig WOG, semi-steel body and plug, pressure lubricated, Teflon packing, flanged ends, with wrench operator with set screw.
  - C. Manufactured by Nordstrom, Powell, or Walworth.

# PART 3 - EXECUTION

## 3.1 PREPARATION

- A. Ream pipe and tube ends. Remove burrs. Bevel or groove plain end ferrous pipe.
- B. Remove scale and dirt on inside and outside before assembly.
- C. Prepare piping connections to equipment with flanges, couplings or unions.
- D. After completion, fill, clean, and treat systems.

# 3.2 INSTALLATION

- A. Pipe shall be cut accurately to measurements established at the jobsite and worked into place without springing or forcing, properly clearing all windows, doors, and other openings.
- B. Route piping in orderly manner, plumb and parallel to building structure, and maintain gradient.
- C. Ferrous piping and copper piping shall be electrically isolated from each other with dielectric couplings or fittings.
- D. Do not use bull-headed tee fittings.

- E. Install piping to conserve building space, and not interfere with use of space and other work. Do not change the designed path of piping, add excessive turns or offsets, or change pipe sizes without first consulting the Engineer.
- F. Group piping whenever practical at common elevations.
- G. Install piping to allow for expansion and contraction without stressing pipe, joints, or connected equipment.
- H. Provide clearance for installation of insulation, and access to valves and fittings.
- I. Provide access where valves and fittings are not exposed.
- J. Slope piping and arrange systems to drain at low points. Use eccentric reducers to maintain top of pipe level.
- K. Where pipe support members are welded to structural building framing, scrape, brush clean, and apply one coat of zinc rich primer to welding.
- L. Prepare pipe, fittings, supports, and accessories for finish painting. Refer to Section Painting.
- M. Install valves with stems upright or horizontal, not inverted.
- N. Grooved joint piping systems shall be installed in accordance with the manufacturer's guidelines and recommendations. All grooved couplings, fittings, valves and specialties shall be the products of a single manufacturer. Grooving tools shall be of the same manufacturer as the grooved components. The gasket style and elastomeric material (grade) shall be verified as suitable for the intended service as specified. Grooved end shall be clean and free of indentations, projections and roll marks in the area from pipe end to groove for proper gasket sealing. A factory trained field representative shall provide on-site training to contractor's field personnel in the proper use of grooving tools and the installation of grooved piping products. Factory trained representative shall periodically review the product installation. Contractor shall remove and replace any improperly installed products.
- O. Escutcheons shall be provided at all finished surfaces where exposed piping, bare or insulated, passes through floors, walls, or ceilings. Escutcheons shall be fastened securely to pipe sleeves or to extensions of sleeves without any part of sleeves being visible. Where sleeves project slightly from floors, special deep-type escutcheons shall be used.

# 3.3 APPLICATION

- A. Use grooved mechanical couplings and fasteners in accessible locations or where approved by the engineer.
- B. Install unions or grooved joint couplings downstream of valves and at equipment or apparatus connections.
- C. Install brass male adapters each side of valves in copper piped system. Sweat solder adapters to pipe.
- D. Install gate or ball valves for shut-off and to isolate equipment, part of systems, or vertical risers.
- E. Install globe or ball valves for throttling, bypass, or manual flow control services.
- F. Provide spring loaded check valves on discharge of condenser water pumps.
- G. Use plug cocks for throttling service.
- H. Use only butterfly valves in heat pump and cooling tower water systems interchangeably with gate and globe valves.

- I. Use only butterfly valves in condenser water systems for throttling and isolation service.
- J. Use lug or grooved end butterfly valves to isolate equipment.
- K. Provide 3/4-inch gate or ball drain valves at main shut-off valves, low points of piping, bases of vertical risers, and at equipment. Pipe to nearest drain.
- L. Provide automatic air vents, piped per details on drawings, at all high points of piping and at end of hydronic supply mains.
- M. Do not install above grade piping in areas subject to freezing. When such an area is encountered, notify the engineer for further instructions.

# 3.4 TESTS

A. Piping: After cleaning, all piping shall be hydrostatically tested at a pressure equal to 150 percent of the total system operating pressure but not less than 100 psi for a period sufficient to inspect every joint in the system and in no case less than 2 hours. No loss of pressure will be allowed. Leaks found during tests shall be repaired by re-welding or replacing pipe or fittings. Caulking or peening of joints or fittings will not be permitted. Concealed and insulated piping shall be tested in place before covering or concealing.

END OF SECTION 23 21 13

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	S A M P L E S	OTHER
Pipe	x	x						
Fittings	x	x						
Valves	x	x	x					
Welders Certificate						x		

# SECTION 23 21 16 – HYDRONIC PIPING SPECIALTIES

PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Air Vents
  - B. Strainers
  - C. Combination Valves
  - D. Flow Indicators, Controls, Meters

### 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 230100 GENERAL PROVISIONS FOR MECHANICAL WORK
- C. Section 230529 SUPPORTS AND ANCHORS FOR HVAC PIPING AND EQUIPMENT
- D. Section 232113 HYDRONIC PIPING AND VALVES

## 1.3 REGULATORY REQUIREMENTS

- A. Conform to ANSI/ASME Boilers and Pressure Vessels Code Section 8D for manufacture of tanks.
- 1.4 QUALITY ASSURANCE
  - A. Manufacturer: For each product specified, provide components by same manufacturer throughout.
- PART 2 PRODUCTS
- 2.1 AIR VENTS
  - A. Manual Type: Short vertical sections of 2-inch diameter pipe to form air chamber, with 1/8-inch brass needle valve at top of chamber. Plumb to nearest drain with Type M soft copper 1/4-inch pipe.
  - B. Automatic Float Type: Brass or semi-steel body, copper float, stainless steel valve and valve seat; suitable for system operating temperature and pressure; with isolating valve. Plumb to nearest drain with Type M soft copper 1/4-inch pipe.
  - C. Manufactured by Amtrol, Armstrong, Bell & Gossett, Taco.
- 2.2 STRAINERS
  - A. Size 2 inch and Under: Screwed brass, for copper pipe or iron, for steel pipe body for 175 psig working pressure, Y pattern with 1/32-inch stainless steel perforated screen.
  - B. Size 2-1/2 inch to 6 inch: Flanged or grooved ductile iron body for 300 psig maximum working pressure, Y pattern with 3/64-inch, 1/16 inch, or 1/8-inch stainless steel perforated screen.
  - C. Manufactured by Victaulic, Armstrong, GruvLok, Leslie, Kieley, Mueller, Wheatley.
  - D. Provide screens for water service.
- 2.3 AUTOMATIC FLOW CONTROL VALVES

- A. Valve design and construction. All valves to be of bronze body/brass ball construction with glass and carbon filled TFE seat rings or brass or ductile iron body globe construction. Valves to have differential pressure read-out ports across valve seat area. Read-out ports to be fitted with internal EPT insert and check valve. Valve bodies to have 1/4" NPT tapped drain/purge port. Valves to have memory stop feature to allow valve to be closed for service and then reopened to set point without disturbing balancer position. All valves to have calibrated name plate to assure specific valve settings. Valves to be leak-tight at full rated working pressure.
- B. Size circuit setters for less than 5 feet pressure drop when fully open.
- C. Manufactured by Armstrong, Bell & Gossett, Griswold, GruvLok, IMI Flow Design, Nexus, Victaulic/TA Hydraulics.

## PART 3 - EXECUTION

- 3.1 INSTALLATION AND APPLICATION
  - A. Install specialties in accordance with manufacturer's instructions to permit intended performance.
  - B. Support tanks inside building from building structure. In accordance with manufacturer's instructions.
  - C. Where large air quantities can accumulate, provide enlarged air collection standpipes.
  - D. Provide manual air vents at system high points and as indicated.
  - E. For automatic air vents in ceiling spaces or other concealed locations, provide vent tubing to nearest drain.
  - F. Provide air separator on suction side of system circulation pump and connect to expansion tank.
  - G. Provide valved drain and hose connection on strainer blow down connection.
  - H. Provide combination pump discharge valve or valve assembly on discharge side of in line centrifugal pumps.
  - I. Provide relief valves on expansion tanks, low pressure side of reducing valves.
  - J. Select system relief valve capacity so that it is greater than make-up pressure reducing valve capacity. Select equipment relief valve capacity to exceed rating of connected equipment.
  - K. Pipe relief valve outlet to nearest floor drain.

END OF SECTION 23 21 16

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAY-NGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	SAMPLES	OTHER
Air Vents	Х	Х						
Strainers	х	х						
Flow Control Valves	Х	Х						

# SECTION 23 31 13 – DUCTWORK AND DUCTWORK INSULATION

### PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Low Pressure Ducts
  - B. Medium- and High-Pressure Ducts
  - C. Insulation
  - D. Duct Cleaning

#### 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 230100 GENERAL PROVISIONS FOR MECHANICAL WORK
- C. Section 233300 DUCTWORK ACCESSORIES

#### 1.3 REFERENCES

- A. ASHRAE Handbook 2013 Fundamentals; Chapter 21- Duct Design.
- B. ASHRAE Handbook 1989 HVAC Systems and Equipment; Chapter 19 Duct Construction.
- C. ASHRAE Surface Burning Characteristics of Building Materials.
- D. NFPA 90A Installation of Air Conditioning and Ventilating Systems.
- E. NFPA 90B Installation of Warm Air Heating and Air Conditioning Systems.
- F. NFPA 96 Installation of Equipment for the removal of Smoke and Grease- Laden Vapors from Commercial Cooling Equipment.
- G. IMC International Mechanical Code Latest Issue
- H. SMACNA HVAC Duct Construction Standards, Metal and Flexible.
- I. UL 181 Factory-made Air Ducts and Connections.
- 1.4 DEFINITIONS
  - A. Duct Sizes: Inside clear dimensions. For lined ducts, maintain sizes inside lining.
  - B. Low Pressure: Three pressure classifications: 2-inch WG positive or negative static pressure and velocities less than 2, 000 fpm; 1-inch WG positive or negative static pressure and velocities less than 2,500 fpm and 2-inch WG positive or negative static pressure and velocities less than 2,500 fpm.
  - C. Medium Pressure: Three pressure classifications: 3-inch WG positive or negative static pressure and velocities less than 4,000 fpm, 4-inch WG positive static pressure and velocities greater than 2,000 fpm, 6-inch WG positive static pressure and velocities grater thank 2,000 fpm and
  - D. High Pressure: 10-inch WG positive static pressure and velocities greater than 2,000 fpm.

PART 2 - PRODUCTS

2.1 ACCEPTABLE MANUFACTURERS

A. C&R Sheet Metal, Ductmate, DuctSox Corporation, Eastern Sheet Metal, Euro-Aire, Fabricair, FlexmasterUSA, KE Fibertec, Lindab, Nordfab, Turnkey or Hamlin.

## 2.2 MATERIALS

- A. General: Non-combustible or conforming to requirements for Class 1 air duct materials, or UL 181.
- B. All duct material and covering shall have a flame spread rating of 24 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84.
- C. Steel Ducts: ASTM A653/A653M galvanized steel sheet, lock forming quality, having zinc coating of 1.25 oz. Per sq. ft. for each side in conformance with ASTM G90.
- D. Flexible Ducts: Interlocking spiral of galvanized steel, or fabric supported on helically wound spring steel wire rated to 2 inches WG positive and 1.5 inches WG negative for low pressure ducts and 15 inches positive or negative for medium high-pressure ducts. Flexible ducts shall conform to UL 181. Maximum length per run shall be 48".
- E. Insulated Flexible Duct: Flexible duct wrapped with flexible glass fiber insulation, enclosed by seamless aluminum pigmented plastic vapor barrier jacket; maximum 0.23 K value at 75 degrees F. Maximum length per run shall be 48".
- F. Stainless Steel Ducts: ASTM A480/A480M, Type 304.
- G. Double-Wall Duct and Fittings
  - 1. Outer Duct to conform with SMACNA Duct Construction Standards.
  - 2. Inner Duct: Minimum 0.028-inch perforated galvanized sheet steel having 3/32-inch diameter perforations, with overall open area of 23%.
  - 3. Interstitial Insulation: Fibrous-glass liner complying with ASTM C1071, NFPA 90A or NFPA 90B; and NAIMA AH124, "Fibrous Glass Duct Liner Standard".
    - a. Maximum Thermal Conductivity: 0.27 Btu x in./hr. x sq. ft. x deg F at 75 deg F mean temperature.
    - b. Install spacers that position the duct liner at uniform distance from the outer duct without compressing insulation.
    - c. Coat insulation with antimicrobial coating.
    - d. Cover insulation with polyester film complying with UL 181, Class 1.
- H. Fasteners: Rivets, bolts, or sheet metal screws.
- I. Sealant: Non-hardening, water resistant, fire resistive, compatible with mating materials; liquid used along or with tape, or heavy mastic.
- J. Hanger Rod: Steel, galvanized; threaded both ends, threaded one end, or continuously threaded. Stainless steel for stainless steel duct.

## 2.3 INSULATION

- A. Internal: Glass fiber; ASTM C1071, G21 and G22 with an NRC not less than .65, 1.5 lb./.cu. ft. minimum density; smooth black matted air side surface for maximum 5000 FPM air velocity.
- B. External (choose one of the following):
  - 1. Flexible or rigid glass fiber; ASTM C1290 and C1136 all-service duct wrap; K value of .27 at 75 degrees F and a minimum installed R-value of R-6. Provide with foil scrim facing.

- 2. Reflectix (or equal) R-6.0 insulation having two layers of aluminum foil with polyethylene bonded for strength, and two inner layers of insulated bubbles; 5/16" thick; 1.25 oz./sq. ft. Flame and smoke 25/50.
- C. Insulation material and jackets shall have a flame spread rating of 25 or less and a smoke developed rating of 50 or less when tested in accordance with ASTM E84.
- D. Adhesives: Waterproof fire-retardant tape.
- E. Lagging Adhesives: Fire resistive to ASTM E84, NFPA 255, UL723.
- F. Impale Anchors: Galvanized steel, 12- gage, spot welded or self-adhesive pad. No anchors shall penetrate duct walls.
- G. Joint Tape: Glass fiber cloth, open mesh.
- H. Tie Wire: Annealed steel, 16-gage.

# 2.4 DUCT HANGERS

- A. All duct hangers in direct contact with galvanized duct shall be galvanized steel.
- B. All duct hangers in direct contact with stainless steel ducts shall be stainless steel.

## PART 3 - EXECUTION

## 3.1 LOW PRESSURE DUCTWORK

- A. Fabricate and support in complete accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible and ASHRAE handbooks latest editions, except as indicated. Provide duct material, gages, reinforcing, and sealing for operation pressures indicated.
- B. Size round ducts installed in place of rectangular ducts in accordance with ASHRAE table of equivalent rectangular and round ducts. No variation of duct configuration or sizes permitted except by written permission.
- C. Construct T's, bends, and elbows with a radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide turning vanes. Where acoustical lining is indicated, provide turning vanes of perforated metal with glass fiber insulation fill.
- D. Increase duct sizes gradually, not exceeding 15 degrees divergence wherever possible. Divergence upstream of equipment shall not exceed 30 degrees; convergence downstream shall not exceed 30 degrees.
- E. Provide easements where low pressure ductwork conflicts with piping and structure. Where easements exceed 10 percent duct area, split into two ducts maintaining original duct area.
- F. Connect flexible ducts to metal ducts with draw bands or adhesive plus sheet metal screws.
- G. Use crimp joints with or without bead for joining round duct sizes 8 inch and smaller with crimp in direction of air flow.

# 3.2 MEDIUM- AND HIGH-PRESSURE DUCTS

- A. Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards, Metal and Flexible and ASHRAE handbooks, except as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated.
- B. Construct T's, bends, and elbows with radius of not less than 1-1/2 times width of duct on centerline. Where not possible and where rectangular elbows are used, provide air foil turning vanes. Where acoustical lining is required, provide turning vanes of perforated metal with glass fiber insulation fill.

- C. Transform duct sizes gradually, not exceeding 15 degrees divergence and 30 degrees convergence.
- D. Fabricate continuously welded medium and high-pressure round and oval ducts fittings two gages heavier than duct gages indicated in SMACNA Standard. Joints shall be minimum 4-inch cemented slip joint, brazed or electric welded. Prime coat welded joints.
- E. Provide standard 45-degree lateral wye takeoffs unless otherwise indicated where 90degree conical tee connections may be used.

# 3.3 DUCTWORK INSTALLATION

- A. Provide engineered openings in ductwork where required to accommodate thermometers and controllers. Provide pilot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring and maintain vapor barrier where applicable.
- B. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.
- C. Provide residue traps in kitchen hood exhaust ducts at base of vertical risers with provisions for cleanout. Use stainless steel for ductwork exposed to view and stainless steel or galvanized steel for ducts where concealed.
- D. During construction, provide temporary closures of metal or taped polyethylene on open ductwork to prevent construction dust from entering ductwork system.
- E. Clean duct system and force air at high velocity through duct to remove accumulated dust. To obtain sufficient air, clean half the system at a time. Protect equipment which may be harmed by excessive dirt with temporary filters, or bypass during cleaning.
- F. Space between duct and floor or masonry wall openings shall be sealed with fire rated caulk.
- G. Verify all field conditions before fabrication of ductwork to avoid installation conflicts. Notify Engineer of any conflict areas.
- H. Do not change the designed path of ductwork, add excessive turns or offsets, or change duct sizes without first consulting the Engineer.

#### 3.4 INSULATION INSTALLATION

- A. Install materials in accordance with manufacturer's instructions.
- B. Exterior Insulation Application
  - 1. Secure insulation with vapor barrier with wires and seal jacket joints with vapor barrier adhesive or tape to match jacket.
  - 2. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
  - 3. Continue insulation with vapor barrier though penetrations.
- C. Internal Application
  - 1. Adhere insulation with adhesive for 100 percent coverage. Secure insulation with mechanical fasteners on 15-inch centers maximum on top and side of ductwork with dimension exceeding 20 inches. Seal and smooth joints. DO not use nail-type fasteners. Seal vapor barrier penetrations by mechanical fasteners with vapor barrier adhesive.
  - 2. Ductwork dimensions indicated are net inside dimensions required for air flow. Increase ductwork to allow for insulation thickness.

- D. Insulation Schedule
  - 1. Supply, return, and outside air ductwork shall be insulated with external insulation as noted below.
  - 2. Ductwork listed below that is to be externally insulated:
    - a. All supply, return and outside air ductwork shall be externally insulated unless otherwise noted.
  - 3. Externally insulated ductwork shall be insulated using one of the following methods:
    - a. Ductwork shall be externally insulated with Reflectix (or equal) R-6.0 insulation having two layers of aluminum foil with polyethylene bonded for strength, and two inner layers of insulated bubbles; 5/16" thick; 1.25 oz./sq. ft. Flame and smoke 25/50.
      - i) Ductwork may also be insulated with fiberglass insulation, maintaining the insulation value of R-6.0, in lieu of Reflectix insulation.
  - 4. Insulation must be installed in strict accordance with insulation manufacturer's requirements. Provide spacers, pins, bands and adhesive as required. Special care must be taken on large ductwork to prevent sagging of insulation away from ductwork.
  - 5. Interior exhaust duct shall not require insulation
  - 6. Combustion air duct shall have  $1\frac{1}{2}$  inch external insulation.
  - 7. Where duct is scheduled to be insulated (either externally or internally) herein and shown to be routed in an area that will be exposed based on Architectural drawings, the Contractor shall provide double-wall duct conforming with the specifications provided herein.
  - 8. All ductwork insulation must conform to the minimum requirements of ASHRAE 90.1 (current edition) and International Energy Conservation Code (current edition) unless otherwise specified in this section.

## 3.5 HANGERS

- A. Duct hangers may be directly attached to ducts. Ducts shall be hung by angles or straps as listed in the following schedule. Rods, straps or angles may be used in trapeze hangers. Hangers shall be in accordance with the following schedule, except that there shall be no less than one set of hangers for each section of ductwork. Where elbows or tees are installed for changes in direction, hangers shall be provided. No ductwork shall rest on the building structural system. No ductwork shall be supported by suspended ceiling systems. All ductwork must be independently supported from building structural system.
- B. Where trapeze hangers are used, the bottom of the duct shall be supported to angle sized as follows (for round ducts, the angle shall conform to the bottom 120 degrees of the duct):

Diameter of Duct	Width of Duct	Bottom Angle Sizes
0"-32"	0"-30"	1" x 1" x 1/8"
35" and Larger	31" - 48"	1-1/2" x 1-1/2" x 1/8"

C. All hangers shall be sufficiently across-braced to eliminate, in the opinion of the Architect, excessive sway. Wherever ductwork contains filter sections, coils, fans or other heavy equipment (excluding registers, grilles, diffusers, splitter dampers, etc.) such equipment shall be hung independently of the ductwork, with rods or angles of sizes adequate to support the load.

- D. Special Duct Hanging Conditions
  - 1. In the event ductwork interferes with suspended ceiling support hangers, provide cross members from hangers affected. These cross members shall be of reinforcing steel or furring channels and shall run under ductwork in question from which additional ceiling hangers shall be supported.

END OF SECTION 23 31 13

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to the Architect for approval within 30 days after notice to proceed.

	SHOP DRAWINGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I NG D I A G R A M	C E R T I F I C A T I O N	S A M P L E S	
ITEM DESCRIPTION								OTHER
Duct Work	Х	Х						
Insulation	Х	х					Х	
Hangers	х	x						

## SECTION 23 33 00 - DUCTWORK ACCESSORIES

### PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Volume Control Dampers
  - B. Air Turning Devices
  - C. Flexible Duct Connectors
  - D. Duct Test Holes
- 1.2 RELATED DOCUMENTS
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 230100 General Provisions for Mechanical Work
  - C. Section 233113 Ductwork and Ductwork Insulation
- 1.3 ACTION SUBMITTALS
  - A. Product Data: For each type of product specified.

# PART 2 - PRODUCTS

### 2.1 VOLUME CONTROL DAMPERS

- A. Acceptable Manufacturers
  - 1. United Enertech, Air Balance, American Warming, Arrow, Cesco, Creative Metals, Nailor, Ruskin, Vent Products, and Whiz Air.
- B. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.
- C. Fabricate splitter dampers of material same gage as duct to 24 inches size in either direction, and two gages heaver for sizes over 24 inches.
- D. Fabricate splitter dampers to streamline shape. Secure blade with continuous hinge or rod. Operate with minimum 1/4-inch diameter rod in self aligning, universal joint action flanged bushing with set screw.
- E. Fabricate single blade dampers for duct sizes to 12 inch.
- F. Fabricate multi-blade damper of opposed blade pattern with maximum blade sizes 12 x 72 inches. Assemble center and edge crimped blades in prime coated or galvanized channel frame with suitable hardware.
- G. Except in round ductwork 12 inches and smaller, provide end bearings. On multiple blade dampers, provide oil-impregnated nylon or sintered bronze bearings.
- H. Provide locking, indicating quadrant regulators on single and multi-blade dampers. Where rod lengths exceed 30 inches provide regulator at both ends.

### 2.2 AIR TURNING DEVICES

- A. Acceptable Manufacturers
  - 1. Ductmate Industries, Duro-Dyne, Metalaire, Semco, Ward Industries.

B. Multi-blade device with blades aligned in short dimension; steel or aluminum construction; with individually adjustable blades, mounting straps. Provide in all square turns.

# 2.3 FLEXIBLE DUCT CONNECTORS

- A. Acceptable Manufacturers
  - 1. Ductmate Industries, Duro-Dyne, Vent Fabrics, Ward Industries.
- B. Fabricate in accordance with SMACNA Low Pressure Duct Construction Standards, and as indicated.
- C. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz per square yard, approximately 6 inches wide, crimped into metal edging strip.

### 2.4 DUCT TEST HOLES

- A. Cut or drill temporary test holes in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
- B. Permanent test holes shall be factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

#### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Install accessories in accordance with manufacturer's instructions.
- B. Provide balancing dampers at points on low pressure supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Use splitter dampers where required.
- C. Provide backdraft dampers on exhaust fans or exhaust ducts nearest to outside and where indicated.
- D. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.
- E. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8-inch size for hand access, 18 x 18-inch size for shoulder access, and as indicated.
- F. Provide duct test holes where indicated and required for testing and balancing purposes.
- G. Provide fire dampers at locations indicated, where ducts and outlets pass through fire rated components, and where required by authorities having jurisdiction. Install with required perimeter mounting angles, sleeves, breakaway duct connections, corrosion resistant springs, bearings, bushings and hinges.
- H. Only dynamic fire dampers are to be used unless otherwise specified. Dynamic fire dampers are specifically to be used where heating, ventilating and air conditioning systems are designed to operate with fans on during a fire.
- I. Demonstrate re-setting of fire dampers to authorities having jurisdiction and Owner's representative.

END OF SECTION 23 33 00

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to the Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAY-NGS	C A T A L O G D A T A	P A R T S L I S T S	OPERATING MANUAL	WIRING DIAGRAM	C E R T I F I C A T I O N	SAMPLES	OTHER
Volume Control Dampers	Х	х						
Air Turning Devices	х	х						
Flexible Duct Connectors	Х	х						
Duct Test Holes	Х	Х						

# SECTION 23 34 23 – POWER VENTILATORS

PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Roof Exhaust Fans
- 1.2 RELATED DOCUMENTS
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 230100 GENERAL PROVISIONS FOR MECHANICAL WORK
  - C. Section 230529 SUPPORTS AND ANCHORS FOR HVAC PIPING AND EQUIPMENT
  - D. Section 230548 VIBRATION ISOLATION FOR HVAC EQUIPMENT AND PIPING
  - E. Section 233113 DUCTWORK AND DUCTWORK INSULATION
  - F. Section 230900 INSTRUMENTATION AND CONTROLS FOR HVAC

#### 1.3 REFERENCES

- A. AMCA 99 Standards Handbook.
- B. AMCA 210 Laboratory Methods of Testing Fans for Rating Purposes.
- C. AMCA 300 Test Code for Sound Rating Air Moving Devices.
- D. AMCA 301 Method of Publishing Sound Ratings for Air Moving Devices.
- E. SMACNA Low Pressure Duct Construction Standard.
- 1.4 QUALITY ASSURANCE
  - A. Performance Ratings: Conform to AMCA 210.
  - B. Sound Ratings: AMCA 301, tested to AMCA 300.
  - C. Fabrication: Conform to AMCA 99.
- 1.5 ACTION SUBMITTALS
  - A. Product Data: For each type of product indicated.
  - B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
    - 1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
    - 2. Wiring Diagrams: For power, signal, and control wiring.
- 1.6 CLOSEOUT SUBMITTALS
  - A. Operation and maintenance data.

# PART 2 - PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS
  - A. Greenheck, Penn, Carnes, Loren Cook, Jenn-Aire, Acme, Adco, ILG, Shipman, Breident, Venmar, Spinnaker.

# 2.2 GENERAL

- A. Provide all fans with disconnect.
- B. Provide all fans with motor starters. See Section 230100 for details.
- C. Integral phase relay shall be provided as a part of all three phase motor starters. Relay shall shut motor down on phase loss or phase unbalance and automatically reset when normal phasing is restored. Phase failure relay shall have adjustable restart time capabilities. Mechanical contractor shall coordinate staggered restart times as required.
- D. See drawings or Specification Section 230900 INSTRUMENTATION AND CONTROLS FOR HVAC for control of fans.

# 2.3 ROOF EXHAUST FAN

- A. Roof exhaust fans shall be of the centrifugal, belt driven type. The fan housing shall be constructed of heavy gauge aluminum mounted on a rigid support structure. The shroud shall have a rolled bead and internal structural members. The fan wheel shall be of the aluminum backward curved, centrifugal type with inlet venturi for maximum performance. Wheels shall be dynamically and statically balanced. Motors and centrifugal wheels shall be mounted on vibration isolators.
- B. Motors shall be isolated from the exhaust airstream. Air for cooling the motor shall be taken into the motor compartment from a location free from contaminants. Motors shall be readily accessible for maintenance.
- C. A disconnect switch shall be factory installed and wired from the fan motor to the disconnect junction box. A conduit chase shall be provided for running electrical wiring through the curb cap into the power compartment.
- D. All fans shall bear the AMCA Certified Ratings Performance Seal for both air and sound performance.
- E. Provide with gravity back draft dampers.
- F. Provide factory roof curb to match the slope of the roof, minimum 12-inch height.

## PART 3 - EXECUTION

## 3.1 INSTALLATION

- A. Install in accordance with manufacturer's instructions.
- B. Install equipment in a manner to provide required clearances for proper operation and maintenance.
- C. For roof mounted fans, secure roof exhausters with lag screws to roof curb.

END OF SECTION 23 34 23

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAY-NGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	CERTIFICATION	SAMPLES	OTHER
Roof Exhausters	Х	Х	Х	Х	Х			
Sidewall Exhausters	х	х	х	х	х			
In-Line Exhausters	х	х	х	х	х			
Ceiling Exhausters	Х	х	х	х	х			
Wall Propeller Fan	Х	х	Х	х	х			
Roof Supply Fan	Х	Х	Х	Х	Х			
# SECTION 23 36 00 - AIR TERMINAL UNITS

### PART 1 - GENERAL

- 1.1 SUMMARY
  - A. Section Includes:
    - 1. Shutoff, single-duct air terminal units.
    - 2. Casing liner.

# 1.2 RELATED DOCUMENTS

- A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
- B. Section 233113 DUCTWORK
- C. Section 233300 DUCTWORK ACCESSORIES
- D. Section 223099 INSTRUMENTATION AND CONTROL FOR HVAC

### PART 2 - PRODUCTS

- 2.1 SYSTEM DESCRIPTION
  - A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
  - B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 "Systems and Equipment" and Section 7 "Construction and System Start-up."
  - C. ASHRAE Compliance: Applicable requirements in ASHRAE/IES 90.1, "Section 6 Heating, Ventilating, and Air Conditioning."
- 2.2 ACCEPTABLE MANUFACTURERS
  - A. Trane, ETI, Daikin, Nailor, Kreuger, Price, Titus.
- 2.3 SHUTOFF, SINGLE-DUCT AIR TERMINAL UNITS
  - A. Configuration: Volume-damper assembly inside unit casing with control components inside a protective metal shroud.
  - B. Casing: 0.034-inch thick galvanized steel, single wall.
    - 1. Casing Liner: Comply with requirements in "Casing Liner" Article for fibrous-glass duct liner.
    - 2. Air Inlet: Round stub connection or S-slip and drive connections for duct attachment.
    - 3. Air Outlet: S-slip and drive connections.
    - 4. Access: Removable panels for access to parts requiring service, adjustment, or maintenance; with airtight gasket.
    - 5. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.
  - C. Regulator Assembly: System-air-powered bellows section incorporating polypropylene bellows for volume regulation and thermostatic control. Bellows shall operate at

temperatures from zero to 140 deg F, shall be impervious to moisture and fungus, shall be suitable for 10-inch wg static pressure, and shall be factory tested for leaks.

- D. Volume Damper: Galvanized steel with peripheral gasket and self-lubricating bearings.
  - 1. Maximum Damper Leakage: AHRI 880 rated, 2 percent of nominal airflow at 3inch wg inlet static pressure.
- E. Hydronic Heating Coils: Copper tube, with mechanically bonded aluminum fins spaced no closer than 0.1 inch and rated for a minimum working pressure of 200 psig and a maximum entering-water temperature of 220 deg F. Include manual air vent and drain valve.
- F. Control devices shall be compatible with temperature controls system specified in Section 230900 Instrumentation and Controls for HVAC.

### 2.4 CASING LINER

- A. Casing Liner: Fibrous-glass with foil facing duct liner, complying with ASTM C 1071, NFPA 90A, or NFPA 90B; and with NAIMA AH124, "Fibrous Glass Duct Liner Standard."
  - 1. Minimum Thickness: 3/4 inch.
    - a. Type I, Flexible: 0.27 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
    - b. Type II, Rigid: 0.23 Btu x in./h x sq. ft. x deg F at 75 deg F mean temperature.
- B. Antimicrobial Erosion-Resistant Coating: Apply to the surface of the liner that will form the interior surface of the duct to act as a moisture repellent and erosion-resistant coating. Antimicrobial compound shall be tested for efficacy by an NRTL and registered by the EPA for use in HVAC systems.
- C. Water-Based Liner Adhesive: Comply with NFPA 90A or NFPA 90B and with ASTM C 916.

## PART 3 - EXECUTION

- 3.1 HANGER AND SUPPORT INSTALLATION
  - A. Comply with SMACNA's "HVAC Duct Construction Standards Metal and Flexible," Ch. 5, "Hangers and Supports" and with Section 230529 Supports and Anchors for HVAC Piping and Equipment.
- 3.2 TERMINAL UNIT INSTALLATION
  - A. Install air terminal units according to NFPA 90A, "Standard for the Installation of Air Conditioning and Ventilating Systems."
  - B. Install air terminal units level and plumb. Maintain sufficient clearance for normal service and maintenance.
  - C. Where installing piping adjacent to air terminal unit, allow space for service and maintenance.
  - D. Hot-Water Piping: Comply with requirements in Section 232113 Hydronic Piping & Valves and Section 232116 Hydronic Piping Specialties, and connect heating coils to supply with shutoff valve, strainer, control valve, and union or flange; and to return with balancing valve and union or flange.
  - E. Comply with requirements in Section 233113 Ductwork and Ductwork Insulation for connecting ducts to air terminal units.
  - F. Make connections to air terminal units with flexible connectors complying with requirements in Section 233300 Ductwork Accessories.

G. Label each air terminal unit with plan number, nominal airflow, and maximum and minimum factory-set airflows. Comply with requirements in Section 230553 Identification for HVAC Piping and Equipment for equipment labels and warning signs and labels.

# 3.3 FIELD QUALITY CONTROL

- A. Perform the following tests and inspections:
  - 1. After installing air terminal units and after electrical circuitry has been energized, test for compliance with requirements.
  - 2. Leak Test: After installation, fill water coils and test for leaks. Repair leaks and retest until no leaks exist.
  - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
  - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Air terminal unit will be considered defective if it does not pass tests and inspections.
- C. Prepare test and inspection reports.

# 3.4 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain air terminal units.

# END OF SECTION 23 36 00

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit 11 copies of the required information to Architect for approval within 30 days after notice to proceed.

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	R	0	s		D	1	s	
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	w		L	A	A	A	м	
	1	D	1	N	G	Т	Р	
	N	A	s	υ	R		L	
	G	Т	Т	A	A	0	E	
	s	A	s	L	м	N	s	
ITEM DESCRIPTION								OTHER
Shut-off Single Duct Air								_
Terminal	X	X	X	X	X			
Parallel, Fan-powered Air Terminals	x	x	х	х	х			
Series, Fan-powered Air Terminals	X	X	X	X	X			

# SECTION 23 37 13 - AIR DISTRIBUTION DEVICES

PART 1 - GENERAL

- 1.1 WORK INCLUDED
  - A. Diffusers
  - B. Registers/grilles
- 1.2 RELATED DOCUMENTS
  - A. The General and Special Conditions and all other Contract Documents (ESPECIALLY DIVISIONS 21, 22, 23 AND 26) are applicable to work under this section of the specifications. All the work under this section of the specifications shall be governed by any alternates and unit prices called for in the FORM OF PROPOSAL insofar as they affect this portion of the work.
  - B. Section 230100 GENERAL PROVISIONS FOR MECHANICAL WORK
  - C. Section 233113 DUCTWORK AND DUCTWORK INSULATION
  - D. Section 233300 DUCTWORK ACCESSORIES
- 1.3 REFERENCES
  - A. ADC 1062 Certification, Rating and Test Manual.
  - B. AMCA 500 Test Method for Louvers, Dampers and Shutters.
  - C. ANSI/NFPA 90A Installation of Air Conditioning and Ventilating Systems.
  - D. ARI 650 Air Outlets and Inlets.
  - E. ASHRAE 70 Method of Testing for Rating the Air Flow Performance of Outlets and Inlets.
  - F. SMACNA Low Pressure Duct Construction Standard.
- 1.4 QUALITY ASSURANCE
  - A. Test and rate performance of air outlets and inlets in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
  - B. Test and rate performance of louvers in accordance with AMCA 500.
- 1.5 REGULATORY REQUIREMENTS
  - A. Conform to ANSI/NFPA 90A.
- PART 2 PRODUCTS

### 2.1 ACCEPTABLE MANUFACTURERS

- A. Manufacturer listed in schedule is for design selection only.
- B. Registers, Grilles, and Diffusers
  - 1. Anemostat, Carnes, Hart and Cooley, Krueger, Metalaire, Price, Titus, Tuttle and Bailey.
- C. Louvers
  - 1. Arrow, Cesco, Greenheck, Louvers and Dampers, Ruskin, Vent Products and United Enertech.
- 2.2 RECTANGULAR CEILING DIFFUSERS
  - A. Square, stamped, multicore type diffuser to discharge air in 360-degree pattern.

- B. Provide for surface mount and inverted T-bar where shown. In plaster ceilings, provide plaster frame and ceiling frame.
- C. Fabricate of steel with baked enamel finish.
- D. Provide radial opposed blades damper adjustable from diffuser face for surface mounted unit where specified.

## 2.3 CEILING GRID CORE EXHAUST AND RETURN REGISTERS/GRILLES

- A. Fixed grilles of  $1/2 \times 1/2 \times 1$ -inch louvers.
- B. Fabricate margin frame with countersunk screw mounting or lay-in frame for suspended grid ceilings as shown in schedule on drawings.
- C. Fabricate of aluminum with factory clear lacquer finish.
- D. Where scheduled provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.
- E. All louver-faced grilles shall be provided with pattern controller blades unless scheduled otherwise on the Drawings.
- 2.4 WALL SUPPLY REGISTERS/GRILLES
  - A. Streamlined and individually adjustable blades, depth of which exceeds 3/4 inch with adjustable blades, vertical, horizontal face, and horizontal rear deflectors.
  - B. Fabricate margin frame with countersunk screw or concealed mounting and gasket suitable for surface or duct mounting.
  - C. Fabricate of steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.
  - D. Provide integral, gang-operated opposed blade dampers with removable key operator, operable from face.
- 2.5 WALL EXHAUST AND RETURN REGISTERS/GRILLES
  - A. Streamlined blades, fixed, non-adjustable, horizontal face.
  - B. Fabricate margin frame with countersunk screw or concealed mounting.
  - C. Fabricate of steel with 20 gage minimum frames and 22 gage minimum blades, steel and aluminum with 20 gage minimum frame, or aluminum extrusions, with factory baked enamel finish.

### PART 3 – EXECUTION

### 3.1 INSTALLATION

- A. Furnish and install where shown on drawings all registers, grilles, diffusers and louvers in accordance with the tabulation in the schedule on drawings.
- B. Provide accessories and modifications as indicated in schedule notes.
- C. Install items in accordance with manufacturer's instructions.
- D. Install in locations as shown on drawings. Items have been located as shown to provide maximum performance. Coordinate with architectural features and notify Architect/Engineer of any conflicts.
- E. Install diffusers to ductwork with air tight connection.

F. Provide accessible balancing dampers on duct take-off to diffusers, and grilles and registers, regardless of whether dampers are specified as part of the diffuser, or grille and register.

END OF SECTION 23 37 13

# SUBMITTALS

In accordance with the requirements of the General Conditions and Supplementary General Conditions, the following information is required to be submitted for this Section. The Contractor shall submit 11 copies of the required information to Architect for approval within 30 days after notice to proceed.

ITEM DESCRIPTION	SHOP DRAWINGS	C A T A L O G D A T A	P A R T S L I S T S	O P E R A T I N G M A N U A L	W I R I N G D I A G R A M	C E R T I F I C A T I O N	S A M P L E S	OTHER
Diffusers	х	х						
Registers/Grilles	x	X						
Louvers	x	x						

# **ELECTRICAL INDEX**

#### SECTION NUMBER DIVISION 26 – ELECTRICAL

- 26 05 00 GENERAL REQUIREMENTS
- 26 05 05 PENETRATION FIRESTOPPING
- 26 05 19 ELECTRICAL POWER CONDUCTORS AND CABLES
- 26 05 26 GROUNDING AND BONDING
- 26 05 29 HANGERS AND SUPPORTS
- 26 05 33 RACEWAY AND BOXES
- 26 05 36 CABLE TRAYS
- 26 05 53 IDENTIFICATION
- 26 09 23 LOW VOLTAGE LIGHTING CONTROLS
- 26 24 16 PANELBOARDS
- 26 27 26 WIRING DEVICES
- 26 28 16 ENCLOSED SWITCHES AND CIRCUIT BREAKERS
- 26 51 00 LIGHTING

### **DIVISION 27 – COMMUNICATIONS**

- 27 15 00 COMMUNICATIONS HORIZONTAL CABLING
- 27 51 23 INTERCOM AND CLOCK SYSTEM

# **DIVISION 28 – ELECTRONIC SAFETY AND SECURITY**

28 31 11 DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

# SECTION 26 05 00 – GENERAL REQUIREMENTS

- 1.1 GENERAL REQUIREMENTS
  - A. All drawings and general provisions of the contract, including the General and Supplementary Conditions and Division 01 Specifications apply to all specifications in Divisions 26, 27 and 28. In addition, the general requirements described within this specification section, 260500 General Requirements, apply to all specifications in Division 26, 27, 28 and the Contract Drawings.
  - B. The contractor is responsible for obtaining and paying for all building permits, fees, licenses and inspections required by the governing agencies.
  - C. The drawings and specifications constitute the Contract Documents. They complement each other. All items shown on the drawings and/or listed in the specifications shall be provided and installed by the Contractor unless specifically noted that it will be provided and/or installed by others. In the event there is a conflict within the Contract Documents, the Contractor shall notify the Engineer immediately. If a clarification is not given, the Contractor shall bid the more stringent of the two requirements.
  - D. Any materials, labor, equipment or services not specifically mentioned herein which may be necessary to complete any part of the electrical systems described in the drawings and/or specifications shall be included as part of the Contract.
  - E. References in the Contract Documents to any specific manufacturer and/or catalog numbers are intended to establish a standard of quality and not to limit competition. Proposed equivalent manufacturers shall be provided to the Engineer a minimum of 14 days prior to bid.
  - F. All work performed in the Contract shall comply with all relevant codes adopted by the state and locality in which the project is located.
  - G. All electrical components, devices and accessories shall be listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
  - H. The drawings are diagrammatic only. It is the responsibility of this Contractor to coordinate the installation of the specified components with all other trades to accomplish the following:
    - 1. Allow maximum possible headroom unless specific mounting heights that reduce headroom are indicated.
    - 2. Provide for ease of disconnecting the equipment with minimum interference with other installations.
    - 3. Allow right of way for piping and conduit installed at required slope, so connecting raceways, cables, wireways, cable trays and busways will be clear of obstructions and of the working and access space of other equipment.
  - I. All work shall be installed in a neat and workman like manner complying with standards in NECA1, Standard for Good Workmanship in Electrical Construction.

### 1.2 WARRANTY

A. At a minimum the Contractor shall warranty all defects in material and labor for one year starting from the date of substantial completion. In the event of a multi-phased renovation, all warranty periods shall start on the date of substantial completion of the final phase. Additional warranties may be required and will be described within the associated specification section.

### 1.3 SHOP DRAWINGS

A. The Contractor shall provide the Engineer with any and all product cutsheets, dimensioned drawings, wiring diagrams or any other documentation which may be required to describe the material to be provided as part of this Contract.

### 1.4 OPERATION AND MAINTENANCE MANUALS

A. Provide product information for all electrical components to be included in the operation and maintenance manuals. The information shall include at a minimum cutsheets for all equipment, requirements for routine maintenance and instructions for testing and adjusting equipment.

### 1.5 SMOKE AND FIREPROOFING

- A. The Contractor shall provide fire and/or smoke stopping around/in any components which penetrate rated assemblies as required to maintain the rating of that assembly.
- B. Refer to the related specifications under Division 07 for additional information.

### 1.6 DEMOLITION

- A. All existing materials that will not be reused must be removed unless noted otherwise. All conduits shall be removed unless located in walls or slabs which do not get demolished. All conductors shall be removed.
- B. All removed materials MUST be disposed of in a lawful manner. The contractor shall familiarize themselves with all local requirements.
- C. The contractor shall keep all existing building systems functioning during construction.
- D. The contractor is responsible for patching and repairing all areas where walls, slabs and materials have been cut, removed or modified as a result of demolition. Match existing materials, ratings and finishes. This includes, but not limited to, patching holes in walls with like materials where switches, receptacles and other devices have been removed.

# SECTION 26 05 05 – PENETRATION FIRESTOPPING

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Refer to the General Requirements Specifications, Section 260500.
- B. Section Includes:
  - 1. Penetrations in fire-resistance-rated walls.
  - 2. Penetrations in horizontal assemblies.
  - 3. Penetrations in smoke barriers.

### 1.2 SCOPE

A. Provide fire and/or smoke stopping around, or in, any components which penetrate rated assemblies as required to maintain the rating of that assembly.

### 1.3 SUBMITTALS

- A. Product Data
  - 1. Provide product data for each type of product to be utilized on this project.
- B. Shop Drawings
  - 1. Provide shop drawings detailing materials, installation methods, and relationships to adjoining construction for each through-penetration firestop system, and each kind of construction condition penetrated and kind of penetrating item.
- C. Qualifications Data
  - 1. Provide documentation from a qualified testing and inspecting agency indicating that each through-penetration firestop configuration submitted has been tested for the manner in which it is to be installed.

# 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: A firm experienced in installing penetration firestopping similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful performance. Qualifications include having the necessary experience, staff, and training to install manufacturer's products per specified requirements. Manufacturer's willingness to sell its penetration firestopping products to Contractor or to Installer engaged by Contractor does not in itself confer qualification on buyer.
- B. Fire-Test-Response Characteristics: Penetration firestopping shall comply with the following requirements:
  - 1. Penetration firestopping is identical to those tested per testing standard referenced in "Penetration Firestopping" Article. Provide rated systems complying with the following requirements:
    - a. Classification markings on penetration firestopping correspond to designations listed by the following:
      - i) UL in its "Fire Resistance Directory."
      - ii) Intertek ETL SEMKO in its "Directory of Listed Building Products."
      - iii) FM Global in its "Building Materials Approval Guide."

C. Single-source responsibility: Obtain through-penetration fire-stop systems for each kind of penetration and construction condition from a single-supplier.

### PART 2 - PRODUCTS

- 2.1 ACCEPTABLE MANUFACTURERS
  - A. 3M
  - B. Dow Corning Corporation
  - C. Hilti Construction Chemicals

### 2.2 PENETRATION FIRESTOPPING

- A. Provide penetration firestopping that is produced and installed to resist spread of fire according to requirements indicated, resist passage of smoke and other gases, and maintain original fire-resistance rating of construction penetrated. Penetration firestopping systems shall be compatible with one another, with the substrates forming openings, and with penetrating items if any.
- B. Penetrations in Fire-Resistance-Rated Walls: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  - 1. F-Rating: Not less than the fire-resistance rating of constructions penetrated.
- C. Penetrations in Horizontal Assemblies: Provide penetration firestopping with ratings determined per ASTM E 814 or UL 1479, based on testing at a positive pressure differential of 0.01-inch wg.
  - 1. F-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated.
  - 2. T-Rating: At least 1 hour, but not less than the fire-resistance rating of constructions penetrated except for floor penetrations within the cavity of a wall.
- D. Penetrations in Smoke Barriers: Provide penetration firestopping with ratings determined per UL 1479.
  - 1. L-Rating: Not exceeding 5.0 cfm/sq. ft. of penetration opening at 0.30-inch wg at both ambient and elevated temperatures.
- E. W-Rating: Provide penetration firestopping showing no evidence of water leakage when tested according to UL 1479.
- F. Exposed Penetration Firestopping: Provide products with flame-spread and smokedeveloped indexes of less than 25 and 450, respectively, as determined per ASTM E 84.
- G. VOC Content: Penetration firestopping sealants and sealant primers shall comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
  - 1. Sealants: 250 g/L.
  - 2. Sealant Primers for Nonporous Substrates: 250 g/L.
  - 3. Sealant Primers for Porous Substrates: 775 g/L.
- H. Accessories: Provide components for each penetration firestopping system that are needed to install fill materials and to maintain ratings required. Use only those components specified by penetration firestopping manufacturer and approved by qualified testing and inspecting agency for firestopping indicated.
  - 1. Permanent forming/damming/backing materials, including the following:

- a. Slag-wool-fiber or rock-wool-fiber insulation.
- b. Sealants used in combination with other forming/damming/backing materials to prevent leakage of fill materials in liquid state.
- c. Fire-rated form board.
- d. Fillers for sealants.
- 2. Temporary forming materials.
- 3. Substrate primers.
- 4. Collars.
- 5. Steel sleeves.
- 2.3 FILL MATERIALS
  - A. Cast-in-Place Firestop Devices: Factory-assembled devices for use in cast-in-place concrete floors and consisting of an outer metallic sleeve lined with an intumescent strip, a radial extended flange attached to one end of the sleeve for fastening to concrete formwork, and a neoprene gasket.
  - B. Latex Sealants: Single-component latex formulations that do not re-emulsify after cure during exposure to moisture.
  - C. Firestop Devices: Factory-assembled collars formed from galvanized steel and lined with intumescent material sized to fit specific diameter of penetrant.
  - D. Intumescent Composite Sheets: Rigid panels consisting of aluminum-foil-faced elastomeric sheet bonded to galvanized-steel sheet.
  - E. Intumescent Putties: Nonhardening dielectric, water-resistant putties containing no solvents, inorganic fibers, or silicone compounds.
  - F. Intumescent Wrap Strips: Single-component intumescent elastomeric sheets with aluminum foil on one side.
  - G. Mortars: Prepackaged dry mixes consisting of a blend of inorganic binders, hydraulic cement, fillers, and lightweight aggregate formulated for mixing with water at Project site to form a nonshrinking, homogeneous mortar.
  - H. Pillows/Bags: Reusable heat-expanding pillows/bags consisting of glass-fiber cloth cases filled with a combination of mineral-fiber, water-insoluble expansion agents, and fire-retardant additives. Where exposed, cover openings with steel-reinforcing wire mesh to protect pillows/bags from being easily removed.
  - I. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.
  - J. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below:
    - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces, and nonsag formulation for openings in vertical and sloped surfaces, unless indicated firestopping limits use of nonsag grade for both opening conditions.

## 2.4 MIXING

A. For those products requiring mixing before application, comply with penetration firestopping manufacturer's written instructions for accurate proportioning of materials, water (if required), type of mixing equipment, selection of mixer speeds, mixing

containers, mixing time, and other items or procedures needed to produce products of uniform quality with optimum performance characteristics for application indicated.

### PART 3 - EXECUTION

### 3.1 COORDINATION

- A. Coordinate construction of openings and penetrating items to ensure that penetration firestopping is installed according to specified requirements.
- B. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate penetration firestopping.

#### 3.2 INSTALLATION

- A. General: Install penetration firestopping to comply with manufacturer's written installation instructions and published drawings for products and applications indicated.
- B. Surface Cleaning: Clean out openings immediately before installing penetration firestopping to comply with manufacturer's written instructions and with the following requirements:
  - 1. Remove from surfaces of opening substrates and from penetrating items foreign materials that could interfere with adhesion of penetration firestopping.
  - 2. Clean opening substrates and penetrating items to produce clean, sound surfaces capable of developing optimum bond with penetration firestopping. Remove loose particles remaining from cleaning operation.
  - 3. Remove laitance and form-release agents from concrete.
- C. Priming: Prime substrates where recommended in writing by manufacturer using that manufacturer's recommended products and methods. Confine primers to areas of bond; do not allow spillage and migration onto exposed surfaces.
- D. Masking Tape: Use masking tape to prevent penetration firestopping from contacting adjoining surfaces that will remain exposed on completion of the Work and that would otherwise be permanently stained or damaged by such contact or by cleaning methods used to remove stains. Remove tape as soon as possible without disturbing firestopping's seal with substrates.
- E. Environmental Limitations: Do not install penetration firestopping when ambient or substrate temperatures are outside limits permitted by penetration firestopping manufacturers or when substrates are wet because of rain, frost, condensation, or other causes.
- F. Install and cure penetration firestopping per manufacturer's written instructions using natural means of ventilations or, where this is inadequate, forced-air circulation.
- G. Install forming materials and other accessories of types required to support fill materials during their application and in the position needed to produce cross-sectional shapes and depths required to achieve fire ratings indicated.
  - 1. After installing fill materials and allowing them to fully cure, remove combustible forming materials and other accessories not indicated as permanent components of firestopping.
- H. Install fill materials for firestopping by proven techniques to produce the following results:
  - 1. Fill voids and cavities formed by openings, forming materials, accessories, and penetrating items as required to achieve fire-resistance ratings indicated.

- 2. Apply materials so they contact and adhere to substrates formed by openings and penetrating items.
- 3. For fill materials that will remain exposed after completing the Work, finish to produce smooth, uniform surfaces that are flush with adjoining finishes.
- I. Clean off excess fill materials adjacent to openings as the Work progresses by methods and with cleaning materials that are approved in writing by penetration firestopping manufacturers and that do not damage materials in which openings occur.
- J. Provide final protection and maintain conditions during and after installation that ensure that penetration firestopping is without damage or deterioration throughout the duration of this project.

# SECTION 26 05 19 - ELECTRICAL POWER CONDUCTORS AND CABLES

- PART 1 GENERAL
- 1.1 SUMMARY
  - A. This Section includes the following:
    - 1. Building wires and cables rated 600 V and less.
    - 2. Connectors, splices, and terminations rated 600 V and less.
- 1.2 SUBMITTALS
  - A. Product Data: For each conductor type.
- PART 2 PRODUCTS
- 2.1 CONDUCTORS AND CABLES
  - A. Acceptable Manufacturers:
    - 1. Alcan Products Corporation; Alcan Cable Division.
    - 2. American Insulated Wire Corp.; a Leviton Company.
    - 3. General Cable Corporation.
    - 4. Senator Wire & Cable Company.
    - 5. Southwire Company.
  - B. Copper Conductors: Comply with NEMA WC 70.
  - C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN and SO.
- 2.2 CONNECTORS AND SPLICES
  - A. Acceptable Manufacturers:
    - 1. AFC Cable Systems, Inc.
    - 2. Hubbell Power Systems, Inc.
    - 3. O-Z/Gedney; EGS Electrical Group LLC.
    - 4. 3M; Electrical Products Division.
    - 5. Tyco Electronics Corp.
  - B. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

### PART 3 - EXECUTION

### 3.1 CONDUCTOR MATERIAL APPLICATIONS

A. Conductors: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

# 3.2 CONDUCTOR INSULATION AND WIRING METHODS

- A. All locations unless otherwise noted: Conductors shall have THHN-THWN insulation and installed in raceway.
- B. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.

## 3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

### 3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

# SECTION 26 05 26 - GROUNDING AND BONDING

### PART 1 - GENERAL

# 1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment:
- 1.2 SUBMITTALS
  - A. Product Data: For the grounding bus bar and grounding electrodes.
- 1.3 QUALITY ASSURANCE
  - A. Comply with UL 467 for grounding and bonding materials and equipment.

# PART 2 - PRODUCTS

# 2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
  - 1. Solid Conductors: ASTM B 3.
  - 2. Stranded Conductors: ASTM B 8.
  - 3. Tinned Conductors: ASTM B 33.
  - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch in diameter.
  - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
  - 6. Bonding Jumper: Copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
  - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors, terminated with copper ferrules; 1-5/8 inches wide and 1/16 inch thick.
- C. Bare Grounding Conductor:
  - 1. No. 4 AWG minimum, soft-drawn copper.

### 2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressuretype, with at least two bolts.
  - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.

### PART 3 - EXECUTION

### 3.1 APPLICATIONS

A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.

### 3.2 EQUIPMENT GROUNDING

A. Install insulated equipment grounding conductors with all feeders and branch circuits.

### 3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.

### 3.4 FIELD QUALITY CONTROL

- A. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
- B. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
- C. Ground resistances shall not exceed the following values:
  - 1. Power and Lighting Equipment or System with Capacity 500 kVA and Less: 10 ohms.
  - 2. Power and Lighting Equipment or System with Capacity 500 to 1000 kVA: 5 ohms.
  - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
  - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 3 ohm(s).
- D. If resistance to ground exceeds specified values, take appropriate measures to reduce ground resistance.

# SECTION 26 05 29 – HANGERS AND SUPPORTS

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. This Section includes the following:
  - 1. Hangers and supports for electrical equipment and systems.

### 1.2 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.
- C. Rated Strength: Adequate in tension, shear, and pullout force to resist maximum loads calculated or imposed for this Project, with a minimum structural safety factor of five times the applied force.

### PART 2 - PRODUCTS

### 2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
  - 1. Acceptable Manufacturers:
    - a. Allied Tube & Conduit.
    - b. Cooper B-Line, Inc.; a division of Cooper Industries.
    - c. ERICO International Corporation.
    - d. GS Metals Corp.
    - e. Thomas & Betts Corporation.
    - f. Unistrut; Tyco International, Ltd.
  - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
  - 3. Channel Dimensions: Selected for applicable load criteria.
- B. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- C. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- D. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- E. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- F. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:

- 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
  - a. Acceptable Manufacturers:
    - 1) Hilti Inc.
    - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
    - 3) MKT Fastening, LLC.
    - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
- 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
  - a. Acceptable Manufacturers:
    - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
    - 2) Empire Tool and Manufacturing Co., Inc.
    - 3) Hilti Inc.
    - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
    - 5) MKT Fastening, LLC.
- 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.
- 4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
- 5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
- 6. Toggle Bolts: All-steel springhead type.
- 7. Hanger Rods: Threaded steel.
- 2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES
  - A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
  - B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

#### PART 3 - EXECUTION

- 3.1 APPLICATION
  - A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
  - B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, and RMC as scheduled in NECA 1, where its Table 1 lists maximum spacings less than stated in NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
  - C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
    - 1. Secure raceways and cables to these supports with two-bolt conduit clamps.

### 3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
  - 1. To Wood: Fasten with lag screws or through bolts.
  - 2. To New Concrete: Bolt to concrete inserts.
  - 3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
  - 4. To Existing Concrete: Expansion anchor fasteners.
  - 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
  - 6. To Steel: Beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
  - 7. To Light Steel: Sheet metal screws.
  - 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

### 3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for sitefabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.
- 3.4 PAINTING
  - A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
    - 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.
  - B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.

C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

# SECTION 26 05 33 – RACEWAY AND BOXES

PART 1 - GENERAL

- 1.1 SUMMARY
  - A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.
- 1.2 DEFINITIONS
  - A. EMT: Electrical metallic tubing.
  - B. ENT: Electrical nonmetallic tubing.
  - C. FMC: Flexible metal conduit.
  - D. LFMC: Liquid-tight flexible metal conduit.
  - E. LFNC: Liquid-tight flexible nonmetallic conduit.
  - F. RNC: Rigid nonmetallic conduit.
  - G. RSC: Rigid galvanized steel conduit.
- 1.3 SUBMITTALS
  - A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
  - B. Shop Drawings: For the following raceway components. Include plans, elevations, sections, details, and attachments to other work.
    - 1. Custom enclosures and cabinets.
    - 2. For handholes and boxes for underground wiring, including the following:
      - a. Duct entry provisions, including locations and duct sizes.
      - b. Frame and cover design.
      - c. Grounding details.
      - d. Dimensioned locations of cable rack inserts, and pulling-in and lifting irons.
      - e. Joint details.

### PART 2 - PRODUCTS

### 2.1 METAL CONDUIT AND TUBING

- 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. AFC Cable Systems, Inc.
  - 2. Alflex Inc.
  - 3. Allied Tube & Conduit; a Tyco International Ltd. Co.
  - 4. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 5. Electri-Flex Co.
  - 6. Manhattan/CDT/Cole-Flex.
  - 7. Maverick Tube Corporation.

- 8. O-Z Gedney; a unit of General Signal.
- 9. Wheatland Tube Company.
- B. Rigid Galvanized Steel Conduit: ANSI C80.1.
- C. EMT: ANSI C80.3.
- D. FMC: Zinc-coated steel or aluminum.
- E. LFMC: Flexible steel conduit with PVC jacket.
- F. Fittings for Conduit (Including all Types and Flexible and Liquidtight), EMT, and Cable: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.
  - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886.
  - 2. Fittings for EMT: Compression, steel type.
- G. Joint Compound for Rigid Steel Conduit: Listed for use in cable connector assemblies, and compounded for use to lubricate and protect threaded raceway joints from corrosion and enhance their conductivity.

### 2.2 NONMETALLIC CONDUIT AND TUBING

- 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. AFC Cable Systems, Inc.
  - 2. Anamet Electrical, Inc.; Anaconda Metal Hose.
  - 3. Arnco Corporation.
  - 4. CANTEX Inc.
  - 5. CertainTeed Corp.; Pipe & Plastics Group.
  - 6. Condux International, Inc.
  - 7. ElecSYS, Inc.
  - 8. Electri-Flex Co.
  - 9. Lamson & Sessions; Carlon Electrical Products.
  - 10. Manhattan/CDT/Cole-Flex.
  - 11. RACO; a Hubbell Company.
  - 12. Thomas & Betts Corporation.
- B. ENT: NEMA TC 13.
- C. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- D. LFNC: UL 1660.
- E. Fittings for ENT and RNC: NEMA TC 3; match to conduit or tubing type and material.
- F. Fittings for LFNC: UL 514B.
- 2.3 OPTICAL FIBER/COMMUNICATIONS CABLE RACEWAY AND FITTINGS
  - 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. Arnco Corporation.
- 2. Endot Industries Inc.
- 3. IPEX Inc.
- 4. Lamson & Sessions; Carlon Electrical Products.
- B. Description: Comply with UL 2024; flexible type, approved for plenum riser general-use installation as required by the environment.
- 2.4 METAL WIREWAYS
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. Cooper B-Line, Inc.
    - 2. Hoffman.
    - 3. Square D; Schneider Electric.
  - B. Description: Sheet metal sized and shaped as indicated, NEMA 250, Type 1, unless otherwise indicated.
  - C. Fittings and Accessories: Include couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
  - D. Wireway Covers: Hinged type.
  - E. Finish: Manufacturer's standard enamel finish.
- 2.5 SURFACE RACEWAYS
  - A. Surface Metal Raceways: Galvanized steel with snap-on covers. Manufacturer's standard enamel finish in color selected by Architect.
    - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      - a. Thomas & Betts Corporation.
      - b. Walker Systems, Inc.; Wiremold Company (The).
      - c. Wiremold Company (The); Electrical Sales Division.
- 2.6 BOXES, ENCLOSURES, AND CABINETS
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. Cooper Crouse-Hinds; Div. of Cooper Industries, Inc.
    - 2. EGS/Appleton Electric.
    - 3. Hoffman.
    - 4. Hubbell Incorporated; Killark Electric Manufacturing Co. Division.
    - 5. RACO; a Hubbell Company.
    - 6. Robroy Industries, Inc.; Enclosure Division.
    - 7. Thomas & Betts Corporation.
    - 8. Walker Systems, Inc.; Wiremold Company (The).
  - B. Sheet Metal Outlet and Device Boxes: NEMA OS 1.

- C. Cast-Metal Outlet and Device Boxes: NEMA FB 1, aluminum, Type FD, with gasketed cover.
- D. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- E. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- F. Cast-Metal Access, Pull, and Junction Boxes: NEMA FB 1, galvanized, cast iron with gasketed cover.
- G. Hinged-Cover Enclosures: NEMA 250, Type 1, with continuous-hinge cover with flush latch, unless otherwise indicated.
  - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
- H. Cabinets:
  - 1. NEMA 250, Type 1, galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
  - 2. Hinged door in front cover with flush latch and concealed hinge.
  - 3. Key latch to match panelboards.
  - 4. Metal barriers to separate wiring of different systems and voltage.
  - 5. Accessory feet where required for freestanding equipment.

# PART 3 - EXECUTION

- 3.1 RACEWAY APPLICATION
  - A. The use of metal clad (MC) cable is NOT permitted.
  - B. Indoors: Comply with the following indoor applications, unless otherwise indicated:
    - 1. Exposed, Not Subject to Physical Damage: EMT.
    - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
    - 3. Exposed and Subject to Severe Physical Damage: RSC. Includes raceways in the following locations:
      - a. Loading dock.
      - b. Corridors used for traffic of mechanized carts, forklifts, and pallethandling units.
    - 4. Above Ceilings: EMT.
    - 5. Concealed within concrete block and concrete walls: RNC. RNC shall transition to EMT above ceiling and all boxes shall be steel. No non-metallic boxes shall be permitted.
    - 6. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
    - 7. Damp or Wet Locations: Rigid Steel Conduit.
    - 8. Raceways for Optical Fiber or Communications Cable in Spaces Used for Environmental Air: EMT.
    - 9. Raceways for Optical Fiber or Communications Cable Risers in Vertical Shafts: EMT.

- 10. Raceways for Concealed General Purpose Distribution of Optical Fiber or Communications Cable: EMT.
- 11. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4, stainless steel in damp or wet locations.
- 12. Exposed not Subject to Severe Damage, Below Ceiling, Finished Space: Surface Raceway
- C. Minimum Raceway Size: 3/4-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
  - 1. Rigid Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.
  - 2. EMT: Use compression, steel fittings. Comply with NEMA FB2.10.

### 3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Arrange stub-ups so curved portions of bends are not visible above the finished slab.
- E. Install no more than the equivalent of three 90-degree bends in any conduit run except for communications conduits, for which fewer bends are allowed.
- F. Conceal conduit and EMT within finished walls, ceilings, and floors, unless otherwise indicated.
- G. Surface Raceways: Coordinate installation with architectural drawings including windows, furniture, etc.
- H. Raceways Embedded in Slabs:
  - 1. Run conduit larger than 1-inch trade size, parallel or at right angles to main reinforcement. Where at right angles to reinforcement, place conduit close to slab support.
  - 2. Arrange raceways to cross building expansion joints at right angles with expansion fittings.
  - 3. Change from ENT to rigid steel conduit or EMT, as applicable, before rising above the floor.
- I. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- J. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors, including conductors smaller than No. 4 AWG.
- K. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb (90-kg) tensile strength. Leave at least 12 inches of slack at each end of pull wire.
- L. Raceways for Optical Fiber and Communications Cable: Install raceways, metallic and nonmetallic, rigid and flexible, as follows:

- 1. 3/4-Inch Trade Size and Smaller: Install raceways in maximum lengths of 50 feet.
- 2. 1-Inch Trade Size and Larger: Install raceways in maximum lengths of 75 feet.
- 3. Install with a maximum of two 90-degree bends or equivalent for each length of raceway unless Drawings show stricter requirements. Separate lengths with pull or junction boxes or terminations at distribution frames or cabinets where necessary to comply with these requirements.
- M. Install raceway sealing fittings at suitable, approved, and accessible locations and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings at the following points:
  - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
  - 2. Where otherwise required by NFPA 70.
- N. Flexible Conduit Connections: Use maximum of 72 inches of flexible conduit for recessed and semirecessed lighting fixtures, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
  - 1. Use LFMC in damp or wet locations subject to severe physical damage.
  - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- O. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block and install box flush with surface of wall.
- 3.3 PROTECTION
  - A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
    - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
    - 2. Repair damage to PVC or paint finishes with matching touchup coating recommended by manufacturer.

# SECTION 26 05 36 - CABLE TRAYS

#### PART 1 - GENERAL

#### 1.1 SUMMARY

A. This Section includes basket cable trays, ladder runway and accessories. The term "cable tray" is used interchangeably to describe either wire basket tray or ladder runway.

### 1.2 SUBMITTALS

A. Product Data: Include data indicating dimensions and finishes for each type of cable tray indicated. Include data on all specified cable tray accessories.

### 1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain components through one source from a single manufacturer.
- B. UL Classified as equipment grounding conductor.
- 1.4 DELIVERY, STORAGE, AND HANDLING
  - A. Store indoors to prevent water or other foreign materials from staining or adhering to cable tray. Unpack and dry wet materials before storage.

#### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Chalfant Manufacturing Company.
  - 2. Cooper B-Line, Inc.
  - 3. Cope, T. J., Inc.; a subsidiary of Allied Tube & Conduit.
  - 4. GS Metals Corp.; GLOBETRAY Products.
  - 5. MONO-SYSTEMS, Inc.
  - 6. MPHusky.
  - 7. PW Industries.
  - 8. Cablofil.
  - 9. Southwest Data Products (Ladder Rack Only)
  - 10. Chatsworth
  - 11. Snake Tray

### 2.2 MATERIALS AND FINISHES

- A. Cable Trays, Fittings, and Accessories: Pre-galvanized steel meeting the minimum mechanical properties of ASTM A641.
- B. Sizes and Configurations:
  - 1. Refer to the drawings for the basket type cable tray size. If not noted, provide 12"x4" tray.

#### 2.3 CABLE TRAY ACCESSORIES

A. Fittings: Tees, crosses, risers, elbows, and other fittings as indicated, of same materials and finishes as cable tray.

- B. Supports and connectors, including bonding jumpers, as recommended by manufacturer.
- C. Manufacturer's metallic or non-metallic dropouts, cable rollers, non-metallic radius shields and rubber caps.

### PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Basket type cable tray shall be installed at all other locations unless otherwise noted on the drawings.
- B. Comply with recommendations in NEMA VE 2 and ANSI/EIA/TIA 569A. Install as a complete system, including all necessary fasteners, hold-down clips, splice-plate support systems, hinged horizontal and vertical splice plates, elbows, reducers, tees, and crosses.
- C. Remove burrs and sharp edges from cable trays.
- D. Fasten cable tray supports to building structure.
  - 1. Place supports so that spans do not exceed maximum spans per manufacturer.
  - 2. Construct supports from channel members, threaded rods, and other appurtenances furnished by cable tray manufacturer. Arrange supports in trapeze or wall-bracket form as required by application.
  - 3. Support bus assembly to prevent twisting from eccentric loading.
  - 4. Locate and install supports according to NEMA VE 1.
  - 5. Trays shall be supported using a minimum of  $\frac{1}{4}$ " inch all threaded rod when using trapeze hangers.
- E. Make connections to equipment with flanged fittings fastened to cable tray and to equipment. Support cable tray independent of fittings. Do not carry weight of cable tray on equipment enclosure.
- F. Install expansion connectors where cable tray crosses building expansion joint and in cable tray runs that exceed dimensions recommended in NEMA VE 1. Space connectors and set gaps according to applicable standard.
- G. Make changes in direction and elevation using standard fittings.
- H. Make cable tray connections using standard fittings.
- I. Workspace: Install cable trays with enough space to permit access for installing cables.
- J. Radius Shields: Install where cable tray changes direction.
- K. Dropouts: Install where cable extends downward from tray.
- L. Cable Rollers: Install at corners for ease of cable installation.
- M. Rubber Caps: Install at exposed ends of wire basket tray.
- 3.2 CABLE INSTALLATION
  - A. Install cables only when cable tray installation has been completed and inspected.
  - B. Fasten cables on horizontal runs with cable clamps or velcro cable ties as recommended by NEMA VE 2. Tighten clamps only enough to secure the cable, without indenting the cable jacket. Install cable ties with a tool that includes an automatic pressure-limiting device.
  - C. On vertical runs, fasten cables to tray every 18 inches. Install intermediate supports when cable weight exceeds the load-carrying capacity of the tray rungs.

D. In existing construction, remove inactive or dead cables from cable tray.

### 3.3 CONNECTIONS

- A. Ground and bond metal cable tray according to manufacturer's written instructions and NFPA 70, Article 392.
  - 1. Provide continuity between cable tray components.
  - 2. Make connections to tray using mechanical, compression or exothermic connectors.

### 3.4 FIELD QUALITY CONTROL

- A. After installing cable trays and after electrical circuitry has been energized, survey for compliance with requirements. Perform the following field quality-control survey:
  - 1. Visually inspect cable insulation for damage. Correct sharp corners, protuberances in cable tray, vibration, and thermal expansion and contraction conditions, which may cause or have caused damage.
  - 2. Verify that there is no intrusion of such items as pipe, hangers, or other equipment that could damage cables.
  - 3. Remove deposits of dust, industrial process materials, trash of any description, and any blockage of tray ventilation.
  - 4. Test cable tray to ensure electrical continuity of bonding and grounding connections. There shall be a continuous electrical path to the electrical grounding system from any point on the telecommunications pathway. See NFPA 70B, Chapter 18, for testing and test methods.
  - 5. Visually inspect each cable tray joint and each ground connection for mechanical continuity. Check bolted connections between sections for corrosion. Clean and retorque in suspect areas.
  - 6. Check for missing or damaged bolts, bolt heads, or nuts. When found, replace with specified hardware.
  - 7. Perform visual and mechanical checks for adequacy of cable tray grounding; verify that all takeoff raceways are bonded to cable tray.
- B. Report results in writing.

### 3.5 PROTECTION

- A. Protect installed cable trays.
  - 1. Install temporary protection for cables in open trays to protect exposed cables from falling objects or debris during construction. Temporary protection for cables and cable tray can be constructed of wood or metal materials until the risk of damage is over.
  - 2. Provide protection from paint. Wrap cables in plastic, or other means to ensure cables do not get painted during construction.

# SECTION 26 05 53 – IDENTIFICATION

PART 1 - GENERAL

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Identification for raceways.
  - 2. Identification of power and control cables.
  - 3. Identification for conductors.
  - 4. Warning labels and signs.
  - 5. Equipment identification labels.
  - 6. Miscellaneous identification products.
- 1.3 SUBMITTALS
  - A. Product Data: For each electrical identification product indicated.
- 1.4 QUALITY ASSURANCE
  - A. Comply with ANSI A13.1.
  - B. Comply with NFPA 70.
  - C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
  - D. Comply with ANSI Z535.4 for safety signs and labels.
  - E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.
- 1.5 COORDINATION
  - A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.
  - B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
  - C. Coordinate installation of identifying devices with location of access panels and doors.
  - D. Install identifying devices before installing acoustical ceilings and similar concealment.

#### PART 2 - PRODUCTS

- 2.1 POWER RACEWAY IDENTIFICATION MATERIALS
  - A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
  - B. Colors for Raceways Carrying Circuits at 600 V or Less:
    - 1. Black letters on an orange field.
    - 2. Legend: Indicate voltage.

C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

### 2.2 POWER AND CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weatherand chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

# 2.3 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weatherand chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

### 2.4 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.
- C. Baked-Enamel Warning Signs:
  - 1. Preprinted aluminum signs, punched or drilled for fasteners, with colors, legend, and size required for application.
  - 2. 1/4-inch grommets in corners for mounting.
  - 3. Nominal size, 7 by 10 inches.
- D. Metal-Backed, Butyrate Warning Signs:
  - 1. Weather-resistant, nonfading, preprinted, cellulose-acetate butyrate signs with 0.0396-inch galvanized-steel backing; and with colors, legend, and size required for application.
  - 2. 1/4-inch grommets in corners for mounting.
  - 3. Nominal size, 10 by 14 inches.
- E. Warning label and sign shall include, but are not limited to, the following legends:
  - 1. Multiple Power Source Warning: "DANGER ELECTRICAL SHOCK HAZARD -EQUIPMENT HAS MULTIPLE POWER SOURCES."
  - 2. Workspace Clearance Warning: "WARNING OSHA REGULATION AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."

# 2.5 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved, Laminated Acrylic or Melamine Label: Punched or drilled for screw mounting. White letters on a black background. Minimum letter height shall be 3/8 inch.
- 2.6 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

# PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- E. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- F. Aluminum Wraparound Marker Labels and Metal Tags: Secure tight to surface of conductor or cable at a location with high visibility and accessibility.
- G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:
  - 1. Outdoors: UV-stabilized nylon.
  - 2. In Spaces Handling Environmental Air: Plenum rated.
- H. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

### 3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box of the following systems with self-adhesive vinyl labels with the wiring system legend and system voltage. System legends shall be as follows:
  - 1. Emergency Power.
  - 2. Power.
  - 3. UPS.
- B. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
  - 1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service, feeder and branch-circuit conductors.
    - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
    - b. Colors for 208/120-V Circuits:
      - i) Phase A: Black.
      - ii) Phase B: Red.
- iii) Phase C: Blue.
- c. Colors for 480/277-V Circuits:
  - i) Phase A: Brown.
  - ii) Phase B: Orange.
  - iii) Phase C: Yellow.
- d. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- C. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- D. Workspace Indication: Install floor marking tape to show working clearances in the direction of access to live parts. Workspace shall be as required by NFPA 70 and 29 CFR 1926.403 unless otherwise indicated. Do not install at flush-mounted panelboards and similar equipment in finished spaces.
- E. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
  - 1. Labeling Instructions:
    - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inchhigh letters on 1-1/2-inch- high label; where two lines of text are required, use labels 2 inches high.
    - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
    - c. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
  - 2. Equipment to Be Labeled:
    - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
    - b. Enclosures and electrical cabinets.
    - c. Access doors and panels for concealed electrical items.
    - d. Switchgear.
    - e. Switchboards.
    - f. Transformers: Label that includes tag designation shown on Drawings for the transformer, feeder, and panelboards or equipment supplied by the secondary.
    - g. Emergency system boxes and enclosures.
    - h. Motor-control centers.

- i. Enclosed switches.
- j. Enclosed circuit breakers.
- k. Enclosed controllers.
- I. Variable-speed controllers.
- m. Push-button stations.
- n. Power transfer equipment.
- o. Contactors.
- p. Remote-controlled switches, dimmer modules, and control devices.
- q. Battery-inverter units.
- r. Power-generating units.
- s. Monitoring and control equipment.

END OF SECTION 26 05 53

# SECTION 26 09 23 – LOW VOLTAGE LIGHTING CONTROLS

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. The lighting control system shall be an expansion of the existing Wattstopper DLM lighting control system installed in the facility.
- B. All new devices are to be networked into the existing system.
- C. The lighting control system specified in this section shall provide time-based, sensorbased and manual lighting control. All system devices shall be networked together enabling digital communication and shall be individually addressable.
- D. The system architecture shall be capable of enabling stand-alone groups (rooms) of devices to function in some default capacity even if network connectivity to the greater system is lost.
- E. The system architecture shall facilitate remote operation via a computer connection.

# 1.2 SHOP DRAWINGS

- A. Product Datasheets for all lighting control components.
- B. Riser Diagrams detailed drawings showing interconnectivity of devices. Provide a riser diagram for each zone.
- C. Drawings showing the location and type of each device overlaid on the floor plan. Show all interconnections between devices. This drawings shall be representative of the graphical user interface (GUI) provided with the control software.
- D. Example Contractor Startup/Commissioning Worksheet
- 1.3 OPERATION AND MAINTENANCE MANUALS
  - A. Include Hardware and Software Operation Manuals.
  - B. A list/description of any routine maintenance requirements.
  - C. Provide a typed description of the final control sequence for each lighting zone.

### 1.4 QUALITY ASSURANCE

- A. All components and the manufacturing facility where product was manufactured must be ROHS compliant.
- B. When LCS components are installed in high humidity or cold environments, they shall be conformably coated and rated for condensing humidity and -40 degree Fahrenheit (and Celsius) operation.
- C. All applicable products must be UL / CUL Listed or other acceptable national testing organization.
- 1.5 COORDINATION
  - A. The installing contractor shall be responsible for a complete and functional system in accordance with all applicable local and national codes.
- 1.6 WARRANTY
  - A. All devices in lighting control system shall have a 5 year warranty starting from the date of substantial completion. The first year's warranty shall include materials and labor. The remainder of the term of the warranty shall include material only.

# PART 2 - PRODUCTS

# 2.1 MANUFACTURERS

- A. WattStopper DLM System (Existing in facility)
- B. nLight Network Control System
- C. Hubbell NX Network Control System

# 2.2 SYSTEM REQUIREMENTS

- A. Refer to the drawings for additional information and riser diagrams.
- B. System shall have an architecture that is based upon three main concepts: 1) intelligent lighting control devices 2) standalone lighting control zones 3) network backbone for remote or time based operation.
- C. Intelligent lighting control devices shall consist of one or more basic lighting control components; occupancy sensors, photocell sensors, relays, dimming outputs, manual switch stations, and manual dimming stations. Combining one or more of these components into a single device enclosure should be permissible so as to minimize overall device count of system.
- D. Intelligent lighting control devices shall communicate digitally, require <4 mA of current to function (Graphic wall stations excluded), and posses RJ-45 style connectors.
- E. Lighting control zones shall consist of one or more intelligent lighting control components, be capable of stand-alone operation, and be capable of being connected to a higher level network backbone.
- F. Devices within a lighting control zone shall be connected with CAT-5 low voltage cabling in any order.
- G. Lighting control zone shall be capable of automatically configuring itself for default operation without any start-up labor required.
- H. Individual lighting zones must continue to provide a user defined default level of lighting control in the event of a system communication failure with the backbone network or the management software becoming unavailable.
- I. Power for devices within a lighting control zone shall come from either resident devices already present for switching (relay device) or dimming purposes, or from the network backbone. Standalone "bus power supplies" shall not be required in all cases.
- J. System shall have one or more primary wall mounted network control "gateway" devices that are capable of accessing and controlling connected system devices and linking into an Ethernet LAN.
- K. System shall use "bridge" devices that route communication and distribute power for up to 8 directly connected lighting zones together for purposes of decreasing system wiring requirements.
- L. System shall have a web-based software management program that enables remote system control, status monitoring, and creation of lighting control profiles.
- M. Individual lighting zones shall be capable of being segmented into several "local" channels of occupancy, photocell, and switch functionality for more advanced configurations and sequences of operation.
- N. Devices located in different lighting zones shall be able to communicate occupancy, photocell, and switch information via wired backbone.
- O. System shall be capable of operating a lighting control zone according to several sequences of operation. System shall be able to change a space's sequence of operation

according to a time schedule so as to enable customized time-of-day, day-of-week utilization of a space.

### 2.3 INDIVIDUAL DEVICE SPECIFICATIONS

- A. Control Module (Gateway)
  - 1. Control module shall be a device that facilitates communication and time-based control of downstream network devices and linking into an Ethernet.
  - 2. Devices shall have a user interface that is capable of wall mounting, powered by low voltage, and have a touch screen.
  - 3. Control device shall have three RJ-45 ports for connection to other backbone devices (bridges) or directly to lighting control devices.
  - 4. Device shall automatically detect all devices downstream of it.
  - 5. Device shall have a standard and astronomical internal time clock.
  - 6. Device shall have one RJ-45 10/100 BaseT Ethernet connection.
  - 7. Device shall have a USB port
  - 8. Each control gateway device shall be capable of linking 1500 devices to the management software.
  - 9. Device shall be capable of using a dedicated or DHCP assigned IP address.
- B. System Occupancy Sensors
  - 1. Occupancy sensors system shall sense the presence of human activity within the desired space and fully control the on/off function of the lights.
  - 2. Passive Infrared Sensors (PIR) shall utilize passive infrared technology, which detects occupant motion. Ultrasonic or Microwave based sensing technologies shall not be accepted.
  - 3. Dual technology sensors shall have one of its two technologies not require motion to detect occupancy. Acceptable dual technology includes PIR/Microphonics or ultrasonic.
  - 4. Sensors shall be available with zero, one, or two integrated Class 1 switching relays, and up to one 0-10 VDC dimming output. Sensors shall be capable of switching 120 / 277 / 347 VAC. Load ratings shall be 800 W @ 120 VAC, 1200 W @ 277 VAC, 1500 W @ 347 VAC, and ¼ HP motor. Relays shall be dry contacts.
  - 5. Sensors shall be available with one or two occupancy "poles", each of which provides a programmable time delay.
  - 6. Sensors shall be available in multiple lens options which are customized for specific applications.
  - 7. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
  - 8. All sensors shall have two RJ-45 ports or capable of utilizing a splitter.
  - 9. All sensors shall have the ability to detect when it is not receiving valid communication (via CAT-5 connections) and blink its LED in a pattern to visually indicate of a potential wiring issue
  - 10. System shall also have ceiling, fixture, recessed, & corner mounted sensors available.

- 11. Fixture mount sensors shall be capable of powering themselves via a line power feed.
- 12. Sensors shall have optional features for photocell/daylight override, dimming control, and low temperature/high humidity operation.
- 13. Sensors with dimming can control 0 to 10 VDC dimmable ballasts by sinking up to 20 mA of Class 2 current (typically 40 or more ballasts).
- C. System Power (Relay) Packs
  - 1. Power Pack shall incorporate one or more Class 1 relays and contribute low voltage power to the rest of the system. Secondary Packs shall incorporate the relay(s), shall have an optional 2nd relay, 0-10 VDC dimming output, or line voltage dimming output, but shall not be required to contribute system power. Power Supplies shall provide system power only, but are not required to switch line voltage circuit. Auxiliary Relay Packs shall switch low voltage circuits only.
  - 2. Power Packs shall accept 120 or 277 VAC (or optionally 347 VAC), be plenum rated, and provide Class 2 power to the system.
  - 3. All devices shall have two RJ-45 ports.
  - 4. Every Power Pack parameter shall be available and configurable remotely from the software and locally via the device push-button.
  - 5. Power Pack shall securely mount to junction location through a threaded ½ inch chase nipple or be capable of being secured within a luminaire ballast channel. Plastic clips into junction box shall not be accepted. All Class 1 wiring shall pass through chase nipple into adjacent junction box without any exposure of wire leads. Note: UL Listing under Energy Management or Industrial Control Equipment automatically meets this requirement, whereas Appliance Control Listing does not meet this safety requirement.
  - 6. When required by local code, Power Pack must install inside standard electrical enclosure and provide UL recognized support to junction box. All Class 1 wiring is to pass through chase nipple into adjacent junction box without any exposure of wire leads.
  - 7. Power (Secondary) Packs shall be available that provide up to 16 Amp switching of all lighting load types.
  - 8. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120 VAC incandescent lighting loads or 120/277 VAC line voltage dimmable fluorescent ballasts (2-wire and 3-wire versions).
  - 9. Specific Secondary Packs shall be available that provide up to 5 Amps of switching and can dim 120/277 VAC magnetic low voltage transformers.
  - 10. Specific Secondary Packs shall be available that provide up to 4 Amps of switching and can dim 120 VAC electronic low voltage transformers.
  - 11. Specific Power/Secondary Packs shall be available that are UL924 listed for switching of Emergency Power circuits.
  - 12. Specific Secondary Packs shall be available that control louver/damper motors for skylights.
  - 13. Specific Secondary Packs shall be available that provide a pulse on/pulse off signal for purposes of controlling shade systems via relay inputs.
- D. System Wall Switches & Dimmers
  - 1. Devices shall recess into single-gang switch box and fit a standard GFI opening.

- 2. Devices shall be available with zero or one integrated Class 1 switching relay.
- 3. Communication and low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
- 4. All sensors shall have two RJ-45 ports.
- 5. All devices shall provide toggle switch control. Dimming control and low temperature/high humidity operation are available options.
- 6. Devices shall be available in four colors (Ivory, White, Light Almond, Gray).
- 7. Devices with dimming control outputs can control 0-10 VDC dimmable ballasts by sinking up to 20 mA of current (typically 40 or more ballasts).
- 8. Devices with capacitive touch buttons shall provide audible user feedback with different sounds for on/off, raise/lower, start-up, and communication offline.
- 9. Devices with mechanical push-buttons shall provide tactile and LED user feedback.
- 10. Devices with mechanical push-buttons shall be made available with custom button labeling
- 11. Devices with a single on button shall be capable of selecting all possible lighting combinations for a bi-level lighting zone such that the user confusion as to which of two buttons (as is present in multi-button scenarios) controls which load is eliminated.
- E. System Scene Controllers
  - 1. Device shall have two to four buttons for selecting programmable lighting control profiles or acting as on/off switches.
  - 2. Device shall recess into single-gang switch box and fit a standard GFI opening.
  - 3. Devices shall provide LED user feedback.
  - 4. Communication and Class 2 low voltage power shall be delivered to each device via standard CAT-5 low voltage cabling with RJ-45 connectors.
  - 5. All sensors shall have two RJ-45 ports.
  - 6. Device shall be capable of reprogramming other devices in its zone so as to implement user selected lighting scene.
  - 7. Device shall be capable of selecting a lighting profile be run by the system's upstream Gateway so as to implement selected lighting profile across multiple zones (and not just its local zone).
  - 8. Device shall have LEDs indicating current selection.
- F. Communication Bridges
  - 1. Device shall surface mount to a standard 4" x 4" square junction box.
  - 2. Device shall have 8 RJ-45 ports.
  - 3. Device shall be capable of aggregating communication from multiple lighting control zones for purposes of minimizing backbone wiring requirements back to Control Gateway.
  - 4. Device shall be powered with Class 2 low voltage supplied locally via a directly wired power supply or delivered via a CAT-5 cabled connection.
  - 5. Device shall be careful of redistributing power from its local supply and connect lighting control zones with excess power to lighting control zones with insufficient

local power. This architecture also enables loss of power to a particular area to be less impactful on network lighting control system.

### 2.4 MANAGEMENT SOFTWARE

A. Utilize existing lighting control software in the facility and integrate all new spaces into this system.

# 2.5 START-UP & SUPPORT FEATURES

- A. To facilitate start-up, all devices daisy-chained together (using CAT-5) shall automatically be grouped together into a functional lighting control zone.
- B. All lighting control zones shall be able to function according to default settings once adequate power is applied and before any system software is installed.
- C. Once software is installed, system shall be able to auto-discover all system devices without requiring any commissioning.
- D. All system devices shall be capable of being given user defined names.
- E. All devices within the network shall be able to have their firmware reprogrammed remotely and without being physically uninstalled for purposes of upgrading functionality at a later date.
- F. All sensor devices shall have the ability to detect improper communication wiring and blink its LED in a specific cadence as to alert installation/startup personnel.

# PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. The control system shall be installed and wired as shown on the plans, as described within this specification and according to the manufacturer's recommendations.
- B. A factory trained technician shall provide on-site commissioning, start-up and owner training. The owner training will only happen after the system has been commissioned and fully programmed and proven to be operating. This includes the ability to remotely operate the system via the Ethernet. The technician shall inform the Engineer when the system is completely operational so the Engineer can conduct an inspection prior to the owner training. The technician shall be present during the Engineer's inspection. The owner's training and Engineer's inspection will not occur on the same day.
- C. Coordinate with the Owner's Technology Coordinator for required IP addresses.
- D. The LCS manufacturer's technician shall schedule and provide the following at a minimum:
  - 1. Pre-installation meeting with electrical contractor.
  - 2. Start-up and commissioning.
  - 3. Owner Training.

### 3.2 COMMISSIONING

- A. A third party commissioning service provider will be procured outside this contract to provide functional testing of the lighting control system.
- B. The commissioning authority will review the system in accordance with the International Energy Conservation Code requirements.
- C. The commissioning authority will provide the following at a minimum:

- 1. Ensure that control hardware and software are calibrated, adjusted, programmed and in proper working condition in accordance with the construction documents and manufacturer's installation instruction.
- 2. Confirm that the placement, sensitivity and time-out adjustments for occupant sensors meet the design requirements.
- 3. Confirm that the time switches and programmable schedule controls are programmed to turn the lights off at times determined by the owner.
- 4. Confirm that the placement and sensitivity adjustments for photosensor controls reduce the electric light based on the amount of usable daylight in the space as specified.
- D. Electrical Contractor's Responsibilities
  - 1. Attend commissioning meetings as scheduled by the Commissioning Authority.
  - 2. Verify proper installation and performance of all electrical services provided.
  - 3. Complete system verification checklists and manufacturer's prestart checklists prior to scheduling start-up of commissioned equipment.
  - 4. Monitor and respond to Resolution Tracking Forms distributed by the Commissioning Authority in order to expedite corrective actions necessary to achieve the design intent.
  - 5. Provide an electrical technician to assist during verification and performance testing.
  - 6. Correct any issues that may be discovered during start-up and verification and performance testing.

# 3.3 SEQUENCES OF OPERATION

- A. Refer to the drawings for additional information.
- B. The time delay of all occupancy sensors shall be set to 30 minutes.
- C. All lighting zones that contain occupancy sensors shall be set to manual on/auto off with the exception of restrooms and stairwells
- D. Interior lighting zones controlled by a Time-of-Day schedule shall provide a "blink" of the lights to warn the occupants the lights are going to be swept off. The occupants shall have override capability. Once the warning has occurred, the occupant may override the lights on for up to 90 minutes. The override time shall be adjustable. The occupant shall be able to override the lights on for the designated amount of time by using the local switch. Prior to the lights being turned off after the allotted override time, the occupant shall be warned again. The process shall continue to repeat as described.
- E. Specific times for Time-of-Day schedules will be determined by the owner during construction.

# 3.4 DOCUMENTATION

- A. The contractor shall provide accurate as-built drawings to the Engineer for review. The as-builts at a minimum shall show the location of all LCS components. Where loads are connected to a relay panel, the as-builts shall indicate the load/zones controlled by each relay, electrical circuit number connected to each relay, and the relay panel number.
- B. Provide a typed description of the final control sequence for each lighting zone. This shall be included in the Operation and Maintenance manuals.

# 3.5 FACTORY SUPPORT AND SERVICE

A. Factory telephone service support and assistance shall be available at no cost to the owner. It shall consist of solving programming or application questions concerning all components of the LCS.

END OF SECTION 26 09 23

# SECTION 26 24 16 – PANELBOARDS

PART 1 - GENERAL

- 1.1 RELATED DOCUMENTS
  - A. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 01 Specification Sections, apply to this Section.
- 1.2 SUMMARY
  - A. Section Includes:
    - 1. Lighting and appliance branch-circuit panelboards.

### 1.3 DEFINITIONS

- A. SVR: Suppressed voltage rating.
- B. TVSS: Transient voltage surge suppressor.
- 1.4 SUBMITTALS
  - A. Product Data: For each type of panelboard, switching and overcurrent protective device, transient voltage suppression device, accessory, and component indicated. Include dimensions and manufacturers' technical data on features, performance, electrical characteristics, ratings, and finishes.
  - B. Panelboard Schedules: For installation in panelboards. Submit final versions after load balancing.
  - C. Operation and Maintenance Data: For panelboards and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
    - 1. Manufacturer's written instructions for testing and adjusting overcurrent protective devices.
    - 2. Time-current curves, including selectable ranges for each type of overcurrent protective device that allows adjustments.

# 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain panelboards, overcurrent protective devices, components, and accessories from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for panelboards including clearances between panelboards and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NEMA PB 1.
- E. Comply with NFPA 70.
- 1.6 DELIVERY, STORAGE, AND HANDLING
  - A. Handle and prepare panelboards for installation according to NEMA PB 1.
- 1.7 PROJECT CONDITIONS
  - A. Environmental Limitations:

- 1. Do not deliver or install panelboards until spaces are enclosed and weathertight, wet work in spaces is complete and dry, work above panelboards is complete, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.
- 2. Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - a. Ambient Temperature: Not exceeding 23 deg F to plus 104 deg F.
  - b. Altitude: Not exceeding 6600 feet .
- B. Service Conditions: NEMA PB 1, usual service conditions, as follows:
  - 1. Ambient temperatures within limits specified.
  - 2. Altitude not exceeding 6600 feet.
- C. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Architect and Owner no fewer than seven days in advance of proposed interruption of electric service.
  - 2. Do not proceed with interruption of electric service without Architect and Owner's permission.
  - 3. Comply with NFPA 70E.
- 1.8 COORDINATION
  - A. Coordinate layout and installation of panelboards and components with other construction that penetrates walls or is supported by them, including electrical and other types of equipment, raceways, piping, encumbrances to workspace clearance requirements, and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.
- 1.9 WARRANTY
  - A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace transient voltage suppression devices that fail in materials or workmanship within specified warranty period.
    - 1. Warranty Period: Five years from date of Substantial Completion.

# PART 2 - PRODUCTS

# 2.1 GENERAL REQUIREMENTS FOR PANELBOARDS

- A. Enclosures: Flush- and surface mounted cabinets.
  - 1. Rated for environmental conditions at installed location.
    - a. Indoor Locations: NEMA 250, Type 1.
  - 2. Hinged Front Cover: Entire front trim hinged to box and with standard door within hinged trim cover.
  - 3. Finishes:
    - a. Panels and Trim: Steel, factory finished immediately after cleaning and pretreating with manufacturer's standard two-coat, baked-on finish consisting of prime coat and thermosetting topcoat.

- b. Back Boxes: Galvanized steel.
- 4. Directory Card: Inside panelboard door, mounted in metal frame with transparent protective cover.
- B. Incoming Mains Location: Top and bottom.
- C. Phase, Neutral, and Ground Buses:
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Equipment Ground Bus: Adequate for feeder and branch-circuit equipment grounding conductors; bonded to box.
- D. Conductor Connectors: Suitable for use with conductor material and sizes.
  - 1. Material: Hard-drawn copper, 98 percent conductivity.
  - 2. Main and Neutral Lugs: Mechanical type.
  - 3. Ground Lugs and Bus-Configured Terminators: Mechanical type.
  - 4. Feed-Through Lugs: Mechanical type, suitable for use with conductor material. Locate at opposite end of bus from incoming lugs or main device.
  - 5. Subfeed (Double) Lugs: Mechanical type suitable for use with conductor material. Locate at same end of bus as incoming lugs or main device.
- E. Future Devices: Mounting brackets, bus connections, filler plates, and necessary appurtenances required for future installation of devices.
- F. Panelboard Short-Circuit Current Rating: Fully rated to interrupt symmetrical short-circuit current available at terminals.
- G. Surge Protection Device: IEEE C62.41-compliant, integrally mounted, bolt-on, solidstate, parallel-connected, modular (with field-replaceable modules)type, with sine-wave tracking suppression and filtering modules, short-circuit current rating complying with UL 1449, second edition, and matching or exceeding the panelboard short-circuit rating, redundant suppression circuits, with individually fused metal-oxide varistors.
  - 1. Accessories:
    - a. Fuses rated at 200-kA interrupting capacity.
    - b. Fabrication using bolted compression lugs for internal wiring.
    - c. Integral disconnect switch.
    - d. Redundant suppression circuits.
    - e. Redundant replaceable modules.
    - f. Arrangement with wire connections to phase buses, neutral bus, and ground bus.
    - g. LED indicator lights for power and protection status.
    - h. Audible alarm, with silencing switch, to indicate when protection has failed.
    - i. Form-C contacts rated at 5 A and 250-V ac, one normally open and one normally closed, for remote monitoring of system operation. Contacts shall reverse position on failure of any surge diversion module or on opening of any current-limiting device. Coordinate with building power monitoring and control system.
    - j. Four-digit, transient-event counter set to totalize transient surges.

- 2. Peak Single-Impulse Surge Current Rating: 160 kA per phase.
- 3. Minimum single-impulse current ratings, using 8-by-20-mic.sec. waveform described in IEEE C62.41.2.
  - a. Line to Neutral: 70,000 A.
  - b. Line to Ground: 70,000 A.
  - c. Neutral to Ground: 50,000 A.
- 4. Withstand Capabilities: 12,000 IEEE C62.41, Category C3 (10 kA), 8-by-20mic.sec. surges with less than 5 percent change in clamping voltage.
- 5. Protection modes and UL 1449 SVR for grounded wye circuits with 208Y/120 -V, three-phase, four-wire circuits shall be as follows:
  - a. Line to Neutral: 400 V for 208Y/120.
  - b. Line to Ground: 400 V for 208Y/120.
  - c. Neutral to Ground: 400 V for 208Y/120.
- 2.2 DISCONNECTING AND OVERCURRENT PROTECTIVE DEVICES
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    - 2. General Electric Company; GE Consumer & Industrial Electrical Distribution.
    - 3. Siemens Energy & Automation, Inc.
    - 4. Square D; a brand of Schneider Electric.
  - B. Molded-Case Circuit Breaker (MCCB): Comply with UL 489, with interrupting capacity to meet available fault currents.
    - 1. Alternate Maintenance Setting (AMS) Switch. Switch shall be provided for the temporary arc-flash incident energy reduction during maintenance activities. Provide for circuit breakers where the actual overcurrent device installed in the circuit breakers are rated or can be adjusted to 1,200 amps or higher.
      - a. Provide a manual switch on the compartment door to switch the circuit breaker's short-time tripping characteristics to instantaneous with minimum pick-up setting in order to reduce the danger from a potential arc-flash at downstream equipment.
      - b. Provide a lock feature for the AMS switch so that it may be locked in either the off or on maintenance mode position.
      - c. Provide a blue LED indicating light to indicate the AMS switch is in the maintenance mode.
    - 2. Thermal-Magnetic Circuit Breakers: Inverse time-current element for low-level overloads, and instantaneous magnetic trip element for short circuits. Adjustable magnetic trip setting for circuit-breaker frame sizes 250 A and larger.
    - 3. Adjustable Instantaneous-Trip Circuit Breakers: Magnetic trip element with frontmounted, field-adjustable trip setting.
    - 4. Electronic trip circuit breakers with rms sensing; field-replaceable rating plug or field-replicable electronic trip; and the following field-adjustable settings:
      - a. Instantaneous trip.

- b. Long- and short-time pickup levels.
- c. Long- and short-time time adjustments.
- d. Ground-fault pickup level, time delay, and l<sup>2</sup>t response.
- 5. Current-Limiting Circuit Breakers: Frame sizes 400 A and smaller; let-through ratings less than NEMA FU 1, RK-5.
- 6. GFCI Circuit Breakers: Single- and two-pole configurations with Class A ground-fault protection (6-mA trip).
- 7. Molded-Case Circuit-Breaker (MCCB) Features and Accessories:
  - a. Standard frame sizes, trip ratings, and number of poles.
  - b. Lugs: Mechanical style, suitable for number, size, trip ratings, and conductor materials.
  - c. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge (HID) lighting circuits.

### PART 3 - EXECUTION

- 3.1 EXAMINATION
  - A. Receive, inspect, handle, and store panelboards according to NECA 407 and NEMA PB 1.1.
  - B. Examine panelboards before installation. Reject panelboards that are damaged or rusted or have been subjected to water saturation.
  - C. Examine elements and surfaces to receive panelboards for compliance with installation tolerances and other conditions affecting performance of the Work.
  - D. Proceed with installation only after unsatisfactory conditions have been corrected.

#### 3.2 INSTALLATION

- A. Install panelboards and accessories according to NECA 407 and NEMA PB 1.1.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from panelboards.
- C. Mount top of trim 72 inches above finished floor unless otherwise indicated.
- D. Mount panelboard cabinet plumb and rigid without distortion of box. Mount recessed panelboards with fronts uniformly flush with wall finish and mating with back box.
- E. Install overcurrent protective devices and controllers not already factory installed.
  - 1. Set field-adjustable, circuit-breaker trip ranges.
- F. Install filler plates in unused spaces.
- G. Stub four 1-inch (27-GRC) empty conduits from panelboard into accessible ceiling space or space designated to be ceiling space in the future. Stub four 1-inch (27-GRC) empty conduits into raised floor space or below slab not on grade.
- H. Arrange conductors in gutters into groups and bundle and wrap with wire ties after completing load balancing.
- I. Comply with NECA 1.

### 3.3 IDENTIFICATION

- A. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs complying with Division 26 Section "Identification for Electrical Systems."
- B. Create a directory to indicate installed circuit loads after balancing panelboard loads; incorporate Owner's final room designations. Obtain approval before installing. Use a computer or typewriter to create directory; handwritten directories are not acceptable.
- C. Panelboard Nameplates: Label each panelboard with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."
- D. Device Nameplates: Label each branch circuit device in distribution panelboards with a nameplate complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

# 3.4 FIELD QUALITY CONTROL

- A. Tests and Inspections:
  - 1. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
  - 2. Correct malfunctioning units on-site, where possible, and retest to demonstrate compliance; otherwise, replace with new units and retest.
- B. Panelboards will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports, including a certified report that identifies panelboards included and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

#### 3.5 ADJUSTING

- A. Adjust moving parts and operable component to function smoothly and lubricate as recommended by manufacturer.
- B. Set field-adjustable circuit-breaker trip ranges as indicated.
- C. Load Balancing: After Substantial Completion, but not more than 60 days after Final Acceptance, measure load balancing and make circuit changes.
  - 1. Measure as directed during period of normal system loading.
  - 2. Perform load-balancing circuit changes outside normal occupancy/working schedule of the facility and at time directed. Avoid disrupting critical 24-hour services such as fax machines and on-line data processing, computing, transmitting, and receiving equipment.
  - 3. After circuit changes, recheck loads during normal load period. Record all load readings before and after changes and submit test records.
  - 4. Tolerance: Difference exceeding 20 percent between phase loads, within a panelboard, is not acceptable. Rebalance and recheck as necessary to meet this minimum requirement.

END OF SECTION 26 24 16

# SECTION 26 27 26 – WIRING DEVICES

PART 1 - GENERAL

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

# 1.2 SUMMARY

- A. This Section includes the following:
  - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
- B. Related Sections include the following:
  - 1. Division 27 Section "Communications Horizontal Cabling" for workstation outlets.

### 1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. UTP: Unshielded twisted pair.

# 1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

### 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

# 1.6 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.
  - 1. Cord and Plug Sets: Match equipment requirements.

#### PART 2 - PRODUCTS

#### 2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
  - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
  - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
  - 3. Leviton Mfg. Company Inc. (Leviton).
  - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

# 2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Receptacles shall have nickel-plated brass strap and a one piece strap with integral ground.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Cooper; 5351 (single), 5352 (duplex).
    - b. Hubbell; HBL5351 (single), CR5352 (duplex).
    - c. Leviton; 5891 (single), 5352 (duplex).
    - d. Pass & Seymour; 5381 (single), 5352 (duplex).

### 2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, safe lock protection, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
  - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; GF20.
    - b. Pass & Seymour; 2084.

### 2.4 TAMPER-RESISTANT RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply With NEMA WD 1, NEMA WD 6 Configuration 5-20R, UL 498 Supplement SD, and FS W-C-596.
  - 1. Products: Subject to compliance with requirements products that may be incorporated into the Work include, but are not limited to, the following:
    - a. Cooper; TR8300.
    - b. Hubbell; HBL8300SGA.
    - c. Leviton; 8300-SGG.
    - d. Pass & Seymour; TR63H.

### 2.5 PLUG LOAD CONTROL RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498. Receptacle shall be marked to indicate that it is part of plug load control in accordance with the current version of the National Electrical Code. Receptacles shall have nickel-plated brass strap and a one piece strap with integral ground.
  - 1. Products: Subject to compliance with requirements, provide one of the following:
    - a. Leviton; 5362-1P (duplex/half controlled); 5362-S2 (duplex fully controlled)
    - b. Pass & Seymour; 5362CH (duplex/half controlled); 5362CD (duplex fully controlled)
    - c. Cooper
    - d. Hubbell

# 2.6 M WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
  - 1. Plate-Securing Screws: Metal with head color to match plate finish.
  - 2. Material for Kitchens: Stainless steel.
  - 3. Material for Finished Spaces: Stainless Steel.
  - 4. Material for Unfinished Spaces: Stainless Steel.
  - 5. Material for Damp Locations: Cast aluminum with spring-loaded lift cover, and listed and labeled for use in "wet locations."
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weatherresistant, "While In Use" die-cast aluminum with lockable cover.

### 2.7 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
  - 1. Wiring Devices Connected to Normal Power System: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.
  - 2. Wiring Devices Connected to Emergency Power System: Red .

# PART 3 - EXECUTION

### 3.1 INSTALLATION

- A. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- B. Coordination with Other Trades:
  - 1. Take steps to insure that devices and their boxes are protected. Do not place wall finish materials over device boxes and do not cut holes for boxes with routers that are guided by riding against outside of the boxes.
  - 2. Keep outlet boxes free of plaster, drywall joint compound, mortar, cement, concrete, dust, paint, and other material that may contaminate the raceway system, conductors, and cables.
  - 3. Install device boxes in brick or block walls so that the cover plate does not cross a joint unless the joint is troweled flush with the face of the wall.
  - 4. Install wiring devices after all wall preparation, including painting, is complete.
- C. Conductors:
  - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
  - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
  - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
  - 4. Existing Conductors:
    - a. Cut back and pigtail or replace all damaged conductors.
    - b. Straighten conductors that remain and remove corrosion and foreign matter.

- c. Pigtailing existing conductors is permitted provided the outlet box is large enough.
- D. Device Installation:
  - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
  - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
  - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
  - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
  - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
  - 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
  - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
  - 8. Tighten unused terminal screws on the device.
  - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
  - 1. Install ground pin of vertically mounted receptacles up, and on horizontally mounted receptacles to the right.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.
- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical and with grounding terminal of receptacles on top. Group adjacent switches under single, multigang wall plates.

# 3.2 FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
  - 1. Test Instruments: Use instruments that comply with UL 1436.
  - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
  - 1. Line Voltage: Acceptable range is 105 to 132 V.
  - 2. Percent Voltage Drop under 15-A Load: A value of 6 percent or higher is not acceptable.
  - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
  - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
  - 5. Using the test plug, verify that the device and its outlet box are securely mounted.

6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 26 27 26

# SECTION 26 28 16 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

### PART 1 - GENERAL

# 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Fusible switches.
  - 2. Nonfusible switches.
  - 3. Molded-case circuit breakers (MCCBs).
  - 4. Enclosures.

### 1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

# 1.4 SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
  - 1. Enclosure types and details for types other than NEMA 250, Type 1.
  - 2. Current and voltage ratings.
  - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
  - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
- B. Field quality-control reports.
  - 1. Test procedures used.
  - 2. Test results that comply with requirements.
  - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- C. Manufacturer's field service report.
- D. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
  - 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

### 1.5 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

# 1.6 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
  - 1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
  - 2. Altitude: Not exceeding 6600 feet.
- B. Interruption of Existing Electric Service: Do not interrupt electric service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary electric service according to requirements indicated:
  - 1. Notify Architect and Owner no fewer than seven days in advance of proposed interruption of electric service.
  - 2. Indicate method of providing temporary electric service.
  - 3. Do not proceed with interruption of electric service without Architect's and Owner's written permission.
  - 4. Comply with NFPA 70E.
- 1.7 COORDINATION
  - A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

# PART 2 - PRODUCTS

- 2.1 FUSIBLE SWITCHES
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
    - 2. General Electric Company; GE Consumer & Industrial Electrical Distribution.
    - 3. Siemens Energy & Automation, Inc.
    - 4. Square D; a brand of Schneider Electric.
  - B. Type HD, Heavy Duty, Single Throw, 230 or 600V ac as indicated, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with clips or bolt pads to accommodate indicated fuses, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
  - C. Accessories:

- 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
- 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
- 3. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.
- 4. Lugs: Mechanical type, suitable for number, size, and conductor material.
- 5. Service-Rated Switches: Labeled for use as service equipment.

# 2.2 NONFUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
  - 2. General Electric Company; GE Consumer & Industrial Electrical Distribution.
  - 3. Siemens Energy & Automation, Inc.
  - 4. Square D; a brand of Schneider Electric.
- B. Type HD, Heavy Duty, Single Throw, 240 or 600-V ac, 1200 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, lockable handle with capability to accept three padlocks, and interlocked with cover in closed position.
- C. Accessories:
  - 1. Equipment Ground Kit: Internally mounted and labeled for copper and aluminum ground conductors.
  - 2. Neutral Kit: Internally mounted; insulated, capable of being grounded and bonded; labeled for copper and aluminum neutral conductors.
  - 3. Lugs: Mechanical type, suitable for number, size, and conductor material.

# 2.3 ENCLOSURES

- A. Enclosed Switches and Circuit Breakers: NEMA AB 1, NEMA KS 1, NEMA 250, and UL 50, to comply with environmental conditions at installed location.
  - 1. Indoor, Dry and Clean Locations: NEMA 250, Type 1.
  - 2. Outdoor Locations: NEMA 250, Type 3R.
  - 3. Kitchen or Wash-Down Areas: NEMA 250, Type 4X, stainless steel .
  - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 3R.
  - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.
- PART 3 EXECUTION
- 3.1 EXAMINATION
  - A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
  - B. Proceed with installation only after unsatisfactory conditions have been corrected.
- 3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.
- 3.3 IDENTIFICATION
  - A. Label each enclosure with engraved metal or laminated-plastic nameplate.

END OF SECTION 26 28 16

# SECTION 26 51 00 - LIGHTING

### PART 1 - GENERAL

### 1.1 SUMMARY

- A. Refer to the General Requirements Specifications, Section 260500.
- B. Section Includes:
  - 1. Interior lighting fixtures and LED drivers.
  - 2. Emergency lighting units.
  - 3. Exit signs.
  - 4. Lighting fixture supports.
- C. Refer to the light fixture schedule on the contract drawings for specific light fixture requirements and acceptable manufacturers.
- D. Basis of Design light fixtures are described and listed on the fixture schedule with corresponding catalog numbers. Equivalent manufacturers listed in the schedule without corresponding catalog numbers are responsible for meeting the quality standards and photometric distribution set by the specified product.
  - 1. Identification of the basis of design light fixtures by means of manufacturers' names and catalog numbers is to establish basic features, quality and performance standards, and it is not intended to limit competition. Any substitutions must meet or exceed these standards.
- E. Substitutions and/or requests to have a manufacturer added as an acceptable equivalent manufacturer shall be made no later than 14 days prior to the bid date.
- F. Those proposing substitutions shall submit the following to the engineer:
  - 1. Cutsheets for each fixture. Cutsheets shall include at a minimum a picture and description of fixture construction, lamp type, efficiency and any accessories.
  - 2. The engineer may require lighting calculations for specific areas to ensure the substitute fixtures will provide adequate lighting levels.

# 1.2 DEFINITIONS

- A. CCT: Correlated color temperature.
- B. CRI: Color-rendering index.
- C. LER: Luminaire efficacy rating.
- D. Lumen: Measured output of lamp and luminaire, or both.
- E. Luminaire: Complete lighting fixture, including housing, ballast LED array, electronic drivers and integral controls.

# 1.3 SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
  - 1. Physical description of lighting fixture materials and finishes.
  - 2. Emergency lighting units including battery and charger.
  - 3. LED drivers.
  - 4. Life (L7O for LED), output (lumens, CCT, and CRI), and energy-efficiency data.

- 5. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture. Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.
- 6. Details of attaching luminaires and accessories.
- B. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.
  - 1. Provide a list of all special warranties, per fixture type, that are longer than the standard one-year warranty.

### 1.4 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: The manufacturer agrees to replace or repair components that fail in material or workmanship within the specified period.
  - 1. Warranty Period for Emergency Lighting Unit Batteries: Three years from the date of Substantial Completion.
  - 2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Three years from the date of Substantial Completion.
  - 3. The electrical contractor shall be responsible for replacing or repairing all components that fail within one year of the date of Substantial Completion.
  - 4. Warranties that extend beyond one year after Substantial Completion shall apply to materials only. Labor is excluded after the first year.
- B. Special warranty for LED luminaries and devices: The manufacturer agrees to repair or replace the driver and all components of the luminaire that fail in materials or workmanship or have a loss in performance within the specified warranty period listed below:
  - 1. Warranty Period: Five (5) years from the date of substantial completion.
  - 2. The electrical contractor shall be responsible for repairing or replacing all components that fail within one year of the date of substantial completion.
  - 3. Warranties that extend beyond one year from the date of substantial completion shall apply to material only. Labor is excluded after the first year.
- C. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace products that fail in materials or workmanship; that corrode; or that fade, stain, perforate, erode, or chalk due to effects of weather or solar radiation within specified warranty period. Manufacturer may exclude lightning damage, hail damage, vandalism, abuse, or unauthorized repairs or alterations from special warranty coverage.
  - 1. Warranty Period for Luminaires: Five years from date of Substantial Completion.
  - 2. Warranty Period for Metal Corrosion: Five years from date of Substantial Completion.
  - 3. Warranty Period for Color Retention: Five years from date of Substantial Completion.
  - 4. The Electrical Contractor shall be responsible for repairing or replacing all components that fail within one year of the date of substantial completion.
  - 5. Warranties that extend beyond one year from the date of substantial completion shall apply to material only. Labor is excluded after the first year.

# PART 2 - PRODUCTS

# 2.1 MANUFACTURERS

- A. Refer to light fixture scheduled on Contract Drawings.
- 2.2 GENERAL REQUIREMENTS FOR WARRANTIES AND COMPONENTS
  - A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
  - B. LED Fixtures: Comply with UL 8750.
  - C. Metal Parts: Free of burrs and sharp corners and edges.
  - D. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
  - E. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
  - F. Plastic parts and acrylic lighting diffusers shall be 100 percent virgin acrylic plastic. Have a high resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation. UV stabilized.
  - G. Integrated LED Luminaire Factory Applied Labels:
    - 1. Each luminaire shall have the manufacturer's name, trademark, model number, serial number, date of manufacture and lot number as identification, permanently marked inside each unit and outside each packaging box.
    - 2. The rated voltage, rated power in watts and volt-amperes shall be permanently marked inside each unit.
  - H. Luminaire efficiency ratings (LER) shall be tested according to NEMA standards for the type of fixture specified.
  - I. Luminaire Finish: manufacturer's standard or custom paint, as indicted in the Light Fixture Schedule, applied to factory-assembled and tested luminaires before shipping. Match finish for pole and support materials. Colors to be selected by Architect during shop drawing review.
  - J. LED Luminaire General Requirements
    - 1. Each luminaire shall be tested to operate at an average ambient operating temperature of 25°C. Fixtures located in certain operating environments may require the ability to operate in higher or lower ambient temperature environment and still maintain their longevity, CCT and lumen output.
    - 2. Each luminaire shall meet all parameters of this specification throughout the minimum operational life of 50,000 hours when operated at the average operating temperature.
    - 3. The luminaire shall be a single, self-contained device, not requiring on-site assembly for installation.
    - 4. Polymeric materials (if used) of enclosures containing either the power supply or electronic components of the luminaire shall be made of UL94VO flame retardant materials. Luminaire lenses are excluded from this requirement.
    - 5. The assembly and manufacturing process for the Solid State Lighting luminaire shall be designed to assure all internal components are adequately supported to withstand mechanical shock and vibration.

- 6. LED's shall be manufactured by a manufacturer who has produced commercial LEDs for a minimum of five (5) years.
- Lumen Output minimum initial delivered lumen output of the luminaire shall be the lumens exiting the luminaire in the 0-360 degree zone - as measured by IESNA Standard LM-79-08 in an accredited lab. Exact tested lumen output shall be clearly noted on the shop drawings.
- 8. Lumen output shall not decrease by more than 20% over the minimum operational life of 50,000 hours at the rated ambient operating temperature.
- 9. Individual LEDs shall be connected such that a catastrophic loss or the failure of one LED will not result in the loss of the entire luminaire.
- 10. LED Boards shall be suitable for field maintenance and have plug-in connectors. LED boards shall be upgradable.
- 11. Light Color/Quality
  - a. Correlated Color temperature (CCT), as indicated in the light fixture schedule, shall be correlated to chromaticity as defined by the absolute (X,Y) coordinates on the 2-D CIE chromaticity chart.
  - b. Color shift over 6,000 hours shall be <0.007 change in u' v' as demonstrated in IES LM80 report.
  - c. The color rendition index (CRI) shall be 80 or greater.
  - d. LED boards to be tested for color consistency and shall be within a space of 2.5 MacAdam ellipses on the CIE chromaticity chart.
- 12. Thermal Management
  - a. The thermal management (of the heat generated by the LEDs) shall be of sufficient capacity to assure proper operation of the luminaire over the expected useful life.
  - b. The LED manufacturer's maximum junction temperature for the expected life shall not be exceeded at the average operating ambient.
  - c. The LED manufacturer's maximum junction temperature for the catastrophic failure shall not be exceeded at the maximum operating ambient.
  - d. The Driver manufacturer's maximum case temperature shall not be exceeded at the maximum operating ambient. Thermal management shall be passive by design. The use of fans or other mechanical devices shall not be allowed.

# 2.3 INTEGRAL EMERGENCY POWER UNIT

- A. Internal Type: Self-contained, modular, battery-inverter unit, factory mounted within lighting fixture body and compatible with ballast. Comply with UL 924.
  - 1. Emergency Connection: Operate fluorescent lamp(s) continuously. Connect unswitched circuit to battery-inverter unit and switched circuit to fixture ballast.
  - 2. Test Push Button and Indicator Light: Visible and accessible without opening fixture or entering ceiling space.
    - a. Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    - b. Indicator Light: LED indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

- 3. Battery: Sealed, maintenance-free, nickel-cadmium type.
- 4. Charger: Fully automatic, solid-state, constant-current type with sealed power transfer relay.
- 5. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

### 2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
  - 1. Lamps for AC Operation: LEDs, 50,000 hours minimum rated lamp life.
  - 2. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
    - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
    - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
    - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
    - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
    - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.
    - f. Integral Self-Test: Factory-installed electronic device automatically initiates code-required test of unit emergency operation at required intervals. Test failure is annunciated by an integral audible alarm and a flashing red LED.

### 2.5 LED POWER SUPPLIES AND DRIVERS

- A. Driver shall meet or exceed the criteria herein:
  - a. Ten-year expected life while operating at maximum case temperature and 90 percent non-condensing relative humidity.
  - b. Driver should be UL Recognized under the component program and shall be modular for simple field replacement.
  - c. Electrical characteristics: 120 277 volt, UL Listed, CSA Certified, Sound Rated A+. Driver shall be > 80% efficient at full load across all input voltages. Input wires shall be 18AWG solid copper minimum.
  - d. Dimming: Driver shall be suitable for full-range dimming. The luminaire shall be capable of continuous dimming without perceivable flicker over a range of 100 percent to 0.1 percent of rated lumen output with a smooth shut off function.
  - e. Dimming shall be controlled by a 0-10V signal, "DMX", forward phase or electronic low voltage as indicated in the fixture schedule and/or drawings.

- f. Driver shall include ability to provide no light output when the control signal drops below 0.5 V, and shall consume 0.5 watts or less in this standby.
- g. Driver shall be capable of configuring a linear or logarithmic dimming curve.
- h. Drivers shall track evenly across multiple fixtures at all light levels, and shall have an input signal to output light level that allows smooth adjustment over the entire dimming range regardless of the controller type.
- i. Flicker: Driver and luminaire electronics shall deliver illumination that is free from objectionable flicker as measured by flicker index (ANSI/IES RP-16-10). At all points within the dimming range from 100-0.1 percent luminaire shall have:
  - 1) Less than 1 percent flicker index at frequencies below 120 Hz.
  - 2) Less than 12 percent flicker index at 120 Hz, and shall not increase at greater than 0.1 percent per Hz to a maximum of 80 percent flicker index at 800Hz.
- j. Driver disconnect shall be provided.
- k. The surge protection which resides within the driver shall protect the luminaire from damage and failure for transient voltages and currents as defined in ANSI/IEEE C64.41 2002 for Location Category A, where failure does not mean a momentary loss of light during the transient event.
- B. Electrical Requirements
  - 1. Operation Voltage The luminaire shall operate from at 60 HZ ±3 HZ AC line over a voltage ranging from 120 VAC to 277 VAC. The fluctuations of line voltage of plus or minus 10% shall have no visible effect on the luminous output.
  - 2. Power Factor: The luminaire shall have a power factor of 90% or greater at all standard operating voltages and full luminaire output.
  - 3. THD: Total harmonic distortion (current and voltage) induced into an AC power line by a luminaire shall not exceed 20 percent at any standard input voltage and meet ANSI C82.11 maximum allowable THD requirements.
  - 4. In Rush Current: Meet or exceed NEMA 410 driver inrush standard of 430 Amps per 10 Amps load with a maximum of 370 Amps 2 seconds.
  - 5. RF Interference: The luminaire and associated on-board circuitry must meet Class A emission limits referred in Federal Communications Commission (FCC) Title 47, Subpart B, Section 15 Non-Consumer requirements for EMI/RFI emissions.
  - 6. Driver must support automatic adaptation, allowing for future luminaire upgrades and enhancements and deliver improved performance:
  - 7. Adjustment of forward LED voltage, supporting 3V through 60V.
  - 8. Adjustment of LED current from 200mA to 1.05A at the 100 percent control input point in increments of 1mA
  - 9. Adjustment for operating hours to maintain constant lumens (within 5 percent) over the 50,000 hour design life of the system, and deliver up to 20 percent energy savings early in the life cycle.

- 10. Electrical connections between normal power and driver must be modular utilizing a snap fit connector. All electrical components must be easily accessible after installation and be replaceable without removing the fixture from the ceiling.
- 11. All electrical components shall be RoHS compliant.

### 2.6 LUMINAIRE-MOUNTED PHOTOELECTRIC RELAYS

- A. Comply with UL 773 or UL 773A.
- B. Contact Relays: Factory mounted, single throw, designed to fail in the on position, and factory set to turn light unit on at 1.5 to 3 fc and off at 4.5 to 10 fc with 15-second minimum time delay. Relay shall have directional lens in front of photocell to prevent artificial light sources from causing false turnoff.
  - 1. Relay with locking-type receptacle shall comply with ANSI C136.10.
  - 2. Adjustable window slide for adjusting on-off set points.
- 2.7 LIGHTING FIXTURE SUPPORT COMPONENTS
  - A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
  - B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
  - C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
  - D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
  - E. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
  - F. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

#### PART 3 - EXECUTION

#### 3.1 INSTALLATION

- A. Comply with the manufacturer's installation recommendations and guidelines.
- B. Lighting fixtures:
  - 1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
  - 2. Install lamps in each luminaire.
- C. Temporary Lighting: If it is necessary, and approved by the Engineer, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.
- D. Remote Mounting of Ballasts: Distance between the ballast and fixture shall not exceed that recommended by ballast manufacturer. Verify, with ballast manufacturers, maximum distance between ballast and luminaire.
- E. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.
  - 1. Install ceiling support system rods or wires for each fixture. Locate not more than 6 inches from all lighting fixture corners. Rods or wires shall be of the same gauge and style as other ceiling system support wires.
  - 2. Support Clips: Fasten to lighting fixtures and to ceiling grid members at or near each fixture corner with clips that are UL listed for the application.

- 3. Fixtures of Sizes Less Than Ceiling Grid: Install as indicated on reflected ceiling plans or center in acoustical panel, and support fixtures independently with at least two 3/4-inch metal channels spanning and secured to ceiling tees.
- 4. Install at least two independent support rods or wires from the structure to tabs at diagonal corners of each lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- F. Suspended Lighting Fixture Support:
  - 1. Pendants and Rods: Where longer than 48 inches, brace to limit swinging.
  - 2. Stem-Mounted, Single-Unit Fixtures: Suspend with twin-stem hangers.
  - 3. Continuous Rows: Use tubing or stem for wiring at one point and tubing or rod for suspension for each unit length of fixture chassis, including one at each end.
  - 4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.
  - 5. Provide an independent safety chain for fixtures located in gymnasiums or cafeterias used as auxiliary gyms. The safety chain shall be installed from the fixture to the structure.

# 3.2 GROUNDING

- A. Ground metal poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
  - 1. Install grounding electrode for each pole unless otherwise indicated.
  - 2. Install grounding conductor pigtail in the base for connecting luminaire to grounding system.
- B. Ground nonmetallic poles and support structures according to Division 26 Section "Grounding and Bonding for Electrical Systems."
  - 1. Install grounding electrode for each pole.
  - 2. Install grounding conductor and conductor protector.
  - 3. Ground metallic components of pole accessories and foundations.

# 3.3 FIELD QUALITY CONTROL

- A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.
- B. Inspect each installed fixture for damage. Replace damaged fixtures and components.
- C. Illumination Observations: Verify normal operation of lighting units after installing luminaires and energizing circuits with normal power source.
- D. Verify luminaires are operating seemlessly with the lighting controls.

# 3.4 STARTUP SERVICE

A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner.

END OF SECTION 26 51 00

# SECTION 27 15 00 - COMMUNICATIONS HORIZONTAL CABLING

### PART 1 - GENERAL

# 1.1 SUMMARY

- A. Section Includes:
  - 1. Pathways.
  - 2. UTP cabling.
  - 3. Cable connecting hardware, patch panels, and cross-connects.
  - 4. Telecommunications outlet/connectors.
  - 5. Cabling system identification products.
  - 6. Cable management system.

# 1.2 HORIZONTAL CABLING DESCRIPTION

- A. Horizontal cable and its connecting hardware provide the means of transporting signals between the telecommunications outlet/connector and the horizontal cross-connect located in the communications equipment room. This cabling and its connecting hardware are called "permanent link," a term that is used in the testing protocols.
  - 1. Bridged taps and splices shall not be installed in the horizontal cabling. Horizontal cabling shall be continuous.
- B. The maximum allowable horizontal cable length is 295 feet. This maximum allowable length does not include an allowance for the length of 16 feet to the workstation equipment. The maximum allowable length does not include an allowance for the length of 16 feet in the horizontal cross-connect.
- 1.3 SUBMITTALS
  - A. Product Data: For each type of product indicated, including:
    - 1. UTP cabling.
    - 2. Telecommunications outlets.
    - 3. Patch panels.
    - 4. Patch cords.
  - B. Qualification Data: provide copy of certifications for installer and installation supervisor.
  - C. Maintenance Data: For splices and connectors to include in maintenance manuals.

# 1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Cabling Installer must have personnel certified by BICSI on staff or certified by the material manufacturer to install their products.
  - 1. Installation Supervision: Installation shall be under the direct supervision of certified installer, who shall be present at all times when Work of this Section is performed at Project site.
- B. General Performance: Horizontal cabling system shall comply with transmission standards in ANSI/TIA-568-C.1, when tested according to test procedures of this standard.
- C. Telecommunications Pathways and Spaces: Comply with ANSI/TIA-569-C.
- D. Grounding: Comply with ANSI/TIA-607-B.

### 1.5 DELIVERY, STORAGE, AND HANDLING

- A. Test cables upon receipt at Project site.
  - 1. Test each pair of UTP cable for open and short circuits.

#### 1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install cables and connecting materials until wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

### 1.7 COORDINATION

- A. Coordinate layout and installation of telecommunications pathways and cabling with Owner's telecommunications and LAN equipment and service suppliers.
- B. Coordinate telecommunications outlet/connector locations with location of power receptacles at each work area.

### PART 2 - PRODUCTS

### 2.1 PATHWAYS

- A. Cable Support: NRTL labeled for support of Category 6 cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
  - 1. Comply with NFPA 70 and UL 2043 for fire resistant and low smoke producing characteristics.
  - 2. Straps and other devices. All cable straps shall be reusable black Velcro cable wraps. No zip ties will be permitted.

# 2.2 UTP CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. TE Connectivity
  - 2. General Cable
  - 3. Berk-tek
  - 4. Hitachi
  - 5. Mohawk
  - 6. Leviton
  - 7. Superior Essex
  - 8. Belden
- B. Description: 100-ohm, 4-pair UTP, with a thermoplastic, plenum rated jacket. Acceptable Category 6 cable shall have a divider or separator between pairs. Color as selected by the owner/engineer during shop drawing reviews.
  - 1. Comply with ANSI/TIA-568-C.1 for performance specifications.
  - 2. Comply with ANSI/TIA-568-C.2, Category 6.
  - 3. Listed and labeled by an NRTL acceptable to authorities having jurisdiction as complying with UL 444 and NFPA 70 for the following types:
    - a. Communications, General Purpose: Type CM or CMG.
    - b. Communications, Plenum Rated: Type CMP, complying with NFPA 262.

c. Communications, Riser Rated: Type CMR, complying with UL 1666.

# 2.3 UTP CABLE HARDWARE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
  - 1. Panduit Corp.
  - 2. Hubbell Premise Wiring
  - 3. TE Connectivity
  - 4. Leviton Voice & Data Division
  - 5. Ortronics
  - 6. Belden
- B. General Requirements for Cable Connecting Hardware: Comply with ANSI/TIA-568-C.2, IDC type, with modules designed for punch-down caps or tools. Cables shall be terminated with connecting hardware of same category or higher.
- C. Connecting Blocks: 110-style IDC for Category 6. Provide blocks for the number of cables terminated on the block, plus 25 percent spare. Integral with connector bodies, including plugs and jacks where indicated.
- D. Cross-Connect: Modular array of connecting blocks arranged to terminate building cables and permit interconnection between cables.
  - 1. Number of Terminals per Field: One for each conductor in assigned cables.
- E. Patch Panel: Modular patch panels with molded rear snap-in faceplates to accept modular jacks. Provide with labels.
  - 1. Number of Ports: One for each four-pair cable, plus 25 percent spare spaces.
- F. Jacks and Jack Assemblies: Modular, color-coded, eight-position modular receptacle units with integral IDC-type terminals.
- G. Patch Cords: Factory-made, four-pair cables; terminated with eight-position modular plug at each end.
  - 1. Provide equipment room patch cords for 100% of the voice and data cables. Cord lengths shall be 4 feet.
  - 2. Provide workstation patch cords for 100% of the voice and data cables. Cord lengths shall be 10 feet.
  - 3. Patch cords shall have bend-relief-compliant boots and color-coded icons to ensure Category 6 performance. Patch cords shall have latch guards to protect against snagging.
  - 4. Patch cords shall have color-coded boots for circuit identification.
  - 5. Color to be selected by Engineer during submittal review.

# 2.4 TELECOMMUNICATIONS OUTLET/CONNECTORS

- A. Jacks: 100-ohm, balanced, twisted-pair connector; four-pair, eight-position modular.
- B. Workstation Outlets: Four-port-connector modular assemblies mounted in single or multigang faceplate.
  - 1. Faceplate: Coordinate color and material type with Division 26 Section "Wiring Devices."
    - a. Provide Decora style faceplates to cover Decora style inserts.
- 2. For use with snap-in jacks accommodating any combination of UTP, optical fiber, and coaxial work area cords.
  - a. Flush mounting jacks installed in Decora style inserts.
  - b. Decora style inserts shall be thermoplastic.
- 3. Label: Machine generated, self-laminating, adhesive label.

### 2.5 IDENTIFICATION PRODUCTS

A. Comply with ANSI/TIA-606-B and UL 969 for labeling materials, including label stocks, laminating adhesives, and inks used by label printers.

#### PART 3 - EXECUTION

- 3.1 WIRING METHODS
  - A. Wiring Method: Install cables in raceways and cable trays except within consoles, cabinets, desks, and counters. Conceal raceway and cables except in unfinished spaces.
    - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
    - 2. All communications cabling shall be installed above grade, with the exception of where they are installed to floor boxes or island furnishings. Where cabling is installed below grade, the cable must be rated for wet location installation.
  - B. Wiring within Enclosures: Bundle, lace, and train cables to terminal points with no excess and without exceeding manufacturer's limitations on bending radii. Provide and use lacing bars and distribution spools.

# 3.2 INSTALLATION OF CABLES

- A. Comply with NECA 1.
- B. General Requirements for Cabling:
  - 1. Comply with ANSI/TIA-568-C.1.
  - 2. Comply with BICSI ITSIM, Ch. 6, "Cable Termination Practices."
  - 3. Install 110-style IDC termination hardware unless otherwise indicated.
  - 4. Terminate conductors; no cable shall contain unterminated elements. Make terminations only at indicated outlets, terminals, cross-connects, and patch panels.
  - 5. Cables may not be spliced. Secure and support cables at intervals not exceeding 5 feet and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
  - 6. Install lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
  - 7. Bundle, lace, and train conductors to terminal points without exceeding manufacturer's limitations on bending radii, but not less than radii specified in BICSI ITSIM, "Cabling Termination Practices" Chapter. Install lacing bars and distribution spools.
  - 8. Do not install bruised, kinked, scored, deformed, or abraded cable. Do not splice cable between termination, tap, or junction points. Remove and discard cable if damaged during installation and replace it with new cable.
  - 9. Cold-Weather Installation: Bring cable to room temperature before unreeling. Heat lamps shall not be used for heating.

- 10. Service Loops: In the communications equipment room, install a 10-foot-long service loop. Install a one-foot long service loop at the workstation. This loop shall be coiled and attached to the conduit stub-up or stub-out above ceiling. The coil shall be a minimum of 12 inches in diameter.
- 11. Pulling Cable: Comply with BICSI ITSIM, Ch. 4, "Pulling Cable." Monitor cable pull tensions.
- C. UTP Cable Installation:
  - 1. Comply with ANSI/TIA-568-C.2.
  - 2. Maintain a 1/2 inch (or less) untwist on UTP cables from the point of termination to maintain cable geometry.
- D. Open-Cable Installation:
  - 1. Install cabling with horizontal and vertical cable guides in telecommunications spaces with terminating hardware and interconnection equipment.
  - 2. Suspend UTP cable not in a wireway or pathway a minimum of 8 inches above ceilings by J-hooks not more than 60 inches apart.
  - 3. Cable shall not be run through structural members or in contact with pipes, ducts, or other potentially damaging items.
- E. Group connecting hardware for cables into separate logical fields.
- F. Separation from EMI Sources:
  - 1. Comply with BICSI TDMM 13<sup>th</sup> edition and ANSI/TIA-569-C for separating unshielded copper voice and data communication cable from potential EMI sources, including electrical power lines and equipment.
  - 2. Separation between open communications cables or cables in nonmetallic raceways and unshielded power conductors and electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 5 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 12 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 24 inches.
  - 3. Separation between communications cables in grounded metallic raceways and unshielded power lines or electrical equipment shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: A minimum of 2-1/2 inches.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 6 inches.
    - c. Electrical Equipment Rating More Than 5 kVA: A minimum of 12 inches.
  - 4. Separation between communications cables in grounded metallic raceways and power lines and electrical equipment located in grounded metallic conduits or enclosures shall be as follows:
    - a. Electrical Equipment Rating Less Than 2 kVA: No requirement.
    - b. Electrical Equipment Rating between 2 and 5 kVA: A minimum of 3 inches.

- c. Electrical Equipment Rating More Than 5 kVA: A minimum of 6 inches.
- 5. Separation between Communications Cables and Electrical Motors and Transformers, 5 kVA or HP and Larger: A minimum of 48 inches.
- 6. Separation between Communications Cables and Fluorescent Fixtures: A minimum of 5 inches.

## 3.3 FIRESTOPPING

- A. Comply with ANSI/TIA-569-C, Annex A, "Firestopping."
- B. Comply with BICSI TDMM 13<sup>th</sup> edition, "Firestopping Systems" Chapter 7.

## 3.4 GROUNDING

- A. Install grounding according to BICSI TDMM 13<sup>th</sup> edition, Grounding, Bonding (Earthing) Chapter 8.
- B. Comply with ANSI/TIA-607-B.
- C. Bond metallic equipment to the grounding bus bar, using not smaller than No. 6 AWG equipment grounding conductor.

### 3.5 IDENTIFICATION

- A. Identify system components, wiring, and cabling complying with ANSI/TIA-606-B.
  - 1. Color-code cross-connect fields. Apply colors to voice and data service backboards, connections, covers, and labels.
- B. Use unique, alphanumeric designation for each cable and label cable, jacks, connectors, and terminals to which it connects with same designation.
  - 1. Example Label 121-A-1-D1, D2
    - a. 121 Room number
    - b. A Distribution frame identifier. IDF-A. Where cable originates.
    - c. 1 Patch panel identifier. Where cable originates.
    - d. D1, D2 Data jacks 1 and 2 in this outlet and room.
- C. Comply with requirements in Division 09 Section "Interior Painting" for painting backboards. For fire-resistant plywood, do not paint over manufacturer's label.
- D. Paint and label colors for equipment identification shall comply with ANSI/TIA-606-A.
- E. Cable Schedule: Post in prominent location in each equipment room and wiring closet. List incoming and outgoing cables and their designations, origins, and destinations. Protect with rigid frame and clear plastic cover. Furnish an electronic copy of final comprehensive schedules for Project.
- F. Cable and Wire Identification:
  - 1. Label each cable at each termination and tap, where it is accessible in a cabinet or junction or outlet box, and elsewhere as indicated. Provide three labels at each end, spaced 12 inches apart. The first label shall be installed within four inches of the termination. Labels shall be visible from all sides of cable.
  - 2. Label each terminal strip and screw terminal in each cabinet, rack, or panel.
    - a. Individually number wiring conductors connected to terminal strips, and identify each cable or wiring group being extended from a panel or

cabinet to a building-mounted device shall be identified with name and number of particular device as shown.

- b. Label each unit and field within distribution racks and frames.
- 3. Identification within Connector Fields in Equipment Rooms and Wiring Closets: Label each connector and each discrete unit of cable-terminating and connecting hardware. Where similar jacks and plugs are used for both voice and data communication cabling, use a different color for jacks and plugs of each service.
- G. Labels shall be preprinted or computer-printed type with printing area and font color that contrasts with cable jacket color but still complies with requirements in ANSI/TIA-606-B.
  - 1. Use flexible vinyl or polyester, self-laminating, adhesive labels that flex as cables are bent.

# 3.6 FIELD QUALITY CONTROL

- A. Perform Tests and Inspections:
  - 1. Visually inspect UTP and optical fiber cable jacket materials for NRTL certification markings. Inspect cabling terminations in communications equipment rooms for compliance with color-coding for pin assignments, and inspect cabling connections for compliance with ANSI/TIA-568-C.1.
  - 2. Visually confirm Category 6, marking of outlets, cover plates, outlet/connectors, and patch panels.
  - 3. Visually inspect cable placement, cable termination, grounding and bonding, equipment and patch cords, and labeling of all components.
    - a. Test instruments shall meet or exceed applicable requirements in ANSI/TIA-568-C.2. Perform tests with a tester that complies with performance requirements in "Test Instruments (Normative)" Annex, complying with measurement accuracy specified in "Measurement Accuracy (Informative)" Annex. Use only test cords and adapters that are qualified by test equipment manufacturer for channel or link test configuration.
  - 4. UTP Cable Tests:
    - a. All twisted-pair copper cable links shall be tested for continuity, pair reversals, shorts, opens and performance.
    - b. UTP performance test using a level IIe tester for Category 5e, level III tester for Category 6 and level IIIe for Category test cable. Test for each outlet and MUTOA. Perform the following tests according to ANSI/TIA-568-C.1 and ANSI/TIA-568-C.2:
      - 1) Wire map.
      - 2) Length (physical vs. electrical, and length requirements).
      - 3) Insertion loss.
      - 4) Near-end crosstalk (NEXT) loss.
      - 5) Power sum near-end crosstalk (PSNEXT) loss.
      - 6) Equal-level far-end crosstalk (ELFEXT).
      - 7) Power sum equal-level far-end crosstalk (PSELFEXT).
      - 8) Return loss.
      - 9) Propagation delay.

- 10) Delay skew.
- 5. Continuity: Each pair of each installed cable shall be tested using a test unit that shows opens, shorts, polarity and pair-reversals, crossed pairs and split pairs. Shielded/screened cables shall be tested with a device that verifies shield continuity in addition to the above stated tests. The test shall be recorded as pass/fail as indicated by the test unit in accordance with the manufacturers' recommended procedures, and referenced to the appropriate cable identification number and circuit or pair number. Any faults in the wiring shall be corrected and the cable re-tested prior to final acceptance.
- 6. Length: Each installed cable link shall be tested for installed length using a TDR type device. The cables shall be tested from patch panel to patch panel, block to block, patch panel to outlet or block to outlet as appropriate. The cable length shall conform to the maximum distances set forth in the ANSI/TIA 568-C Standard. Cable lengths shall be recorded, referencing the cable identification number and circuit or pair number. For multi-pair cables, the shortest pair length shall be recorded as the length for the cable.
- 7. Final Verification Tests: Perform verification tests for UTP systems after the complete communications cabling and workstation outlet/connectors are installed.
  - a. Voice Tests: These tests assume that dial tone service has been installed. Connect to the network interface device at the demarcation point. Go off-hook and listen and receive a dial tone. If a test number is available, make and receive a local, long distance, and digital subscription line telephone call.
  - b. Data Tests: Connect to the network interface device at the demarcation point. Log onto the network to ensure proper connection to the network.
- B. Document data for each measurement. Data for submittals shall be printed in a summary report that is formatted similar to Table 10.1 in BICSI TDMM, or transferred from the instrument to the computer, saved as text files, and printed and submitted.
- C. End-to-end cabling will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
  - 1. Upon completion of the installation, the telecommunications contractor shall provide three (3) full documentation sets to the Engineer for approval. Documentation shall include the items detailed in the sub-sections below.
  - 2. Documentation shall be submitted within ten (10) working days of the completion of each testing phase (e.g. subsystem, cable type, area, floor, etc.). This is inclusive of all test result and draft as-built drawings. Draft drawings may include annotations done by hand. Machine generated (final) copies of all drawings shall be submitted within 30 working days of the completion of each testing phase. At the request of the Engineer, the telecommunications contractor shall provide copies of the original test results.
  - 3. The Engineer may request that a 10% random field re-test be conducted on the cable system, at no additional cost, to verify documented findings. Tests shall be a repeat of those defined above. If findings contradict the documentation submitted by the telecommunications contractor, additional testing can be required to the extent determined necessary by the Engineer, including a 100% re-test. This re-test shall be at no additional cost to the Owner.

## 3.7 DEMONSTRATION

- A. Train Owner's maintenance personnel in cable-plant management operations, including changing signal pathways for different workstations, rerouting signals in failed cables, and keeping records of cabling assignments and revisions when extending wiring to establish new workstation outlets.
- 3.8 WARRANTY
  - A. A warranty shall be provided for all internal infrastructure wiring as it pertains to voice and data networking for both copper and fiber systems. All installations must be performed according to the manufacturer's System Warranty and Performance Application.
  - B. The warranty will combine an extended product and applications assurance warranty for a minimum of 25 years.
  - C. An Extended Product Warranty shall be provided which warrants functionality of all components used in the system from the date of registration. The Extended Product Warranty shall warrant the installed horizontal and/or backbone copper, and both the horizontal and the backbone optical fiber portions of the cabling system.
  - D. The Application Assurance Warranty shall cover the failure of the wiring system to support the applications that are designed for the link/channel specifications of ANSI/TIA-568-B-1. These applications include, but are not limited to, 10BASE-T, 100BASE-T, 1000BASE-T and 155 Mb/s ATM.
  - E. The contractor shall provide a warranty on the physical installation.

## 3.9 FINAL ACCEPTANCE & SYSTEM CERTIFICATION

A. Completion of the installation, in-progress and final inspections, receipt of the test and asbuilt documentation, and successful performance of the cabling system for a two week period will constitute acceptance of the system. Upon successful completion of the installation and subsequent inspection, the end user shall be provided with a certificate, from the manufacturer, registering the installation.

END OF SECTION 27 51 00

## SECTION 27 51 23 – INTERCOM AND CLOCK SYSTEM

PART 1 - GENERAL

#### 1.1 SUMMARY

- A. Provide new components that are compatible with existing system.
- B. Refer to Contract Drawings for existing intercom and clock system type and where new devices are required.
- 1.2 SCOPE
  - A. Provide all new devices and required cabling to extend sytems into renovated spaces.
- 1.3 SUBMITTALS
  - A. Product Data
    - 1. Include catalogue data sheets, manufacturer's default specifications, user operation guides, and bill of materials.
  - B. Shop Drawings
    - 1. Provide a 1/8" scale floor plan with all new device locations and cabling that is being provided.
      - a. Composite wiring and/or schematic diagrams of the complete system as proposed to be installed. Drawing shall include relative position of all major components, typical connections, field components, accessories, and cable types.
  - C. Quality control shall include the following:
    - 1. Name, address, and telephone number of the nearest fully equipped service organization.
    - 2. Submit a certificate of completion of installation and service training from the system manufacturer.
    - 3. Submit a list of comparable completed projects. Furnish the name, address, telephone number, and contact name of end user.
  - A. Qualifications Data
    - 1. Manufacturers must be regularly engaged in the manufacture of integrated communication systems, master clock systems, and ancillary equipment, of types and capacities required. Approved products shall have been in satisfactory use in similar service for not less than five years.
    - 2. Installer's Qualifications: Firms with at least five years of successful installation experience with projects utilizing integrated communications systems and equipment similar to that required for this project.
    - 3. All items of equipment including wire and cable shall be designed by the manufacturer to function as a complete system and shall be accompanied by the manufacturer's complete service notes and drawings detailing all interconnections.
    - 4. The Contractor shall be an established communications and electronics Contractor that has had and currently maintains a locally run and operated business for at least five years. The Contractor shall be a duly authorized distributor of the equipment supplied with full manufacturer's warranty privileges.
    - 5. The Contractor shall show satisfactory evidence, upon request, that they maintain a fully equipped service organization capable of furnishing adequate inspection and service to the system. The Contractor shall maintain at their

facility the necessary spare parts in the proper proportion as recommended by the manufacturer to maintain and service the equipment being supplied.

- 6. Except where specifically noted otherwise, all equipment supplied shall be the standard product of a single manufacturer of known reputation and experience in the industry. The Contractor shall have attended the manufacturer's installation and service school and upon request must show proof of attending such a school.
- 7. Installing contractor must have a service office within 120 miles of the site and be expected of providing service within a 24-hour period of time.
- D. OPERATION AND MAINTENANCE MANUALS
  - 1. Provide all required installation, maintenance, and service manuals as required.
  - 2. Refer to general requirements for additional information.

## PART 2 - PRODUCTS

## 2.1 ACCEPTABLE MANUFACTURERS

- A. Intercom Components
  - 1. Rauland, no exceptions
- B. Wireless Clock System Components
  - 1. Primex Wireless, no exceptions

## 2.2 CALL SWITCHES

A. Provide a call switch where shown on the floor plans.

### 2.3 CEILING SPEAKERS

- A. The loudspeaker/transformer/baffle assembly shall be used for flush mounting on ceilings. Furnish and install as indicated on the plans.
- B. The loudspeaker size shall be 8 inches in diameter and have a power handling capacity of 15 watts. The voice coil shall be of high-temperature bonded construction, be one inch in diameter and have an impedance of 8 ohms. The speaker shall have a frequency range of at least 50 Hz to 15,000 Hz and an axial sensitivity of 91dB at 4 ft, with a 1 watt input signal @ 1000Hz.
- C. The loudspeaker shall be equipped with a factory wired 25/70 volt line-matching transformer. The transformer shall have the primary taps at  $\frac{1}{4}$ ,  $\frac{1}{2}$ , 1, 2, and 4 watts. The insertion loss shall be no greater than 1.0 dB. The transformer shall be mounted to the speaker with the secondary leads soldered to the speaker terminals.
- D. The assembly shall include a baffle constructed of 22 gauge, cold-rolled steel finished with a mar-resistant white, semi-gloss, epoxy coating. The baffle shall have a diameter of 13". The speaker shall mount to a T8 support bridge, used to attach the assembly to suspended ceilings. The support bridge will accept an enclosure, model H8, to provide a protective enclosure. The H8 enclosure shall attach to the support bridge with appropriate mounting screws.

## 2.4 CLOCK SYSTEM

A. Existing clocks to be salvaged and reinstalled. Refer to Contract Drawings.

## PART 3 - EXECUTION

- 3.1 COORDINATION
  - A. Coordinate removal and reinstallation of all devices indicated on plan with demolition phasing. Protect all equipment and reinstall as shown.
  - B. Maintain as much of the existing wiring as possible for reuse.

#### 3.2 INSTALLATION

- A. GENERAL
  - 1. All materials shall be new, free from any defects, and of the best quality of their respective kinds. All like materials shall be of the same manufacture, model, and quality, unless otherwise specified.
  - 2. Contractor shall do all necessary cutting and drilling of present walls, floors, ceilings, etc., for the installation of new work; but no structural work shall be cut, unless specifically shown on drawings and/or approved by the Owner.
  - 3. Install cabling and connections as required for a complete and operating system. All cabling shall be installed in conduit, cable tray on j-hooks. No cabling shall be installed on or through the ceiling structure.

### B. SPECIFIC INSTALLATION AND PROGRAMMING REQUIREMENTS

- 1. Speaker Wattage Taps: All speakers shall be tapped at ½ watt, 25-volt except as follows:
  - a. Hallway speakers shall be tapped 1 watt, 25-volt.

#### 3.3 RACEWAYS AND CABLES

- A. Electrical work will conform to the National Electric Code and applicable local ordinances.
- B. All 125-volt electrical conductors shall be installed in galvanized electrical metallic tubing with compression type fittings and couplings, minimum 1/2" size conduit.
- C. All low-voltage wires and cables concealed in walls shall be run in EMT conduit from flush outlet boxes to above accessible ceilings. Provide conduit where cables penetrate firewalls above ceilings.
- D. All conduit entering boxes shall be served with insulating throat connectors and locknuts.
- E. No raceway shall be located in proximity of hot water lines or excessive heat.
- F. Use cast "C" clamps, "U" straps, or ring hangers attached to rods, and/or brackets fastened to structure.
- G. No perforated straps or tie wires permitted for supporting raceways.
- H. Ground all electrical apparatus in accordance with the National Electric Code.

## 3.4 CERTIFICATION

- A. Upon completion of the testing, the manufacturer or representative shall issue to the Owner a letter of certification attesting to the fact that he has tested and adjusted the system, that all components are properly installed and free of defects, and that the system is in compliance with the specifications.
- B. Provide two hours of videotaped Owner training to include programming functions, paging functions, all page, zone page, bell system programming, general use of program sources, and operation of administrative control consoles.

END OF SECTION 27 51 23

## SECTION 28 31 11 – DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

#### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Manual fire-alarm boxes .
  - 2. System smoke detectors.
  - 3. Notification appliances.

#### 1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. NICET: National Institute for Certification in Engineering Technologies.

### 1.4 SYSTEM DESCRIPTION

- A. Noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only.
- B. All devices provided and work associated with this section of the specifications shall be compatible with the existing fire alarm system in the building, no exceptions. Refer to Contract Drawings for existing system make and model.

#### 1.5 SUBMITTALS

- A. General Submittal Requirements:
  - 1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
  - 2. Shop Drawings shall be prepared by persons with the following qualifications:
    - a. Trained and certified by manufacturer in fire-alarm system design.
    - b. NICET-certified fire-alarm technician, Level III minimum.
    - c. Licensed or certified by authorities having jurisdiction.
- B. Product Data: For each type of product indicated.
- C. Shop Drawings: For fire-alarm system. Include plans, elevations, sections, details, and attachments to other work.
  - 1. Comply with recommendations in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72.
  - 2. Include voltage drop calculations for notification appliance circuits.
  - 3. Include battery-size calculations.
  - 4. Include performance parameters and installation details for each detector, verifying that each detector is listed for complete range of air velocity, temperature, and humidity possible when air-handling system is operating.
  - 5. Include plans, sections, and elevations of heating, ventilating, and airconditioning ducts, drawn to scale and coordinating installation of duct smoke detectors and access to them. Show critical dimensions that relate to placement

and support of sampling tubes, detector housing, and remote status and alarm indicators. Locate detectors according to manufacturer's written recommendations.

- 6. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.
- D. Delegated-Design Submittal: For smoke and heat detectors indicated to comply with performance requirements and design criteria, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation.
  - 1. Drawings showing the location of each smoke and heat detector, ratings of each, and installation details as needed to comply with listing conditions of the detector.
  - 2. Design Calculations: Calculate requirements for selecting the spacing and sensitivity of detection, complying with NFPA 72.
- E. Qualification Data: For qualified Installer.
- F. Field quality-control reports.
- G. Operation and Maintenance Data: For fire-alarm systems and components to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
  - 1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
  - 2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
  - 3. Record copy of site-specific software.
  - 4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
    - a. Frequency of testing of installed components.
    - b. Frequency of inspection of installed components.
    - c. Requirements and recommendations related to results of maintenance.
    - d. Manufacturer's user training manuals.
  - 5. Manufacturer's required maintenance related to system warranty requirements.
  - 6. Abbreviated operating instructions for mounting at fire-alarm control unit.
  - 7. Copy of NFPA 25.

### 1.6 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician.
- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

- E. NFPA Certification: Obtain certification according to NFPA 72 by an NRTL.
- F. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.
- G. NFPA Certification: Obtain certification according to NFPA 72 in the form of a placard by an FMG-approved alarm company.

#### 1.7 RENOVATIONS

- A. Interruption of Existing Fire-Alarm Service: Do not interrupt fire-alarm service to facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary guard service according to requirements indicated:
  - 1. Notify Construction Manager and Owner no fewer than two days in advance of proposed interruption of fire-alarm service.
  - 2. Do not proceed with interruption of fire-alarm service without Construction Manager's and Owner's permission.
- B. Existing Fire-Alarm Equipment: Maintain existing equipment fully operational until new equipment has been tested and accepted. As new equipment is installed, label it "NOT IN SERVICE" until it is accepted. Remove labels from new equipment when put into service and label existing fire-alarm equipment "NOT IN SERVICE" until removed from the building.
- C. Equipment Removal: After acceptance of new fire-alarm system, remove existing disconnected fire-alarm equipment and wiring.

#### PART 2 - PRODUCTS

- 2.1 MANUFACTURERS
  - A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
    - 1. NOTIFIER; a Honeywell company.

## 2.2 SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices:
  - 1. Manual stations.
  - 2. Heat detectors.
  - 3. Smoke detectors.
  - 4. Duct smoke detectors.
  - 5. Verified automatic alarm operation of smoke detectors.
  - 6. Automatic sprinkler system water flow.
  - 7. Fire-extinguishing system operation.
  - 8. Fire standpipe system.
- B. Fire-alarm signal shall initiate the following actions:
  - 1. Continuously operate alarm notification appliances.
  - 2. Identify alarm at fire-alarm control unit and remote annunciators.
  - 3. Transmit an alarm signal to the remote alarm receiving station.
  - 4. Unlock electric door locks in designated egress paths.

- 5. Release fire and smoke doors held open by magnetic door holders.
- 6. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
- 7. Close smoke dampers in air ducts of designated air-conditioning duct systems.
- 8. Recall elevators to primary or alternate recall floors.
- 9. Activate emergency shutoffs for gas and fuel supplies.
- 10. Record events in the system memory.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
  - 1. Valve supervisory switch.
  - 2. Elevator shunt-trip supervision.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
  - 1. Open circuits, shorts, and grounds in designated circuits.
  - 2. Opening, tampering with, or removing alarm-initiating and supervisory signalinitiating devices.
  - 3. Loss of primary power at fire-alarm control unit.
  - 4. Ground or a single break in fire-alarm control unit internal circuits.
  - 5. Abnormal ac voltage at fire-alarm control unit.
  - 6. Break in standby battery circuitry.
  - 7. Failure of battery charging.
  - 8. Abnormal position of any switch at fire-alarm control unit or annunciator.
- E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators. Record the event on system printer.

### 2.3 MANUAL FIRE-ALARM BOXES

- A. General Requirements for Manual Fire-Alarm Boxes: Comply with UL 38. Boxes shall be finished in red with molded, raised-letter operating instructions in contrasting color; shall show visible indication of operation; and shall be mounted on recessed outlet box. If indicated as surface mounted, provide manufacturer's surface back box.
  - 1. Double-action mechanism requiring two actions to initiate an alarm, pull-lever type; with integral addressable module arranged to communicate manual-station status (normal, alarm, or trouble) to fire-alarm control unit.
  - 2. Station Reset: Key- or wrench-operated switch.
  - 3. Indoor Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm. Lifting the cover actuates an integral battery-powered audible horn intended to discourage false-alarm operation.
  - 4. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.
- 2.4 SYSTEM SMOKE DETECTORS
  - A. General Requirements for System Smoke Detectors:

- 1. Comply with UL 268; operating at 24-V dc, nominal.
- 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- 3. Base Mounting: Detector and associated electronic components shall be mounted in a twist-lock module that connects to a fixed base. Provide terminals in the fixed base for connection to building wiring.
- 4. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
- 5. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
- 6. Remote Control: Unless otherwise indicated, detectors shall be analogaddressable type, individually monitored at fire-alarm control unit for calibration, sensitivity, and alarm condition and individually adjustable for sensitivity by firealarm control unit.
  - a. Rate-of-rise temperature characteristic shall be selectable at fire-alarm control unit for 15 or 20 deg F per minute.
  - b. Fixed-temperature sensing shall be independent of rate-of-rise sensing and shall be settable at fire-alarm control unit to operate at 135 or 155 deg F.
  - c. Provide multiple levels of detection sensitivity for each sensor.
- B. Photoelectric Smoke Detectors:
  - 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
  - 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    - a. Primary status.
    - b. Device type.
    - c. Present average value.
    - d. Present sensitivity selected.
    - e. Sensor range (normal, dirty, etc.).
- C. Ionization Smoke Detector:
  - 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
  - 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
    - a. Primary status.
    - b. Device type.
    - c. Present average value.
    - d. Present sensitivity selected.
    - e. Sensor range (normal, dirty, etc.).
- D. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

- 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
- 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
  - a. Primary status.
  - b. Device type.
  - c. Present average value.
  - d. Present sensitivity selected.
  - e. Sensor range (normal, dirty, etc.).
- 3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
- 4. Each sensor shall have multiple levels of detection sensitivity.
- 5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
- 6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

## 2.5 NOTIFICATION APPLIANCES

- A. General Requirements for Notification Appliances: Individually addressed, connected to a signaling line circuit, equipped for mounting as indicated and with screw terminals for system connections.
- B. General Requirements for Notification Appliances: Connected to notification appliance signal circuits, zoned as indicated, equipped for mounting as indicated and with screw terminals for system connections.
  - 1. Combination Devices: Factory-integrated audible and visible devices in a singlemounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
- C. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.
- D. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.
- E. Horns: Electric-vibrating-polarized type, 24-V dc; with provision for housing the operating mechanism behind a grille. Comply with UL 464. Horns shall produce a sound-pressure level of 90 dBA, measured 10 feet from the horn, using the coded signal prescribed in UL 464 test protocol.
- F. Visible Notification Appliances: Xenon strobe lights comply with UL 1971, with clear or nominal white polycarbonate lens mounted on an aluminum faceplate. The word "FIRE" is engraved in minimum 1-inch high letters on the lens.
  - 1. Rated Light Output:
    - a. 15/30/75/110 cd, selectable in the field.
  - 2. Mounting: Wall mounted unless otherwise indicated.
  - 3. For units with guards to prevent physical damage, light output ratings shall be determined with guards in place.
  - 4. Flashing shall be in a temporal pattern, synchronized with other units.
  - 5. Strobe Leads: Factory connected to screw terminals.
  - 6. Mounting Faceplate: Factory finished, red.

## 2.6 SURGE PROTECTION

- A. Acceptable Manufacturers:
  - 1. 120Volt/20 Amp Ditek 120SR
  - 2. Analog Dialer Ditek 2MHTPWB
  - 3. IP Dialer Ditek MRJ45C5E
  - 4. Exterior Fire Alarm Circuits Ditek LVLP Series
  - 5. The above list of equipment represents a minimum standard of quality. It is not intended to limit the acceptable manufacturers. Equivalent surge protection devices may be provided by other manufacturers.
- B. Provide surge protection for the following:
  - 1. 120 Volt AC circuits connected to the control panel, extender panels and any other fire alarm device requiring 120 Volt connections.
  - 2. All exterior fire alarm circuits.
  - 3. IP or analog automatic dialers. Provide protection on the telephone or data cables extending to/from the dialer.

### PART 3 - EXECUTION

- 3.1 EQUIPMENT INSTALLATION
  - A. Comply with NFPA 72 for installation of fire-alarm equipment.
  - B. Connecting to Existing Equipment in Renovated Spaces: Verify that existing fire-alarm system is operational before making changes or connections.
    - 1. Connect new equipment to existing control panel in existing part of the building.
    - 2. Expand, modify, and supplement existing control and monitoring equipment as necessary to extend existing control and monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
  - C. Smoke- or Heat-Detector Spacing:
    - 1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
    - 2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
    - 3. Smooth ceiling spacing shall not exceed 30 feet.
    - 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
    - 5. Remote Booster Power Supplies: These are not shown on the contract documents. This is part of the delegated design and the location and quantities are left to the discretion of the contractor. System smoke detectors shall be installed at each remote power supply location.
    - 6. HVAC: Locate detectors not closer than 5 feet from air-supply diffuser or returnair opening.
    - 7. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.

- D. Remote Status and Alarm Indicators: Install near each smoke detector and each sprinkler water-flow switch and valve-tamper switch that is not readily visible from normal viewing position.
- E. Audible Alarm-Indicating Devices: Install not less than 6 inches below the ceiling. Install bells and horns on flush-mounted back boxes with the device-operating mechanism concealed behind a grille.
- F. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.
- G. Device Location-Indicating Lights: Locate in public space near the device they monitor.

## 3.2 CONNECTIONS

- A. For fire-protection systems related to doors in fire-rated walls and partitions and to doors in smoke partitions, comply with requirements in Division 08 Section "Door Hardware." Connect hardware and devices to fire-alarm system.
  - 1. Verify that hardware and devices are NRTL listed for use with fire-alarm system in this Section before making connections.
- B. Make addressable connections with a supervised interface device to the following devices and systems. Install the interface device less than 3 feet from the device controlled. Make an addressable confirmation connection when such feedback is available at the device or system being controlled.
  - 1. Alarm-initiating connection to smoke-control system (smoke management) at firefighter smoke-control system panel.
  - 2. Smoke dampers in air ducts of designated air-conditioning duct systems.
  - 3. Alarm-initiating connection to elevator recall system and components.
  - 4. Supervisory connections at valve supervisory switches.
  - 5. Supervisory connections at elevator shunt trip breaker.

# 3.3 IDENTIFICATION

- A. Identify system components, wiring, cabling, and terminals. Comply with requirements for identification specified in Division 26 Section "Basic Electrical Material and Methods."
- B. Install framed instructions in a location visible from fire-alarm control unit.

### 3.4 GROUNDING

A. Ground fire-alarm control unit and associated circuits; comply with IEEE 1100. Install a ground wire from main service ground to fire-alarm control unit.

# 3.5 FIELD QUALITY CONTROL

- A. Field tests shall be witnessed by authorities having jurisdiction.
- B. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections.
- C. Perform tests and inspections.
  - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- D. Tests and Inspections:
  - 1. Visual Inspection: Conduct visual inspection prior to testing.

- a. Inspection shall be based on completed Record Drawings and system documentation that is required by NFPA 72 in its "Completion Documents, Preparation" Table in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter.
- b. Comply with "Visual Inspection Frequencies" Table in the "Inspection" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72; retain the "Initial/Reacceptance" column and list only the installed components.
- 2. System Testing: Comply with "Test Methods" Table in the "Testing" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- 3. Test audible appliances for the public operating mode according to manufacturer's written instructions. Perform the test using a portable sound-level meter complying with Type 2 requirements in ANSI S1.4.
- 4. Test audible appliances for the private operating mode according to manufacturer's written instructions.
- 5. Test visible appliances for the public operating mode according to manufacturer's written instructions.
- 6. Factory-authorized service representative shall prepare the "Fire Alarm System Record of Completion" in the "Documentation" Section of the "Fundamentals of Fire Alarm Systems" Chapter in NFPA 72 and the "Inspection and Testing Form" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
- E. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- F. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- G. Prepare test and inspection reports.
- H. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- I. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

### 3.6 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

### 3.7 MONITORING

A. Utilize existing monitoring agreement. Coordinate with monitoring company when work is being preformed.

END OF SECTION 28 31 11

SECTION 312000 - EARTH MOVING

### PART 1 - GENERAL

### 1.1 RELATED DOCUMENTS

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

#### 1.2 SUMMARY

- A. Section Includes:
  - 1. Excavating and backfilling for structural work.
  - 2. Drainage course for concrete slabs-on-grade.
  - 3. Excavating and backfilling trenches for utilities and pits for buried utility structures.
- B. Related Requirements:
  - 1. Section "Cast-in-Place Concrete"

#### 1.3 ACTION SUBMITTALS

- A. Product Data: For each type of the following manufactured products required:
- B. Preexcavation Photographs or Videotape: Show existing conditions of adjoining construction and site improvements, including finish surfaces that might be misconstrued as damage caused by earth-moving operations. Submit before earth moving begins.
- 1.4 QUALITY ASSURANCE
- 1.5 FIELD CONDITIONS
  - A. Traffic: Minimize interference with adjoining existing facilities during earth-moving operations.
  - B. Utility Locator Service: Notify utility locator service for area where Project is located before beginning earth-moving operations.

### PART 2 - PRODUCTS

#### 2.1 SOIL MATERIALS

A. General: Provide borrow soil materials when sufficient satisfactory soil materials are not available from excavations.

- B. Satisfactory Soils: Soil Classification Groups GW, GP, GM, SW, SP, and SM according to ASTM D 2487 or a combination of these groups; free of rock or gravel larger than 1 inch in any dimension, debris, waste, frozen materials, vegetation, and other deleterious matter.
- C. Unsatisfactory Soils: Soil Classification Groups GC, SC, CL, ML, OL, CH, MH, OH, and PT according to ASTM D 2487, or a combination of these groups.
  - 1. Unsatisfactory soils also include satisfactory soils not maintained within 2 percent of optimum moisture content at time of compaction.
- D. Subbase Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- E. Base Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 294/D 2940M 0; with at least 95 percent passing a 1-1/2-inch sieve and not more than 8 percent passing a No. 200 sieve.
- F. Engineered Fill: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; with at least 90 percent passing a 1-1/2-inch sieve and not more than 12 percent passing a No. 200 sieve.
- G. Bedding Course: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand; ASTM D 2940/D 2940M; except with 100 percent passing a 1-inch sieve and not more than 8 percent passing a No. 200 sieve.
- H. Drainage Course: Narrowly graded mixture of washed, crushed stone, or crushed or uncrushed gravel; ASTM D 448; coarse-aggregate grading Size 57; with 100 percent passing a 1-1/2-inch sieve and zero to 5 percent passing a No. 8 sieve.
- I. Sand: ASTM C 33/C 33M; fine aggregate.
- J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.

### 2.2 CONTROLLED LOW-STRENGTH MATERIAL

- A. Controlled Low-Strength Material: Self-compacting, normal and low-density, flowable concrete material produced from the following:
  - 1. Portland Cement: ASTM C 150/C 150M, Type II.
  - 2. Fly Ash: ASTM C 618, Class F.
  - 3. Normal-Weight Aggregate: ASTM C 33/C 33M, 3/8-inch nominal maximum aggregate size.
  - 4. Foaming Agent: ASTM C 869/C 869M.
  - 5. Water: ASTM C 94/C 94M.
  - 6. Air-Entraining Admixture: ASTM C 260/C 260M.
- B. Produce low-density, controlled low-strength material with the following physical properties:
  - 1. As-Cast Unit Weight: 30 to 36 lb/cu. ft. at point of placement, when tested according to ASTM C 138/C 138M.
  - 2. Compressive Strength: 80 psi, when tested according to ASTM C 495/C 495M.

C. Produce normal-weight, controlled low-strength material with 80-psi compressive strength when tested according to ASTM C 495/C 495M.

#### 2.3 ACCESSORIES

- A. Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility; colored as follows:
- B. Detectable Warning Tape: Acid- and alkali-resistant, polyethylene film warning tape manufactured for marking and identifying underground utilities, a minimum of 6 inches wide and 4 mils thick, continuously inscribed with a description of the utility, with metallic core encased in a protective jacket for corrosion protection, detectable by metal detector when tape is buried up to 30 inches deep; colored as follows:
  - 1. Red: Electric.
  - 2. Yellow: Gas, oil, steam, and dangerous materials.
  - 3. Orange: Telephone and other communications.
  - 4. Blue: Water systems.
  - 5. Green: Sewer systems.

### PART 3 - EXECUTION

#### 3.1 PREPARATION

- A. Protect structures, utilities, sidewalks, pavements, and other facilities from damage caused by settlement, lateral movement, undermining, washout, and other hazards created by earth-moving operations.
- B. Protect and maintain erosion and sedimentation controls during earth-moving operations.
- C. Protect subgrades and foundation soils from freezing temperatures and frost. Remove temporary protection before placing subsequent materials.

#### 3.2 DEWATERING

- A. Prevent surface water and ground water from entering excavations, from ponding on prepared subgrades, and from flooding Project site and surrounding area.
- B. Protect subgrades from softening, undermining, washout, and damage by rain or water accumulation.
  - 1. Reroute surface water runoff away from excavated areas. Do not allow water to accumulate in excavations. Do not use excavated trenches as temporary drainage ditches.

#### 3.3 EXPLOSIVES

A. Explosives: Do not use explosives.

#### 3.4 EXCAVATION, GENERAL

- A. Unclassified Excavation: Excavate to subgrade elevations regardless of the character of surface and subsurface conditions encountered. Unclassified excavated materials may include rock, soil materials, and obstructions. No changes in the Contract Sum or the Contract Time will be authorized for rock excavation or removal of obstructions.
  - 1. If excavated materials intended for fill and backfill include unsatisfactory soil materials and rock, replace with satisfactory soil materials.
  - Remove rock to lines and grades indicated to permit installation of permanent construction without exceeding the following dimensions specified on drawings. If dimensions are not so specified request information from Architect before initiating such excavation:

#### 3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 1 inch. If applicable, extend excavations a sufficient distance from structures for placing and removing concrete formwork, for installing services and other construction, and for inspections.
  - 1. Excavations for Footings and Foundations: Do not disturb bottom of excavation. Excavate by hand to final grade just before placing concrete reinforcement. Trim bottoms to required lines and grades to leave solid base to receive other work.

## 3.6 EXCAVATION FOR UTILITY TRENCHES

- A. Excavate trenches to indicated gradients, lines, depths, and elevations.
  - 1. Beyond building perimeter, excavate trenches to allow installation of top of pipe below frost line.
- B. Excavate trenches to uniform widths to provide the following clearance on each side of pipe or conduit. Excavate trench walls vertically from trench bottom to 12 inches higher than top of pipe or conduit unless otherwise indicated.
  - 1. Clearance: As indicated.
- C. Trench Bottoms: Excavate and shape trench bottoms to provide uniform bearing and support of pipes and conduit. Shape subgrade to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits. Remove projecting stones and sharp objects along trench subgrade.
  - 1. For pipes and conduit less than 6 inches in nominal diameter, hand-excavate trench bottoms and support pipe and conduit on an undisturbed subgrade.
  - 2. For pipes and conduit 6 inches or larger in nominal diameter, shape bottom of trench to support bottom 90 degrees of pipe or conduit circumference. Fill depressions with tamped sand backfill.

- 3. For flat-bottomed, multiple-duct conduit units, hand-excavate trench bottoms and support conduit on an undisturbed subgrade.
- 4. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.
- D. Trench Bottoms: Excavate trenches 4 inches deeper than bottom of pipe and conduit elevations to allow for bedding course. Hand-excavate deeper for bells of pipe.
  - 1. Excavate trenches 6 inches deeper than elevation required in rock or other unyielding bearing material to allow for bedding course.

### 3.7 SUBGRADE INSPECTION

- A. Notify Architect when excavations have reached required subgrade.
- B. If Architect determines that unsatisfactory soil is present, continue excavation and replace with compacted backfill or fill material as directed.
- C. Authorized additional excavation and replacement material will be paid for according to Contract provisions for changes in the Work.
- D. Reconstruct subgrades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by Architect, without additional compensation.

#### 3.8 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending bottom elevation of concrete foundation or footing to excavation bottom, without altering top elevation. Lean concrete fill, with 28-day compressive strength of 2500 psi, may be used when approved by Architect.
  - 1. Fill unauthorized excavations under other construction, pipe, or conduit as directed by Architect.

#### 3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile borrow soil materials and excavated satisfactory soil materials without intermixing. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
  - 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

### 3.10 BACKFILL

- A. Place and compact backfill in excavations promptly, but not before completing the following:
  - 1. Construction below finish grade including, where applicable, subdrainage, dampproofing, waterproofing, and perimeter insulation.
  - 2. Surveying locations of underground utilities for Record Documents.

- 3. Testing and inspecting underground utilities.
- 4. Removing concrete formwork.
- 5. Removing trash and debris.
- 6. Removing temporary shoring, bracing, and sheeting.
- 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.
- B. Place backfill on subgrades free of mud, frost, snow, or ice.

### 3.11 UTILITY TRENCH BACKFILL

- A. Place backfill on subgrades free of mud, frost, snow, or ice.
- B. Place and compact bedding course on trench bottoms and where indicated. Shape bedding course to provide continuous support for bells, joints, and barrels of pipes and for joints, fittings, and bodies of conduits.
- C. Backfill voids with satisfactory soil while removing shoring and bracing.
- D. Backfill as indicated or otherwise required to protect the utility and the use of the grade surface above.
- E. Warning Tape: Install warning tape directly above utilities, 12 inches below finished grade, except 6 inches below subgrade under pavements and slabs.

#### 3.12 SOIL MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill soil layer before compaction to within 2 percent of optimum moisture content.
  - 1. Do not place backfill or fill soil material on surfaces that are muddy, frozen, or contain frost or ice.
  - 2. Remove and replace, or scarify and air dry, otherwise satisfactory soil material that exceeds optimum moisture content by 2 percent and is too wet to compact to specified dry unit weight.

### 3.13 COMPACTION OF SOIL BACKFILLS AND FILLS

- A. Place backfill and fill soil materials in layers not more than 8 inches in loose depth for material compacted by heavy compaction equipment and not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill and fill soil materials evenly on all sides of structures to required elevations and uniformly along the full length of each structure.
- C. Compact soil materials to not less than the percentages of maximum dry unit weight according to ASTM D 698 or ASTM D 1557 as indicated or directed by the Architect:

#### 3.14 GRADING

- A. General: Uniformly grade areas to a smooth surface, free of irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated.
  - 1. Provide a smooth transition between adjacent existing grades and new grades.
  - 2. Cut out soft spots, fill low spots, and trim high spots to comply with required surface tolerances.
- B. Grading inside Building Lines: Finish subgrade to a tolerance of 1/2 inch when tested with a 10foot straightedge.

### 3.15 DRAINAGE COURSE UNDER CONCRETE SLABS-ON-GRADE

- A. Place drainage course on subgrades free of mud, frost, snow, or ice.
- B. On prepared subgrade, place and compact drainage course under cast-in-place concrete slabson-grade as follows:
  - 1. Place drainage course 6 inches or less as indicated in compacted thickness in a single layer.
  - Compact each layer of drainage course to required cross sections and thicknesses to not less than 95 percent of maximum dry unit weight according to ASTM D 698 or so that it is considered well-compacted.

#### 3.16 FIELD QUALITY CONTROL

- A. Special Inspections: Owner will engage a qualified special inspector to perform the following special inspections:
  - 1. Determine prior to placement of fill that site has been prepared in compliance with requirements.
  - 2. Determine that fill material classification and maximum lift thickness comply with requirements.
  - 3. Determine, during placement and compaction, that in-place density of compacted fill complies with requirements.
- B. Testing Agency: Owner may engage a qualified geotechnical engineering testing agency to perform tests and inspections and provide direction where so indicated or required on behalf of Architect.
- C. When testing agency reports that subgrades, fills, or backfills have not achieved degree of compaction specified, scarify and moisten or aerate, or remove and replace soil materials to depth required; recompact and retest until specified compaction is obtained.

## 3.17 PROTECTION

A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.

- B. Repair and reestablish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or where they lose compaction due to subsequent construction operations or weather conditions.
  - 1. Scarify or remove and replace soil material to depth as directed by Architect; reshape and recompact.
- C. Where settling occurs before Project correction period elapses, remove finished surfacing, backfill with additional soil material, compact, and reconstruct surfacing.
  - 1. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to greatest extent possible.

### 3.18 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Remove surplus satisfactory soil and waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.
- B. Transport surplus satisfactory soil to designated storage areas on Owner's property. Stockpile or spread soil as directed by Architect.
  - 1. Remove waste materials, including unsatisfactory soil, trash, and debris, and legally dispose of them off Owner's property.

END OF SECTION 312000