

2018 Indian Hills Middle School Elevator Addition

Bid No. 18-009

Permit and Bid/Construction Documents

25 January 2018

Shawnee Mission School District No. 512

7235 Antioch
Shawnee Mission, KS 66204

Indian Hills Middle School

6400 Mission Road
Prairie Village, KS 66208

Kevin Cowan Architects LLC

7840 Conser Street
Overland Park, Kansas 66204

2018 Indian Hills Middle School Elevator Addition Shawnee Mission School District

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INVITATION TO BID

Project: 2018 Indian Hills Middle School Elevator Addition Shawnee Mission School District

Issue Date: 25 January, 2018

Architect: Kevin Cowan Architects
7840 Conser Street
Overland Park, KS 66204
Contact: Chad Luikart, 913-341-3288 ext 4

Owner: Shawnee Mission School District
8200 W 71st Street
Overland Park, KS 66204

Bid Time/Date: 2:00 PM, February 15, 2018

Submit Bids to: Shawnee Mission Public Schools
Attn: Everett Morgan
8200 W 71st Street
Overland Park, KS 66204

Note: A bid form is invalid if it has not been received by the time, date and at the location designated for receipt as specified in this Invitation to Bid. Faxed, e-mailed or telephone bid proposals will not be accepted.

Description of the Work: The Work includes, but is not necessarily limited to the following:
Indian Hills Middle School, 6400 Mission Road, Shawnee Mission, KS 66208
The project consists of New Three-story Elevator Addition.

New Elevator addition consists of all new concrete slab and foundations, masonry, structural steel, structural studs, roofing, carpentry, EIFS, sheet metal, gypsum board, steel doors and frames, hardware, sealants, suspended ceilings, floor finishes, paint, signage and concrete pavement, mechanical, electrical, plumbing and fire alarm systems.

Time of Completion: The Work shall be completed according to the following:

Indian Hills Middle School – All Areas	
Notice to Proceed	1 March, 2018
On-Site Start Date	26 May, 2018
Substantial Completion Date	30 July, 2018
Final Completion Date	6 August, 2018

Definitions for Substantial Completion, Final Completion and terms of Liquidated Damages are identified Section 01010.

Receipt of Bids: Bid forms are to be received by the date and time at the location indicated in this Invitation to Bid. Any change in bid time or date will be by Addendum issued to bidders registered at the office of the Architect as having received full sets of bidding documents.
Bid security in the amount of five percent (5%) of the Bid must accompany each Bid in accordance with the Instructions to Bidders.

Bid Opening: Bid forms will be publicly opened and tabulated in the Shawnee Mission Public Schools office at 8200 W. 71st Street, Overland Park, KS 66204 following receipt of bids at the time previously indicated. All interested parties are invited to attend. No award will be announced at that time.

Procurement of Documents: Bidders may obtain Bidding Documents by contacting:

Drexel Technologies, Inc.

10840 W. 86th Street

Lenexa, Kansas 66214-1632

Phone: 913-371-4430

Fax: 913-371-7128

www.drexeltech.com

General Contractor, Subcontractors and material suppliers may purchase plans and specs or a CD of bidding documents (plans and specifications) for a fee payable direct to Drexel Technologies, Inc. Contact Drexel Technologies for pricing.

All Contractors may purchase additional printed sets or partial sets of bidding documents for a fee made payable to Drexel Technologies, Inc.

Examination of the Documents: Bidding documents will be on file at Drexel Technologies, Inc. and may be examined, during normal business hours, or viewed on line at www.drexeltech.com, in accordance with the Instructions to Bidders.

The bidders list will be available from Drexel Technologies, Inc. ONLY

Pre-Bid Conference: A Pre-Bid conference will be held on **4:00 PM, February 1, 2018 at Indian Hills Middle School**, all attendees must sign in at the Administrative Office, conference will be in the Administration Conference Room. The Scope of Work will be reviewed at that time. All bidders are strongly encouraged to attend the pre-bid meeting.



AIA[®] Document A701[™] – 1997

Instructions to Bidders

for the following PROJECT:

(Name and location or address):

THE OWNER:

(Name and address):

Shawnee Mission U.S.D. No. 512
7235 Antioch
Shawnee Mission, KS 66204

THE ARCHITECT:

(Name and address):

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ADDITIONS AND DELETIONS:

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

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

ARTICLE 1 DEFINITIONS

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

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

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

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

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

§ 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.

§ 1.10 A Statutory Bond (also referred to as a Public Works Bond) is a bond provided by the contractor. Whenever any public official, under the laws of the state, enters into a contract in any sum exceeding Ten Thousand and No/100 Dollars (\$10,000.00) with any person or persons for the purpose of making any public improvements, or constructing any public building or making repairs on the same, such officer shall take, from the party contracted with, a bond to the state of Kansas with good and sufficient sureties in a sum not less than the sum total in the contract, conditioned that such contractor or the subcontractor of such contractor shall pay all indebtedness incurred for labor furnished, materials, equipment or supplies, used or consumed in connection with or in or about the construction of such public buildings or in making such public improvements.

ARTICLE 2 BIDDER'S REPRESENTATIONS

§ 2.1 The Bidder by making a Bid represents that:

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

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

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

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception. The Bidder will not later request and will not later expect to receive additional payment for Work related to conditions which could have been determined by examination of the site and the Bidding Documents.

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 (10) days after receipt of Bids. The deposit will be retained in full if the Bidder fails to return the Bidding Documents within ten (10) days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder's deposit will be refunded.

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

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

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

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

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

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

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

§ 3.3 SUBSTITUTIONS

§ 3.3.1 Unless specifically noted by exception as sole source or propriety, 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. Reference in the specifications to any product, material, type or form of construction shall establish a minimum standard of quality and shall not be construed as limiting competition. Reference to standard specifications for basic materials shall not be modified for any substitutions proposed. Proposed substitutions shall be submitted no later than seven (7) days prior to Bid Date. Submittal shall clearly describe the substitution for which approval is requested, including all data necessary to demonstrate acceptability. A Substitution Request Form, found in Section 01631 – PRODUCT SUBSTITUTIONS must be received in the Architect's office seven (7) days prior to Bid Date. Request for substitutions other than as qualified above will not be considered.

§ 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 seven (7) 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, a detailed comparison of physical and performance characteristics of the proposed substitution product with the specified product, including drawings, performance and test data, and other information necessary for an evaluation. A statement setting forth changes in other materials, equipment or other portions of the Work, including changes in the work of other contracts that incorporation of the proposed substitution would require, shall be included. The burden of proof of the merit of the proposed substitution is upon the proposer. The Architect's decision of approval or disapproval of a proposed substitution shall be final.

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

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

§ 3.4 ADDENDA

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

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

§ 3.4.3 Addenda will be issued no later than three (3) business 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. Failure to make this acknowledgment may subject Bidder to disqualification.

ARTICLE 4 BIDDING PROCEDURES

§ 4.1 PREPARATION OF BIDS

§ 4.1.1 Bids shall be submitted on the forms included with the Bidding Documents without modification, alteration or reservation. Bids not on this form will be rejected.

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

§ 4.1.3 Bid shall state a total lump sum price to do all work described in the Bidding Documents under a single contract. 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." The work described in the Bidding Documents for such items, including overhead, profit, and the cost of all changes required from Base Bid conditions, shall be included in order to incorporate such work described.

§ 4.1.6 Bid forms shall be submitted in duplicate, each fully executed and signed.

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

§ 4.2 BID SECURITY

§ 4.2.1 Each Bid shall be accompanied by a bid security in the form of a Bid Bond written on AIA Document A310 in an amount at least equal to five percent (5%) of Bidder's proposal, including all additive alternates.

§ 4.2.2 Bid security is required as a guarantee that Bidder will enter into a written contract and furnish performance, payment and statutory bonds within the time and in form as specified in these Contract Document and if successful Bidder fails to do so, bid security will be retained by Owner. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds, the amount of the bid security shall be paid to the Owner as liquidated damages, not as a penalty.

§ 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. The Bid Number, Date and Time of Bid Opening shall be identified and included on the opaque envelope. 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. Each Bid shall be accompanied by a completed Contractor's qualification statement executed on AIA Document A305.

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

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

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

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID

§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder for a period of sixty (60) days.

§ 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. Any such written request must be contained in a sealed envelope which is plainly marked "Modification of Bid on (project title and bid date)"; or by telegram to be received prior to Bid date and time. If by telegram, written confirmation over the signature of the Bidder shall be mailed and postmarked 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)

§ 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. In awarding the Contract, the Owner may take into consideration the Bidder's skill, facilities, capacity, experience, responsibility, previous work record and financial standing; and the necessity for prompt and efficient completion of the work herein described. Inability of any Bidder to meet the requirements of the Owner may be cause for rejection of the Bid.

§ 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.

§ 5.3.3 Owner shall have the right to award the Contract within sixty (60) calendar days immediately following the actual date of Bid opening.

§ 5.3.4 Bidder to whom award of Contract is made shall execute an Agreement with the Owner within seven (7) days.

§ 5.3.4.1 The Owner will prepare and forward four (4) original drafts of the Agreement to the successful Bidder. Bidder shall return properly executed drafts of these Documents. Bidder shall provide Contract bonds to the Owner within seven (7) consecutive calendar days after receipt of executed Contract.

§ 5.3.4.2 Any successful Bidder which is a corporation organized in a state other than Kansas shall furnish, at its costs, to the Owner a properly certified copy of its current Certificate of Authority and License to do business in the State of Kansas. The Agreement will not be executed by the Owner unless a current certificate is already on file with the Owner.

§ 5.3.4.3 Any successful Bidder which is a corporation organized in the State of Kansas shall furnish, at its own cost, to the Owner, if requested, a Certificate of Good Standing issued by the Secretary of State, such certificate to remain on file with the Owner.

ARTICLE 6 POST-BID INFORMATION

§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT

(Paragraph deleted)

§ 6.2 OWNER'S FINANCIAL CAPABILITY

(Paragraph deleted)

§ 6.3 SUBMITTALS

§ 6.3.1 The Bidder shall, within seven (7) working days of notification of selection for the award of a contract for the work, submit to the Owner and Architect the following information:

- .1 a designation of the Work to be performed with the Bidder's own forces;
- .2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work;
- .3 a list of subcontractor or other persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work; and
- .4 the schedule of values that identifies bid amounts for the categories of work.

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

§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed subcontractor, person or entity, the Bidder may 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 disqualification, bid security will not be forfeited.

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND

§ 7.1 BOND REQUIREMENTS

§ 7.1.1 The Bidder shall furnish bonds covering the faithful performance of the Contract, payment of all obligations arising thereunder and Statutory Bond. Bonds shall be furnished through the same source as furnished the Bid Bond.

§ 7.1.2 The furnishing of such bonds is stipulated in the Bidding Documents and the cost shall be included in the Bid.

§ 7.1.3

§ 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 seven (7) days following the date of receipt of executed Contract.

§ 7.2.2 Performance and Payment bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Statutory Bonds shall be in compliance with the requirements of Kansas law and filed with the Clerk of the District Court. Bonds shall be written in the amount of not less than the Contract Sum.

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

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

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR

§ 8.1 The Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum, as amended.

§ 8.2 TIME OF CONTRACT COMPLETION

§ 8.2.1 Based on the award of the Contract within sixty (60) days after the actual date of Bid opening and contingent on Shawnee Mission School Board's approval of the Contract, all work required under the Contract shall be substantially completed on _____. If approval and notice to proceed does not occur by _____, the date of substantial completion will be adjusted. Refer to Supplementary Conditions Article 8 for provisions for the assessment of liquidated damages.

Additions and Deletions Report for AIA[®] Document A701[™] – 1997

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

Note: This Additions and Deletions Report is provided for information purposes only and is not incorporated into or constitute any part of the associated AIA document. This Additions and Deletions Report and its associated document were generated simultaneously by AIA software at 09:51:03 on 01/18/2013.

PAGE 1

(Name and location or ~~address~~)address):

...

(~~Name, legal status and address~~)(Name and address):

Shawnee Mission U.S.D. No. 512

7235 Antioch

Shawnee Mission, KS 66204

...

(~~Name, legal status and address~~)(Name and address):

~~TABLE OF ARTICLES~~TABLE OF ARTICLES

PAGE 2

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

...

§ 1.10 A Statutory Bond (also referred to as a Public Works Bond) is a bond provided by the contractor. Whenever any public official, under the laws of the state, enters into a contract in any sum exceeding Ten Thousand and No/100 Dollars (\$10,000.00) with any person or persons for the purpose of making any public improvements, or constructing any public building or making repairs on the same, such officer shall take, from the party contracted with, a bond to the state of Kansas with good and sufficient sureties in a sum not less than the sum total in the contract, conditioned that such contractor or the subcontractor of such contractor shall pay all indebtedness incurred for labor furnished, materials, equipment or supplies, used or consumed in connection with or in or about the construction of such public buildings or in making such public improvements.

...

§ 2.1.4 The Bid is based upon the materials, equipment and systems required by the Bidding Documents without exception. The Bidder will not later request and will not later expect to receive additional payment for Work related to conditions which could have been determined by examination of the site and the Bidding Documents.

PAGE 3

§ 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 (10) days after receipt of Bids. The deposit will be retained in full if the Bidder fails to return the Bidding Documents within ten (10) 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.

...

§ 3.3.1 ~~The~~ Unless specifically noted by exception as sole source or propriety, 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. Reference in the specifications to any product, material, type or form of construction shall establish a minimum standard of quality and shall not be construed as limiting competition. Reference to standard specifications for basic materials shall not be modified for any substitutions proposed. Proposed substitutions shall be submitted no later than seven (7) days prior to Bid Date. Submittal shall clearly describe the substitution for which approval is requested, including all data necessary to demonstrate acceptability. A Substitution Request Form, found in Section 01631 – PRODUCT SUBSTITUTIONS must be received in the Architect's office seven (7) days prior to Bid Date. Request for substitutions other than as qualified above will not be considered.

§ 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-seven~~ (7) 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, a detailed comparison of physical and performance characteristics of the proposed substitution product with the specified product, 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.

PAGE 4

§ 3.4.3 Addenda will be issued no later than ~~four-three~~ (3) business 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. Failure to make this acknowledgment may subject Bidder to disqualification.

...

§ 4.1.1 Bids shall be submitted on the forms included with the Bidding Documents ~~Documents~~ without modification, alteration or reservation. Bids not on this form will be rejected.

...

§ 4.1.3 Bid shall state a total lump sum price to do all work described in the Bidding Documents under a single contract. Sums shall be expressed in both words and figures. In case of discrepancy, the amount written in words shall govern.

...

§ 4.1.5 All requested Alternates shall be bid. If no change in the Base Bid is required, enter "No Change." The work described in the Bidding Documents for such items, including overhead, profit, and the cost of all changes required from Base Bid conditions, shall be included in order to incorporate such work described.

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

...

~~§ 4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Section 6.2 of a Bid Bond written on AIA Document A310 in an amount at least equal to five percent (5%) of Bidder's proposal, including all additive alternates.~~

~~§ 4.2.2 If a surety bond is required, it shall be written on AIA Document A310, Bid Bond, unless otherwise provided in the Bidding Documents, and the attorney in fact who executes the bond on behalf of the surety shall affix to the bond a certified and current copy of the power of attorney. Bid security is required as a guarantee that Bidder will enter into a written contract and furnish performance, payment and statutory bonds within the time and in form as specified in these Contract Document and if successful Bidder fails to do so, bid security will be retained by Owner. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds, the amount of the bid security shall be paid to the Owner as liquidated damages, not as a penalty.~~

PAGE 5

~~§ 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. The Bid Number, Date and Time of Bid Opening shall be identified and included on the opaque envelope. 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. Each Bid shall be accompanied by a completed Contractor's qualification statement executed on AIA Document A305.~~

...

~~§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid for a period of sixty (60) days.~~

~~§ 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 Any such written request must be contained in a sealed envelope which is plainly marked "Modification of Bid on (project title and bid date)"; or by telegram to be received prior to Bid date and time. If by telegram, written confirmation over the signature of the Bidder shall be received, and date and time stamped by the receiving party mailed and postmarked 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.~~

...

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

...

§ 5.3.1 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. In awarding the Contract, the Owner may take into consideration the Bidder's skill, facilities, capacity, experience, responsibility, previous work record and financial standing; and the necessity for prompt and efficient completion of the work herein described. Inability of any Bidder to meet the requirements of the Owner may be cause for rejection of the Bid.

PAGE 6

§ 5.3.3 Owner shall have the right to award the Contract within sixty (60) calendar days immediately following the actual date of Bid opening.

§ 5.3.4 Bidder to whom award of Contract is made shall execute an Agreement with the Owner within seven (7) days.

§ 5.3.4.1 The Owner will prepare and forward four (4) original drafts of the Agreement to the successful Bidder. Bidder shall return properly executed drafts of these Documents. Bidder shall provide Contract bonds to the Owner within seven (7) consecutive calendar days after receipt of executed Contract.

§ 5.3.4.2 Any successful Bidder which is a corporation organized in a state other than Kansas shall furnish, at its costs, to the Owner a properly certified copy of its current Certificate of Authority and License to do business in the State of Kansas. The Agreement will not be executed by the Owner unless a current certificate is already on file with the Owner.

§ 5.3.4.3 Any successful Bidder which is a corporation organized in the State of Kansas shall furnish, at its own cost, to the Owner, if requested, a Certificate of Good Standing issued by the Secretary of State, such certificate to remain on file with the Owner.

...

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

...

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

...

§ 6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after within seven (7) working days of notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing contract for the work, submit to the Owner and Architect the following information:

...

- .2 names of the manufacturers, products, and the suppliers of principal items or systems of materials and equipment proposed for the Work; and
- .3 names of a list of subcontractor or other persons or entities (including those who are to furnish materials or equipment fabricated to a special design) proposed for the principal portions of the Work; and

.4 the schedule of values that identifies bid amounts for the categories of work.

...

§ 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) subcontractor, person or entity, the Bidder may 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.~~

...

§ 7.1.1 ~~If stipulated in the Bidding Documents, the~~ The Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. ~~Bonds may be secured through the Bidder's usual sources. Contract, payment of all obligations arising thereunder and Statutory Bond. Bonds shall be furnished through the same source as furnished the Bid Bond.~~

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

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

PAGE 7

§ 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.~~ seven (7) days following the date of receipt of executed Contract.

§ 7.2.2 ~~Unless otherwise provided, the Performance and Payment bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds Statutory Bonds shall be in compliance with the requirements of Kansas law and filed with the Clerk of the District Court. Bonds shall be written in the amount of not less than the Contract Sum.~~

...

~~Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.~~ § 8.1 The Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum, as amended.

§ 8.2 TIME OF CONTRACT COMPLETION

§ 8.2.1 Based on the award of the Contract within sixty (60) days after the actual date of Bid opening and contingent on Shawnee Mission School Board's approval of the Contract, all work required under the Contract shall be substantially completed on _____. If approval and notice to proceed does not occur by _____, the date of substantial completion will be adjusted. Refer to Supplementary Conditions Article 8 for provisions for the assessment of liquidated damages.

Certification of Document's Authenticity

AIA® Document D401™ – 2003

I, _____, hereby certify, to the best of my knowledge, information and belief, that I created the attached final document simultaneously with its associated Additions and Deletions Report and this certification at 09:51:03 on 01/18/2013 under Order No. 3789126235_1 from AIA Contract Documents software and that in preparing the attached final document I made no changes to the original text of AIA® Document A701™ – 1997, Instructions to Bidders, as published by the AIA in its software, other than those additions and deletions shown in the associated Additions and Deletions Report.

(Signed)

(Title)

(Dated)

Shawnee Mission Unified School District No. 512
Amendment to Instructions to Bidders
AIA701-1997

The following terms modify and amend AIA A701-1997 as modified by Shawnee Mission U.S.D. No. 512 ("Owner") and control terms to the contrary.

A701-1997

The Owner may substitute documents for AIA documents required by the Modified AIA A701-1997. Substitutions include documents provided with invitations to bid and may include the District's 5% Bid Security Form, Construction Agreement, and other documents provided by the District with similar subject matter as documents required by the AIA A701-1997, as modified by the Owner.

Article 1 Definitions

- § 1.1. Add the sentence: Bidding Documents include the Construction Agreement, Kansas Contractual Provisions Attachment, Form DA-146a, and other documents created or modified by Owner and referenced in the Bidding documents or the Contract Documents.
- § 1.2 Add the sentence: Contract Documents include Owner's Construction Agreement and Kansas Contractual Provisions Attachment, Form DA-146a.

BID FORM

BID NO. 018-009

LUMP SUM PROPOSAL

**SHAWNEE MISSION SCHOOL DISTRICT
General Construction for: 2018 Elevator Addition – Indian Hills Middle School**

PROPOSAL OF: _____
(Hereinafter called "Bidder"),

A CORPORATON* ORGANIZED AND EXISTING UNDER THE LAWS

OF THE STATE OF _____

A PARTNERSHIP* CONSISTING OF _____

AN INDIVIDUAL* TRADING AS _____

*Complete applicable designation.

TO: SHAWNEE MISSION PUBLIC SCHOOLS
ATTN: MR. EVERETT MORGAN
8200 W 71st Street
OVERLAND PARK, KS 66204

1. The undersigned, having familiarized itself with local conditions affecting the cost of the work at the place where the work is to be done and with all Bidding Documents, including the Instructions to Bidders, Plans and Specifications, General and Supplementary Conditions, the Standard Form of Agreement and the other Contract Documents, and having examined the location of the proposed work and considered the availability of labor and materials, hereby proposes and agrees to perform everything required to be performed, and to provide and furnish any and all labor, materials, supervision, necessary tools, equipment, and all utility and transportation service necessary to perform and complete in a workmanlike and timely manner all of the work required for the project, all in strict conformance with the Instructions to Bidders and other Contract Documents (including Addenda Nos. _____, through _____, the receipt of which is hereby acknowledged), for the lump sums hereinafter specified.

2. BASE BID

The Lump Sum of _____

_____ Dollars (\$_____).

Additional breakdown requirements are described in Section 01010 Summary of Work, Part 1.11 – Additional Owner Requested Bid Breakdown (if applicable).

3. TAX EXEMPTION

This project shall be considered Tax Exempt. Federal, State and local taxes shall not be included with this Bid. Subsequent to the award of the construction contract, the School District will obtain from the State of Kansas a sales tax exemption certificate number. The sales tax exemption certificate will permit the Contractor to purchase materials for incorporation into this project without paying sales tax, provided that the Contractor furnishes the certificate number to the material supplier.

4. **CHANGES IN THE WORK**

Changes in the work shall be as established in the Contract Documents. The following fees shall be used for lump sum pricing and actual cost pricing of additions and deletions to the work included in the Bid, Namely:

	<u>Not to Exceed</u>
A. To Contractor for work performed by his own forces	10%
B. To Contractor for work performed by other than his own forces	5%
C. To Subcontractor for work performed by his own forces	10%
D. To Subcontractor for work performed by other than his own forces	5%

Percentages for overhead and profit will not be allowed on bond premiums.

5. **ALLOWANCES:**

For the allowances described and found in 01210, include in the Base Bid at the prices stated:

A. Allowance No. 1:	<u>\$30,000.00</u>
<u>Indian Hills Middle School – ELEVATOR for undesignated conditions</u>	

6. **UNIT COST BREAKDOWNS:**

(None required)

7. **ALTERNATES: No.1**

ADD \$ _____

Remove and dispose of existing elevator including cab, hoistway and all components in it's entirely for a clean and empty shaft. Disconnect and remove back to source any and all electrical, HVAC, plumbing and security services. Provide new floor slab at Ground, First and Second floors, tie-in to existing structural slab. Infill existing openings with gyp. bd. partition and provide three (3) 3'x 7' new HM doors, frames, w/ keyed closet locks.

8. **BID PROVISIONS**

- A. In the execution of the Agreement, no person shall on the grounds of race, color, religion, sex, disability, or national origin be excluded from full employment rights, be denied the benefits of, or otherwise subject to discrimination under any program, service or activity under the provisions of any and all applicable Federal and state laws against discrimination. Bidder shall furnish all information and reports required by the rules, regulations, and order of the Secretary of Labor for purposes of investigating to determine compliance with such laws.
- B. Bidder shall observe the provisions of the Kansas Acts Against Discrimination and shall not discriminate against any person in the performance of work under the Agreement because of race, religion, color, sex, physical handicap unrelated to such person's ability to engage in the particular work, national origin or ancestry.
- C. In all solicitations or advertisements for employees, Bidder shall include the phrase, "equal opportunity employer", or similar phrase approved by the Owner.
- D. If bidder fails to comply with the provisions of K.S.A. 441031, bidder shall be deemed to have breached the Agreement and it may be canceled, terminated or suspended in whole or in part, by Owner.

- E. If bidder is found guilty of a violation of the Kansas Acts Against Discrimination under a decision or order of Owner that has become final, bidder shall be deemed to have breached the present Agreement and it may be canceled, terminated, or suspended in whole or in part, by Owner.
- F. Bidder shall include the provisions of paragraphs A through E above in every subcontract or purchase order so that such provisions shall be binding upon all subcontractors and vendors.
9. **COMPLETION and LIQUIDATED DAMAGES:**
The undersigned hereby proposes and agrees to substantially and/or finally complete the work or segments of the work on or before the scheduled dates listed in Section 01010-Summary of Work, and to pay as liquidated damages the corresponding amount stipulated in Section 01010-Summary of Work for each consecutive calendar day thereafter that the work or segment of the work remains substantially and/or finally incomplete in accordance with the Contract Documents. This provision shall be applied, and the daily liquidated damages amount(s) shall be calculated separately as to each substantial and/or final complete date stated.
10. **BID BOND:**
Accompanying the Bid is Bid Security of at least 5% of the bid in the form of a Bid Bond in the amount of _____ Dollars (\$ _____), payable without condition to the Owner, which it is agreed shall be retained as liquidated damages for the delay and extra expense caused the Owner, if the undersigned fails to execute the Contract and furnish the bonds required by the Contract Documents, within the time stated in the Contract Documents.
11. **OWNER'S RIGHT:**
In submitting the Bid it is understood that the right to reject any and all bids has been reserved by the Owner and that this bid may not be withdrawn for a period of sixty (60) days from the opening.

Date this _____ day of _____, 2015.

Name of Bidder

Address of Bidder

Authorized Officer

Title

Telephone Number

(Seal)

ATTESTED: _____

CONSTRUCTION AGREEMENT

This Agreement is by and between the Shawnee Mission Public Schools Unified School District (“Owner”) and _____ (“Contractor”). **Kevin Cowan Architects, LLC** (“Architect”) has been retained by Owner to serve as Architect on the project.

The Provisions found in Contractual Provisions Attachment (Form DA-146a, Rev. 06-12), which is attached hereto, are hereby incorporated in this contract and made a part thereof.

The parties, in consideration of the mutual covenants agree as follows:

Article 1 – Work

1.01 Description

1. The Work is generally described as follows: **Indian Hills Middle School**, 6400 Mission Road., Prairie Village, KS 66208
The project consists of a new three-story elevator addition.
Construction consists of demolition of concrete slab, concrete eyebrow, masonry, EIFS, gypsum board, roof tie-in and suspended ceilings, floor finishes, mechanical, electrical, plumbing and fire alarm.

1.02 Scope

Contractor shall complete all work specified in the Agreement Documents in Article 6.

Article 2 – Time

2.01 Time of the Essence

All time limits for milestones, substantial completion, and completion and readiness for final payment as stated in the Agreement Documents are of the essence of the Contract.

2.02 Dates for Substantial Completion and Final Payment

The Work will be substantially complete on or before: **30 July, 2018**.

The Work will be complete and ready for final payment on or before: **6 August, 2018**.

2.03 Liquidated Damages

A. Contractor and Owner recognize that time is of the essence of this Agreement and that Owner will suffer financial loss if the Work is not completed within the times specified in

paragraph 2.02 above, plus any extensions thereof allowed under other terms of this Agreement. The parties also recognize the delays, expenses and difficulties involved in proving in a legal or arbitration proceeding the actual loss suffered by Owner if the Work is not completed on time.

B. Instead of requiring any such proof, Owner and Contractor agree that as liquidated damages for delay (but not as a penalty), Contractor shall pay Owner \$1000.00 for each day for each school that expires after the time specified in paragraph 2.02 for substantial completion until the Work is substantially complete.

C. After substantial completion, if Contractor shall neglect, refuse, or fail to complete the remaining work within the contract time or any proper extension thereof granted by Owner, Contractor shall pay Owner \$1000.00 for each day for each school that expires after the time specified in paragraph 2.02 for completion and readiness for final payment until the Work is completed and ready for final payment.

Article 3 – Agreement Sum

3.01 Sum and payments

Owner shall pay Contractor for completion of the Work under the Agreement Documents in current funds equal to the amounts determined under paragraph 4.02 below:

The Agreement Sum is:

- A. **BASE BID**
The Lump Sum of _____
Dollars (\$_____).

Additional breakdown requirements are described in Section 01010 Summary of Work, Part 1.11 – Additional Owner Requested Bid Breakdown.

The Agreement Sum includes the following allowance and is to be included in the Base Bid amount:

- A. **Allowance No. 1:** **\$30,000.00**
Indian Hills Middle School – ELEVATOR for undesignated conditions

Alternate #1 shall be ADDED to Base Bid amount upon acceptance by SMSD.

- A. **Alternate No.1:** Remove and dispose of existing elevator including cab, hoist way and all components in it's entirely for a clean and empty shaft. Disconnect and remove back to source any and all electrical, HVAC, plumbing and security services. Provide new floor slab at Ground, First and Second floors, tie-in to existing structural

slab. Infill existing openings with gyp. bd. partition and provide three (3) 3'x 7' new HM doors, frames, w/ keyed closet locks.

ADD \$ _____

The Agreement Sum is subject to adjustments under this Agreement.

Article 4 – Payment Procedures

4.01 Submittal and Processing of Payments

The Contractor will submit applications for payment to the Architect for processing. With each application for payment, Contractor will also submit a Lien Waiver for the previous payments received.

4.02 Progress Payments; Retainage

Owner shall make progress payments for the Agreement price based on Contractor's applications for payment and the Engineer's certificates for payment. Contractor must apply for payment on or before the 25th day of each month. Owner shall make progress payments certified by the Engineer within 30 days of submittal, except that if work is continuing, Owner may withhold up to 150 percent of the value of that portion of the retainage attributable to the ongoing work until 45 days after that work is complete. Prior to final completion, progress payments will be made for the Work completed less five percent retainage and less such amounts as Owner may dispute or withhold, including but not limited to liquidated damages.

4.03 Final Payment

Upon final completion and acceptance of the Work by the Owner, Owner shall pay the remainder of the contract price.

Article 5 – Contractor's Representations

5.01 Contractor makes the following representations

- a. Contractor examined and carefully studied the Agreement Documents and any other related data identified in the bidding documents;
- b. Contractor visited the site and become familiar with and is satisfied as to the general, local, and site conditions that may affect cost, progress and performance of the Work;
- c. Contractor is familiar with and is satisfied on all federal, state, and local laws and

regulations that may affect cost, progress, and performance of the Work;

- d. Contractor does not consider that any further examinations, investigations, explorations, tests, studies, or data are necessary for performing the Work at the contract price, within the contract times, and under the other terms and conditions of the Agreement Documents;
- e. Contractor knows of the general nature of the Work to be performed by Owner and others at the site that relates to the Work as stated in the Agreement Documents;
- f. Contractor has correlated the information known to Contractor, information and observations obtained from visits to the site, reports and drawings identified in the Agreement Documents, and all additional examinations, investigations, explorations, tests, studies, and data with the Agreement Documents;
- g. The Agreement Documents convey understanding of all terms and conditions for performance and furnishing of the Work; and
- h. Contractor warrants and guarantees to Owner that all work will be in accordance with the Agreement Documents and will not be defective. Contractor's obligation to perform and complete the Work in accordance with the Agreement Documents shall be absolute.

Article 6 – Agreement Documents

6.01 Contents

The Agreement Documents comprise the following documents in order of precedence:

1. Form DA-146a, Contractual Provisions Attachment;
2. Written Change Orders or Construction Change Directives issued after execution of this Agreement;
3. This Agreement;
4. Special Conditions;
5. General Conditions;
6. Project Manual, **27 February, 2017**;
7. Addendum ____; ____; ____

8. Kansas Statutory Bond (K.S.A. 60-1111);
9. Performance Bond;
10. Payment Bond;
11. Contractor's bid.

If any inconsistent or incompatible provisions arise between the Agreement Documents, the order of precedence shall be followed. The Agreement Documents may only be amended, modified or supplemented with the written agreement of the Owner and Contractor.

Article 7 – Bonds and Insurance

7.01 Performance, Payment and Statutory Bonds

A. Contractor shall furnish a Statutory Bond as required under K.S.A. 60-1111 with good and sufficient sureties in a sum not less than the sum total in this Agreement, conditioned that such contractor or the subcontractor of such contractor shall pay all indebtedness incurred for labor furnished, materials, equipment or supplies, used or consumed in connection with the Work. The Statutory Bond shall be filed with the clerk of the district court of Johnson County.

B. Contractor shall furnish a Performance Bond in an amount at least equal to the Agreement price as security for the faithful performance of all of Contractor's obligations under the Agreement Documents. These Bonds shall remain in effect until one year after the date when final payment becomes due or until completion of the correction period except as provided otherwise by laws or regulations or by the Agreement Documents.

7.02 Certificates of Insurance

A. Contractor shall deliver to Owner Certificates of Insurance (and other evidence of insurance requested by Owner or any other additional insured) this Agreement requires.

7.03 Contractor's Liability Insurance

A. Contractor shall purchase and maintain such liability and other insurance as is appropriate for the Work being performed and also will provide protection from claims which may arise out of or result from Contractor's performance of the Work and Contractor's other obligations under the Agreement Documents, whether it is to be performed by Contractor, any Sub-Contractor or Supplier, or by anyone directly or indirectly employed by any of them to perform any of the Work, or by anyone for whose acts any of them may be liable. Contractor's liability insurance must be for at least \$2,000,000 in coverage.

7.04 Permits

A. Contractor shall obtain and pay for all construction permits and licenses. Owner shall assist Contractor, when necessary, in obtaining such permits and licenses. Contractor shall pay all governmental charges and inspection fees necessary for the prosecution of the Work which apply at the time of opening of bids, or, if there are no bids, on the effective date of the Agreement.

Article 8 – Indemnification

To the fullest extent permitted by laws and regulations, Contractor shall indemnify and hold harmless Owner, and the board members, officers, directors, partners, employees, agents, consultants and Sub-Contractors of each and any of them from and against all claims, costs, losses and damages (including but not limited to all fees and charges of engineers, architects, attorneys and other professionals in all courts or arbitration or other dispute resolution costs) arising out of or relating to the performance of the Work, provided that any such claim, cost, loss or damage is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property, including the loss of use resulting therefrom, but only to the extent caused by any act or omission of Contractor, any Sub-Contractor, any supplier, or any individual or entity directly or indirectly employed by any of them to perform any of the Work or anyone for whose acts any of them may be liable.

Article 9 – Completion of the Work

9.01 Contractor's Construction Schedule

A. Contractor, promptly after being awarded the Agreement, shall prepare and submit for the Owner's information a Contractor's construction schedule for the Work, and a schedule for the critical path for the construction of the Project. Contractor shall provide an updated schedule for construction every 60 days thereafter and anytime upon request of Owner or Architect.

9.02 Delays

A. If Owner or other contractors or utility owners performing other work for Owner, or anyone for whom Owner is responsible, delays, disrupts, or interferes with the performance or progress of the Work, then Contractor shall be entitled to an equitable adjustment in the Agreement Price or the Agreement Times, or both if a Claim is made therefore. Contractor's entitlement to an adjustment of the Agreement Times is conditioned on such adjustment being essential to Contractor's ability to complete the Work within the Agreement Times.

B. If Contractor is delayed in the performance or progress of the Work by fire, flood, epidemic, abnormal unforeseen weather conditions, acts of God, acts or failures to act of utility owners not under the control of Owner, or other causes not the fault of and beyond control of

Owner and Contractor, then Contractor shall be entitled to an equitable adjustment in Agreement Times if a Claim is made therefore, if such adjustment is essential to Contractor's ability to complete the Work within the Agreement Times. Such an adjustment shall be Contractor's sole and exclusive remedy for the delays described in this Paragraph.

C. Owner shall not be liable to Contractor for any claims, costs, losses, or damages (including but not limited to all fees and charges of Engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Contractor on or for any other project or anticipated project.

D. Contractor shall not be entitled to an adjustment in Agreement Price or Agreement Times for delays within the control of Contractor. Delays attributable to and within the control of a Subcontractor or Supplier shall be deemed delays within the control of Contractor.

E. Contractor shall make written request, with supporting documentation, to Owner for a requested adjustment in the Agreement Price or Agreement time as discussed in this Section. Failure to make said request within 10 days of the occurrence giving rise to the request constitutes a waiver of the claim for any adjustment.

9.03 Correction or Removal of Defective Work

A. Promptly after receipt of notice, Contractor shall correct all defective Work, whether or not fabricated, installed, or completed, or, if the Work has been rejected by Owner, remove it from the Project and replace it with Work that is not defective. Contractor shall pay all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) arising out of or relating to such correction or removal (including but not limited to all costs of repair or replacement of work of others).

B. When correcting defective Work under this Paragraph, Contractor shall take no action that would void or otherwise impair Owner's special warranty and guarantee on the Work.

9.04 Change Orders

A. If modifications other than field changes are made in the plans or specifications related to the contract between the Contractor and the District, the District will be notified immediately of those modifications and the reasons for them. Field changes are defined as those minor modifications required to accommodate actual conditions that do not affect contract completion time or total contract cost. (Board Policy FEG.)

B. Changes in the Work may be accomplished after execution of this Agreement, and without invalidating the Agreement, by Change Order or Construction Change Directive.

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

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

The architect will approve no change order without prior authority of the district.

D. A Construction Change Directive is a written order prepared by the Engineer and signed by the Owner and Architect directing a change in the Work and stating a proposed basis for adjustment in the Agreement Sum or Agreement Time, or both. The Owner may by Construction Change Directive, without invalidating the Agreement, order changes in the Work within the general scope of the Agreement comprising additions, deletions or other revisions, the Agreement Sum and Agreement Time being adjusted accordingly.

E. Upon receipt of a Change Order or Construction Change Directive, Contractor shall proceed promptly, unless otherwise notified, with the Work.

F. Contractor may submit a Request for Information to Architect for clarification of any portion of the Agreement Documents, including Change Orders or Construction Change Directives. Architect shall respond to all requests for information promptly.

9.05 Contractor's Warranty of Title

A. Contractor warrants and guarantees that title to all Work, materials, and equipment covered by any Application for Payment, whether incorporated in the Project or not, will pass to Owner no later than the time of payment free and clear of all Liens.

B. Contractor makes the following warranties to the Owner:

1. Materials and equipment furnished under the Agreement will be new and of good quality unless otherwise required or permitted by the Agreement Documents;
2. The Work will be free from defects not inherent in the quality required or permitted; and
3. The Work will conform to the Agreement Documents.

9.06 Waiver of Claims

A. The making and acceptance of final payment will constitute:

1. A waiver of all Claims by Owner against Contractor, except Claims arising from unsettled Liens, from defective Work appearing after final inspection, from failure to comply with the Agreement Documents or the terms of any special guarantees specified therein, or from Contractor's continuing obligations under the Agreement Documents; and
2. A waiver of all Claims by Contractor against Owner other than those previously made under the requirements of this Agreement and acknowledged by Owner in writing as still unsettled.

Article 10 – Waiver of Consequential Damages

A. Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Agreement to the extent allowed by law.

Article 11 – Substantial Completion and Final Completion

11.01 Substantial Completion

A. Substantial completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete under the Agreement Documents so the Owner can occupy or utilize the Work for its intended use.

B. When the Work or designated portion thereof is substantially complete, the Owner will make an inspection to determine whether the Work is substantially complete. When the Owner determines that the Work is substantially complete the Owner shall prepare a Certificate of Substantial Completion that shall establish the date of Substantial Completion, shall establish the responsibilities of the Owner and Contractor, and shall fix the time within which the Contractor shall finish all items on the list accompanying the Certificate. Warranties required by the Agreement 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.

11.02 Final Completion

A. Upon receipt of a final Application for Payment, the Owner will inspect the Work. When the Owner finds the Work acceptable and the Agreement fully performed, the Owner will promptly issue a final Certificate for Payment.

B. Final payment shall not become due until 30 days after Contractor finally completes the Work, submits to the Owner all required documents including, but not limited to, releases and waivers of liens, and data establishing payment or satisfaction of obligations, such as receipts, claims, security interests or encumbrances arising out of the Agreement, and the Owner issues a final Certificate for Payment.

Article 12 – Suspension and Termination

12.01 Owner May Suspend Work

A. At any time and without cause, Owner may suspend the Work or any portion thereof for a period of not over 90 consecutive days by notice in writing to Contractor that will fix the date on which Work will be resumed.

B. Contractor shall resume the Work on the date so fixed.

C. Contractor shall be granted an adjustment in the Agreement Price or an extension of the Agreement Times, or both, directly attributable to any such suspension.

12.02 Owner May Terminate for Cause

A. The occurrence of any one or more of the following events will justify termination for cause:

1. Contractor's failure to perform the Work in accordance with the Agreement Documents (including, but not limited to, failure to supply sufficient skilled workers or suitable materials or equipment or failure to adhere to the Progress Schedule as adjusted from time to time);
2. Contractor's disregard of Laws or Regulations of any public body having jurisdiction; or
3. Contractor's violation in any substantial way of any provisions of the Agreement Documents.

B. If one or more of the events identified in Paragraph 12.02.A occur, Owner may, after giving Contractor (and surety) seven days written notice of its intent to terminate the services of Contractor:

1. Exclude Contractor from the Site, and take possession of the Work and of all Contractor's tools, appliances, construction equipment, and machinery at the Site, and use the same to the full extent they could be used by Contractor

(without liability to Contractor for trespass or conversion),

2. Incorporate in the Work all materials and equipment stored at the Site or for which Owner has paid Contractor but which are stored elsewhere, and
3. Complete the Work as Owner may deem expedient.

C. If Owner proceeds as provided in Paragraph 12.02.B, Contractor shall receive no further payment until the Work is completed. If the unpaid balance of the Agreement Price exceeds all claims, costs, losses, and damages (including but not limited to all fees and charges of engineers, architects, attorneys, and other professionals and all court or arbitration or other dispute resolution costs) sustained by Owner arising out of or relating to completing the Work, such excess will be paid to Contractor. If such claims, costs, losses, and damages exceed such unpaid balance, Contractor shall pay the difference to Owner. When exercising any rights or remedies under this Paragraph Owner shall not be required to obtain the lowest price for the Work performed.

D. Notwithstanding Paragraphs 12.02.B and 12.02.C, Contractor's services will not be terminated if Contractor begins within seven days of receipt of notice of intent to terminate to correct its failure to perform and proceeds diligently to cure such failure within 30 days of receipt of the notice.

E. Where Contractor's services have been so terminated by Owner, the termination will not affect any rights or remedies of Owner against Contractor then existing or which may thereafter accrue. Any retention or payment of moneys due Contractor by Owner will not release Contractor from liability.

F. If Contractor has provided a performance bond under Paragraph 7.01, the termination procedures of that bond shall supersede Paragraphs 12.02.B, and 12.02.C.

12.03 Owner May Terminate For Convenience

A. Upon seven days written notice to Contractor, Owner may, without cause and without prejudice to any other right or remedy of Owner, terminate the Contract. In such case, Contractor shall be paid for the following items without duplication of any items:

1. Completed and acceptable Work executed under the Agreement Documents prior to the effective date of termination, including fair and reasonable sums for overhead and profit on such Work; and
2. Expenses sustained prior to the effective date of termination in performing services and furnishing labor, materials, or equipment as required by the

Agreement Documents in connection with uncompleted Work, plus fair and reasonable sums for overhead and profit on such expenses.

B. Contractor shall not be paid for loss of anticipated profits or revenue or other economic loss arising out of or resulting from such termination.

Article 13 – Dispute Resolution

A. Owner and Contractor shall make a good faith effort to resolve all disputes with an informal meeting between representatives of both parties before resorting to other means of resolution.

B. Owner and Contractor may agree to participate in mediation or arbitration proceedings to resolve a dispute, but this Agreement requires neither proceeding.

C. Nothing in this paragraph shall limit the ability of Owner or Contractor to sue in a court of law regarding a dispute.

Article 14 – Representatives

Owner's Representative: **Tyler Clubb**
8200 W. 71st Street
Overland Park, KS 66204
(913) 993-8500

Contractor's Representative: **_____**.
ADDRESS
ADDRESS
PHONE NUMBER

Architect: **Kevin Cowan Architects, LLC**
7840 Conser Street
Overland Park, KS 66204
913-341-3288

Article 15 – Miscellaneous Provisions

15.01 Nondiscrimination in Employment

Contractor will be required to comply with the President's Executive Order No. 11246,

Title VI and Section 3 of the 1968 HUD Act as pertaining to Equal Employment Opportunity through Affirmative Action. Contractor must comply with all requirements of federal and state civil rights law and rehabilitation statutes and shall not discriminate based on race, religion, color, sex, national origin, age or disability.

15.03 Taxes

The Owner is a public entity exempt from payment of state sales taxes and will furnish the Contractor with all required information to allow Contractor to benefit from this status. The Contractor shall apply the exemption under state law for purchases required for the Work. The Contractor shall pay all other required sales, consumer, use and other similar taxes, if any. The Contractual Provisions Attachment controls any terms of this Agreement to the contrary.

15.04 Student Safety

Contractor and its employees shall not interact with, contact, or otherwise access students on District premises without express approval by the District. District may require Contractor and its employees undergo criminal background checks before entering areas of the District premises occupied by students or before interacting with students. District reserves the right to exclude persons from its premises.

15.05 Giving Notice

A. Whenever any provision of the Agreement Documents requires giving written notice, it will be deemed to have been validly given if:

1. Delivered in person to the individual or to a member of the firm or to an officer of the corporation for whom it is intended, or
2. Delivered at or sent by registered or certified mail, postage prepaid, to the last business address known to the giver of the notice.

15.06 Computation of Times

When the Agreement Documents refer to any period of time by days, it will be computed to exclude the first and include the last day of such period except that if the last day is Saturday, Sunday, or day made a legal holiday by the law of the applicable jurisdiction, such day will be omitted from the computation.

15.07 Cumulative Remedies

The duties and obligations imposed by this Agreement and the rights and remedies available to the parties hereto are in addition to, and are not to be construed as a limitation of, any rights and remedies available to any or all of them which are otherwise imposed or available by laws or regulations, by special warranty or guarantee, or by other provisions of the Agreement Documents. This Paragraph will be as effective as if repeated specifically in the Agreement Documents for each duty, obligation, right, and remedy to which they apply.

15.08 Survival of Obligations

All representations, indemnifications, warranties, and guarantees made in, required by, or given in accordance with the Agreement Documents, and all continuing obligations stated in the Agreement Documents, will survive final payment, completion, and acceptance of the Work or termination or completion of the Agreement or termination of the services of Contractor.

15.09 Controlling Law

This Agreement is to be governed by the law of the State of Kansas.

15.10 Venue

Venue of any lawsuit filed regarding the Project or arising out of this Agreement will be in the Johnson County District Court in the 10th Judicial District of Kansas.

15.11 Headings

Article and paragraph headings are inserted for convenience only and do not constitute parts of this Agreement.

15.12 Counterparts

This Agreement may be executed in one or more counterparts that constitute one entire Contract when taken together and shall be fully executed when each party whose signature is required has signed at least one counterpart.

15.13 Electronic Signatures

For this Agreement, a signature page or other document signed and transmitted by fax, email, or similar electronic medium is to be treated as an original document.

15.14 Assignment

Neither party may assign their rights and obligations under this Agreement without the

prior written consent of the other party, which consent shall not be unreasonably withheld.

15.15 Entire Agreement

This Agreement constitutes the entire agreement between the parties hereto and there are no other understandings, written or oral, relating to the subject matter, and may not be changed, modified or amended, in whole or in part, except in writing signed by Owner and Contractor.

This Agreement will be effective as of **xx March, 2018**.

REMAINDER INTENTIONALLY BLANK

IN WITNESS WHEREOF, Owner and Contractor sign this Agreement.

Owner

By

Board President

Attest

Board Secretary

Contractor

By

Title

Attest

Title

CONTRACTUAL PROVISIONS ATTACHMENT

Important: This form contains mandatory contract provisions and must be attached to or incorporated in all copies of any contractual agreement. If it is attached to the vendor/contractor's standard contract form, then that form must be altered to contain the following provision:

"The Provisions found in Contractual Provisions Attachment (Form DA-146a, Rev. 06-12), which is attached hereto, are hereby incorporated in this contract and made a part thereof."

The parties agree that the following provisions are hereby incorporated into the contract to which it is attached and made a part thereof, said contract being the _____ day of _____, 20_____.

1. **Terms Herein Controlling Provisions:** It is expressly agreed that the terms of each and every provision in this attachment shall prevail and control over the terms of any other conflicting provision in any other document relating to and a part of the contract in which this attachment is incorporated. Any terms that conflict or could be interpreted to conflict with this attachment are nullified.
2. **Kansas Law and Venue:** This contract shall be subject to, governed by, and construed according to the laws of the State of Kansas, and jurisdiction and venue of any suit in connection with this contract shall reside only in courts located in the State of Kansas.
3. **Termination Due To Lack Of Funding Appropriation:** If, in the judgment of the Director of Accounts and Reports, Department of Administration, sufficient funds are not appropriated to continue the function performed in this agreement and for the payment of the charges-hereunder, State may terminate this agreement at the end of its current fiscal year. State agrees to give written notice of termination to contractor at least 30 days prior to the end of its current fiscal year, and shall give such notice for a greater period prior to the end of such fiscal year as may be provided in this contract, except that such notice shall not be required prior to 90 days before the end of such fiscal year. Contractor shall have the right, at the end of such fiscal year, to take possession of any equipment provided State under the contract. State will pay to the contractor all regular contractual payments incurred through the end of such fiscal year, plus contractual charges incidental to the return of any such equipment. Upon termination of the agreement by State, title to any such equipment shall revert to contractor at the end of the State's current fiscal year. The termination of the contract pursuant to this paragraph shall not cause any penalty to be charged to the agency or the contractor.
4. **Disclaimer Of Liability:** No provision of this contract will be given effect that attempts to require the State of Kansas or its agencies to defend, hold harmless, or indemnify any contractor or third party for any acts or omissions. The liability of the State of Kansas is defined under the Kansas Tort Claims Act (K.S.A. 75-6101 et seq.).
5. **Anti-Discrimination Clause:** The contractor agrees: (a) to comply with the Kansas Act Against Discrimination (K.S.A. 44-1001 et seq.) and the Kansas Age Discrimination in Employment Act (K.S.A. 44-1111 et seq.) and the applicable provisions of the Americans With Disabilities Act (42 U.S.C. 12101 et seq.) (ADA) and to not discriminate against any person because of race, religion, color, sex, disability, national origin or ancestry, or age in the admission or access to, or treatment or employment in, its programs or activities; (b) to include in all solicitations or advertisements for employees, the phrase "equal opportunity employer"; (c) to comply with the reporting requirements set out at K.S.A. 44-1031 and K.S.A. 44-1116; (d) to include those provisions in every subcontract or purchase order so that they are binding upon such subcontractor or vendor; (e) that a failure to comply with the reporting requirements of (c) above or if the contractor is found guilty of any violation of such acts by the Kansas Human Rights Commission, such violation shall constitute a breach of contract and the contract may be cancelled, terminated or suspended, in whole or in part, by the contracting state agency or the Kansas Department of Administration; (f) if it is determined that the contractor has violated applicable provisions of ADA, such violation shall constitute a breach of contract and the contract may be cancelled, terminated or suspended, in whole or in part, by the contracting state agency or the Kansas Department of Administration.

Contractor agrees to comply with all applicable state and federal anti-discrimination laws.

The provisions of this paragraph number 5 (with the exception of those provisions relating to the ADA) are not applicable to a contractor who employs fewer than four employees during the term of such contract or whose contracts with the contracting State agency cumulatively total \$5,000 or less during the fiscal year of such agency.
6. **Acceptance Of Contract:** This contract shall not be considered accepted, approved or otherwise effective until the statutorily required approvals and certifications have been given.
7. **Arbitration, Damages, Warranties:** Notwithstanding any language to the contrary, no interpretation of this contract shall find that the State or its agencies have agreed to binding arbitration, or the payment of damages or penalties. Further, the State of Kansas and its agencies do not agree to pay attorney fees, costs, or late payment charges beyond those available under the Kansas Prompt Payment Act (K.S.A. 75-6403), and no provision will be given effect that attempts to exclude, modify, disclaim or otherwise attempt to limit any damages available to the State of Kansas or its agencies at law, including but not limited to the implied warranties of merchantability and fitness for a particular purpose.
8. **Representative's Authority To Contract:** By signing this contract, the representative of the contractor thereby represents that such person is duly authorized by the contractor to execute this contract on behalf of the contractor and that the contractor agrees to be bound by the provisions thereof.
9. **Responsibility For Taxes:** The State of Kansas and its agencies shall not be responsible for, nor indemnify a contractor for, any federal, state or local taxes which may be imposed or levied upon the subject matter of this contract.
10. **Insurance:** The State of Kansas and its agencies shall not be required to purchase any insurance against loss or damage to property or any other subject matter relating to this contract, nor shall this contract require them to establish a "self-insurance" fund to protect against any such loss or damage. Subject to the provisions of the Kansas Tort Claims Act (K.S.A. 75-6101 et seq.), the contractor shall bear the risk of any loss or damage to any property in which the contractor holds title.
11. **Information:** No provision of this contract shall be construed as limiting the Legislative Division of Post Audit from having access to information pursuant to K.S.A. 46-1101 et seq.
12. **The Eleventh Amendment:** "The Eleventh Amendment is an inherent and incumbent protection with the State of Kansas and need not be reserved, but prudence requires the State to reiterate that nothing related to this contract shall be deemed a waiver of the Eleventh Amendment."
13. **Campaign Contributions / Lobbying:** Funds provided through a grant award or contract shall not be given or received in exchange for the making of a campaign contribution. No part of the funds provided through this contract shall be used to influence or attempt to influence an officer or employee of any State of Kansas agency or a member of the Legislature regarding any pending legislation or the awarding, extension, continuation, renewal, amendment or modification of any government contract, grant, loan, or cooperative agreement.

SECTION 01010 - SUMMARY OF WORK

PART 1 GENERAL

1.01 SECTION INCLUDES

- A. Description of the Work.
- B. Work under other contracts.
- C. Products furnished by the owner.
- D. Contractor use of site (and premises).
- E. Code of Conduct.
- F. Existing conditions.
- G. Work sequence, Schedule for Completion and liquidated damages.
- H. Time extensions for adverse weather.
- I. Owner occupancy.
- J. Time extension for factors other than weather.
- K. Additional owner requested bid breakdown.

1.02 DESCRIPTION OF THE WORK

- A. The Contractor shall furnish all labor, materials, facilities, insurance, management, equipment, services, employee training and testing, permits and agreements necessary to perform the work required for the 2018 Elevator Addition at Indian Hills Middle School.

General construction for this bid shall require mobilization at project site. The bidder must perform the work in its entirety. Transferring or sharing prime responsibility for the work will not be allowed and will be considered cause for termination.

- B. The General Contractor shall be represented full time by a competent Superintendent from beginning of the work until final completion. The General Contractor shall provide adequate supervision to cover all Work and shall oversee and direct the daily construction activities at the work site including scheduling of workers and delivery of equipment and materials to meet the project schedule. The superintendent shall also inspect work in progress to ensure that work conforms to the plans and specifications.

- C. The work includes, but is not necessarily limited to the following:

- 1. **Indian Hills Middle School**, 6400 Mission Road., Prairie Village, KS 66208
The project consists new three-story elevator addition.
Construction consists of demolition of concrete slab, concrete eyebrow, masonry, EIFS, gypsum board, roof tie-in and suspended ceilings, floor finishes, mechanical, electrical, plumbing and fire alarm.
New addition consists of concrete, masonry, structural studs, EIFS, carpentry, insulation, gypsum board, roofing, sheet metal, steel doors and frames, hardware, suspended ceilings, floor finishes, paint, signage, electric traction elevator and concrete pavement, mechanical, electrical, plumbing and fire alarm.

1.03 WORK UNDER OTHER CONTRACTS.

- A. The Owner has retained an "on-call" abatement Contractor to remove materials affected by the Work, which contain hazardous materials. Known materials in locations affected by the Work will be removed prior to commencement of Work by the General Contractor in that area. The General Contractor shall notify the Architect and Owner of any material suspected to be hazardous and identified or required to be removed for the new construction, prior to proceeding with demolition.
 - 1. Contractor shall review the Owner's AHERA Inspection reports, on file at SMSD Operations and Maintenance offices, which identify locations of hazardous

materials, prior to commencing any Work. These reports identify materials which must be abated by the Owner's Abatement Contractor. The Contractor shall review existing conditions and identify any locations where the Work will affect the hazardous materials identified in the reports or observed, prior to the commencement of Work.

- B. Items noted 'NIC' (Not in Contract), will be furnished and installed by owner.
- C. Owner will remove and retain possession of items to be maintained, except as described to be salvaged by the Contractor, prior to start of building and/or demolition activities.
- D. The Contractor is responsible for all fees required to obtain building/construction permits, land disturbance, street degradation, etc. fees, with all authorities having jurisdiction.
- E. The Contractor is responsible for the scheduling, phasing, and coordination of all work required to be performed by the respective utility suppliers or their agents. This includes, but is not limited to, work performed by:
 - 1. Water District No. 1 of Johnson County
 - 2. Kansas City Power and Light
 - 3. Spectrum, AT&T, & Google Fiber (Cable, Internet, Phone)
 - 4. Johnson County Wastewater (sanitary sewer)
 - 5. Kansas Gas Service

1.04 CONTRACTOR USE OF SITE AND PREMISES

- A. Limit use of site and premises to areas designated by the Owner, to allow owner occupancy and use of portions of the existing building, parking lots, and hard play areas not required for Work or staging during construction. During construction, the Contractor shall keep the existing building, including construction areas "dry and weather-tight" at all times.
- B. The Contractor shall coordinate the use of the site and locations for all equipment storage, job trailers, portable lavatory facilities, generators, etc., with the Architect and Owner. The owner shall have the final approval for all site use by the contractor.

1.05 CONTRACTOR AND VENDOR EMPLOYEES CODE OF CONDUCT

- A. Shawnee Mission Public Schools requests that all contractor and vendor employees conduct themselves in an acceptable manner while performing work on school district property. The following items are prohibited on school district property:
 - 1. No physical or verbal contact is to be made with students or non-designated staff.
 - 2. No smoking in public or student occupied areas of the building or areas of the site.
 - 3. No drugs and/or alcohol are to be consumed or present on district sites.
 - 4. No firearms, or hunting items, are to be present on the site.
 - 5. Foul and/or abrasive language is not to be used.
 - 6. All workers are to wear clothing on all parts of their body; no shirtless workers. Apparel should be appropriate to a school campus.
 - 7. Utilize designated areas for vehicle access and parking, material storage, etc.
 - 8. All workers are to wear a nametag, which identifies the company name and the individual's name.

1.06 EXISTING CONDITIONS

- A. The contract drawings are based on information taken from original construction drawings and from inspections of the site.

- B. Bidders are advised that "as-built" conditions may vary from those shown on the drawings. Bidders shall not later request, nor expect to receive, additional payment for work related to variations which can be determined by examination of the existing building and site, by the date set for receipt of Bids for this Contract.

1.07 WORK SEQUENCE AND SCHEDULING

- A. The Contractor and all Subcontractors, sub-subcontractors and Suppliers shall furnish sufficient forces, supervision, construction plant and equipment, and shall work such hours as may be required to insure the prosecution of the work in accordance with the Progress Schedule stated herein. If in the opinion of the Owner, the Contractor falls behind the Progress Schedule, the Contractor shall take such steps as may be necessary to improve the progress and the Owner may require them to increase the number of shifts, and/or overtime operations, days of work including holidays, Saturdays and Sundays, all without additional costs to the Owner.

- B. Schedule requirements for the Building is outlined as follows.

Indian Hills Middle School – All Areas

Notice to Proceed	1 March, 2018
On-Site Start Date	26 May, 2018
Substantial Completion Date	30 July, 2018
Final Completion Date	6 August, 2018

- D. **Liquidated Damages:** Liquidated damages for Substantial Completion will be assessed if the general contractor has not achieved adequate progress to permit school district personnel occupancy and use of all noted areas of the building and/or site in accordance with the dates for substantial completion noted above. Damages will accrue and will be based on the unavailability of the building space(s) and/or site for their intended purposes as determined by the school district. Liquidated damages noted are based on the intended use of the building and/or site in accordance with the school schedules proposed or established.

<u>Building/Area</u>	<u>Substantial Completion Date</u>	<u>Liquidated Damages Assessment</u>
Indian Hills Middle - All Areas	July 30, 2018	\$1,000/day from July 30, 2018

Final completion of construction related activities including the satisfactory completion of all punchlist corrections shall be completed in accordance with the timeframe noted above for each building and/or area. Liquidated damages associated with final completion shall be assessed based on any actual costs incurred by the school district due to the restricted use of the facility; and for costs that may be associated with inconvenience, lack of efficiency, and/or district personnel costs associated with providing exclusive access for the general contractor to complete punchlist corrections after normal school day operation and/or on weekends or holidays. Similarly, any actual costs incurred by the school district for extended or additional architect/engineer services made necessary as a result of the general contractor's inability to meet final completion will be assessed as liquidated damages to the general contractor.

1.07 TIME EXTENSIONS FOR ADVERSE WEATHER

- A. The Contractor shall comply with all provisions of the General Conditions in submitting any request for extension of Contract Time due to unusually severe weather.

- B. Definitions:

1. Adverse Weather - atmospheric conditions at a definite time and place which are unfavorable to construction activities.
2. Unusually Severe Weather - weather which is more severe than the adverse weather anticipated for the season, location, or activity involved.

C. In order for any request of time extension due to unusually severe weather to be valid, the Contractor must document both of the following conditions.

1. The weather experienced at the project site during the Contract period is more severe than the adverse weather anticipated for the project location during any given month.
2. The unusually severe weather actually caused a delay to the completion of the project. The delay must be beyond the control and without fault or negligence by the Contractor.

D. The following schedule of monthly anticipated adverse weather delays will constitute the baseline for monthly weather time evaluations. The contractor's progress schedule must reflect these anticipated adverse weather delays in all weather-affected activities:

MONTHLY ANTICIPATED ADVERSE WEATHER DELAY WORK DAYS
BASED ON FIVE (5) DAY WORK WEEK

<u>JAN</u>	<u>FEB</u>	<u>MAR</u>	<u>APR</u>	<u>MAY</u>	<u>JUN</u>	<u>JUL</u>	<u>AUG</u>	<u>SEP</u>	<u>OCT</u>	<u>NOV</u>	<u>DEC</u>
10	8	7	6	7	7	5	5	5	4	5	9

E. Upon receipt of the Notice to Proceed, and continuing throughout the contract, the Contractor shall record on their daily construction report, the occurrence of adverse weather and resultant impact to normally scheduled work. Actual adverse weather delay days must prevent work on critical activities for 50% or more of contractor's scheduled work day.

F. The number of actual adverse weather delay days shall include days impacted by actual adverse weather (even if adverse weather occurred in the previous month), and shall be calculated chronologically from the first to the last day of each month, and be recorded as full work days.

1. If the number of actual adverse weather delay days in a given month exceeds the number of days anticipated in Paragraph D, above, the difference shall be multiplied by 7/5 to convert any qualifying workday delays to calendar days. The resulting number of qualifying lost days shall be added to the contract time.
2. The determination that unusually severe weather occurred does not automatically mean an extension of time will be granted. The contractor must substantiate the unusually severe weather delayed work activities on the critical path of the Progress Schedule.

G. Full consideration for equivalent fair weather workdays shall be given. If the number of actual adverse weather delays in a given month is less than the number of days anticipated in Paragraph D, above, the difference shall be multiplied by 7/5 to convert any work day increases to calendar days. The resulting number of qualifying extra days will be accumulated and subtracted from any future month's days lost due to unusually severe weather.

1. The net cumulative total of extra days/lost days shall not result in a reduction of Contract Time and the Date of Substantial Completion shall not be changed as a result of unusually favorable weather.

H. In converting workdays to calendar days, fractions 0.5 and greater shall be rounded up to the next whole number. Fractions less than 0.5 shall be dropped.

- 1 I. The contractor shall summarize and report all actual adverse weather delay days for each
2 month to the Architect by the tenth (10th) of the following month. A narrative indicating the
3 impact of adverse weather conditions on the scheduled critical activities shall be included.
4 1. Any claim for extension of time due to unusually severe weather shall be
5 submitted to the architect and owner within twenty-one (21) days of the last day of
6 the month in which the delay occurred. Resolution of any weather delay claim
7 shall follow the procedures established by the general conditions and as
8 prescribed above.
9
- 10 J. The contractor shall include and indicate the monthly anticipated adverse weather days,
11 listed in Paragraph D, above, in their progress schedule. (Reference Section 01300 for
12 Progress Schedule requirements.)
13 1. The contractor shall indicate the actual adverse weather days (whether less or
14 more than the anticipated days) in their monthly progress schedule update.
15
- 16 1.09 OWNER OCCUPANCY
17
- 18 A. The existing building, parking lots and hard play areas will be used and occupied by the
19 Shawnee Mission School District during portions of the Contract Time. Occupants will
20 include, but not be limited to: students, faculty, parents, and other groups so authorized
21 to use the building and/or site by the School District.
22
- 23 B. **School will be in session from 8:45 a.m. to 3:45 p.m., Mondays through Fridays,
24 spring and fall semesters, until 25 May, 2018.**
25
- 26 C. The work shall be confined to limited areas of the site. The Contractor shall work with the
27 Project Team to develop a schedule of areas to receive work. The schedule will identify
28 specific areas of the building and site to receive work at specific times. This schedule
29 shall be submitted by the Contractor to the Architect for approval before the work begins.
30
- 31 D. The Owner will move loose furnishings out of the existing building with his own work
32 forces prior to scheduled demolition. This will include furniture, equipment, wall hangings,
33 books, maps, clocks, and loose educational materials prohibiting work.
34
- 35 1.10 TIME EXTENSION FOR FACTORS OTHER THAN WEATHER
36
- 37 A. If the Contractor incurs a delay due to factors out of his control, the Contractor shall
38 submit a claim within seven (7) days after the occurrence for additional time to the
39 architect and project team.
40
- 41 B. If a proposal request for additional work causes the contractor additional time to perform
42 the original contract requirements the contractor may submit a claim for additional time to
43 the Architect and Project Team. The Contractor shall include in his proposal its request
44 for time extension (if any), and shall include sufficient information and dates to
45 demonstrate whether and to what extent the change will delay the completion of the
46 contract in its entirety.
47
- 48 C. The determination that delays have occurred beyond the Contractor's control does not
49 automatically mean an extension of time will be granted. The Contractor must
50 substantiate the delay by indicating suspended work activities on the critical portion of the
51 project schedule.
52
53
54
55
56

1.11 ADDITIONAL OWNER REQUESTED BID BREAKDOWN

- A. The following listing of major subcontractors/material suppliers performing work on the project is to be submitted within 24 hours of the bid. Substitutions in the submitted list require the Owner's written permission.

Work Scope

Subcontractor/Material Supplier

Interior Demolition:
Concrete:
Masonry:
Structural Steel:
Rough Carpentry:
EFIS:
Roofing/Architectural Sheet Metal:
Finish Hardware Supplier:
Doors and Frames Supplier:
Drywall:
Acoustical Ceiling:
Resilient Tile:
Painting:
Signage:
Electric Traction Elevator:
HVAC:
Fire Protection:
Plumbing:
Electrical:

END OF SECTION 01010

SECTION 01020 - CONTRACT CONSIDERATIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Allowances
- B. Schedule of values.
- C. Bid Cost Breakdown.
- D. Application for Progress Payment.
- E. Application for Final Payment
- F. Change Orders and/or Clarifications.

1.01 ALLOWANCES

- A. Certain materials and equipment are specified in the Contract Documents by allowances. In some cases, these allowances include installation. Allowances have been established in lieu of additional requirements.

1.02 SCHEDULE OF VALUES

- A. The Contractor will submit to the Architect, a Schedule of Values that includes all major categories of work and per building if applicable. The Schedule of Values will annotate a value for the construction schedules and progress meeting notes required by the contract documents. The dollar amounts are to include all labor, material, overhead and profit applicable to each item in the breakdown. As a sub-breakdown, each item is to be separated into an estimated labor and materials line item. The Contractor must submit an estimated total value for the projected cost of supplies, materials, and equipment required. Submit typed schedule on AIA Form G703 - Application and Certificate for Payment Continuation Sheet. Contractor's standard form of electronic media printout will be considered as an alternate form of submission.
- B. Submit Schedule of Values in triplicate within fourteen (14) calendar days after contract for construction is executed. Schedule shall list the installed value of the component parts of the work, broken down in sufficient detail to serve as a basis for computing values for progress payments during construction.
- C. Format: At a minimum, use the Table of Contents in this Project Manual to identify each line item with number and title of the major specification section.
- D. Add to the Schedule of Values approved Change Orders, with each Application for Payment. List Change Orders in numerical sequence with each Application for Payment.
- E. Correlate line items in the Schedule of Values with other required additional schedules and forms including:
 - 1. Contractor's construction schedule
 - 2. Contract payment request form
 - 3. List of subcontractors.
 - 4. List of products.
 - 5. List of principle suppliers and fabrications.
 - 6. Schedule of submittals.
- F. Prior to making application for the first progress payment, the Contractor must submit the Schedule of Values. No progress payments will be made until the schedule of values has been received, reviewed and approved by the Architect and Shawnee Mission School District. The costs assigned to the breakdown are to total the contract sum. The approved Schedule of Values is to be used by the Contractor on their Application for

Payment.

1.03 BID COST BREAKDOWN (See Bid Form for any applicable requirements)

1.04 APPLICATION FOR PROGRESS PAYMENTS

- A. At a time consistent with the requirements of this section, the General Conditions, and the Owner-Contractor Agreement, and for each calendar month during the progress of the work, submit three (3) copies of a properly notarized itemized Application for Payment prepared in a manner consistent with the Schedule of Values.
- B. The amount shown on the Application for Payment shall be established by the value of work completed through the last day of the application period based upon the Contractor's estimate of labor and materials incorporated in the work and of materials suitably stored in accordance with the contract through the last day of the previous application, less the aggregate of previous payments, and less the retainage as specified in this section.
- C. The form of application for payment shall be the May, 1983 edition of AIA Document G702. "Application and Certificate for Payment", supported by AIA Document G703. "Continuation Sheet", May, 1983 edition.
- D. Provide the following itemized data on Continuation Sheet:
 - a. Format, schedules, line items, and values shall be from the Schedule of Values accepted by Architect.
 - b. Include names, trades and amount for subcontractors.
 - 1. Application Form:
 - a. Fill in required information, including that for change orders executed prior to the date of submittal application.
 - b. Fill in summary of dollar values to agree with the respective totals indicated on the continuation sheet.
 - c. Execute certificate with the signature of a responsible officer of the contractor's firm.
 - 2. Continuation sheets:
 - a. Fill in total list of all scheduled component items of work, with each number and the scheduled dollar value of each item.
 - b. Fill in the dollar value in each column for each scheduled line item when work has been performed or products stored. Round off values to nearest dollar, or as specified in the Schedule of Values.
 - c. List each change order executed prior to the date of submission, at the end of the continuation sheets. List by change order number, description, and breakdown of costs as for an original component item of work.
- E. Substantiating Data for Progress Payments:
 - 1. Substantiating data is required to verify a payment request. Contractors are to include a cover letter identifying:
 - a. Project.
 - b. Application number and date.
 - c. Detailed list of enclosures.
 - d. For stored products: Item number and identification as shown on application, and description of specific material. Include Bill of Sale, Non-Negotiable Bailment Receipt (see form at the end of this section) and applicable insurance certificate.
 - 2. Submit one copy of the data cover letter for each of the applications.
- F. Applications for Payment shall be accompanied by cost breakdowns from the contractor, subcontractors and sub-sub-contractors.

- 1 G. The three notarized copies of the application for payment will be transferred to the
2 architect to be certified for payment. Provide a copy (non-notarized) to the owner's
3 representative.
4

5 1.05 APPLICATION FOR FINAL PAYMENT
6

- 7 A. Submit final Application for Payment following the procedures specified above for
8 progress payments.
9
10 B. Before submitting final Application for Payment, forward concurrently to the Architect, the
11 written warranties and guarantees, Record and Information Manuals and other
12 documents required by the contract documents, and place properly in approved storage
13 at the site the extra stock and spare parts specified. Contractor will obtain the signature of
14 the Architect verifying receipt of the extra stock and spare parts.
15
16 C. Properly executed "Final Lien Waiver and Release" and Contractor's "Affidavit" shall be
17 submitted to the Architect in duplicate prior to final payment.
18
19 D. Application for Final Payment shall be accompanied by a properly executed "Consent of
20 Surety Company to Final Payment: AIA Document G707, April, 1970 edition.
21

22 1.06 CHANGES AND/OR CLARIFICATIONS
23

- 24 A. Request for Information (**RFI**)
25 1. If during the construction of the project, clarification of the documents is required,
26 it shall be brought to the attention of the Architect. The Architect will either
27 provide clarification or the Contractor will issue a Request for Information (RFI) to
28 the Architect. Each RFI will be dated and sequentially numbered. The Architect
29 shall provide his written response to the RFI and return to the Contractor for
30 distribution to all effected contractors.
31 2. Responses to RFI's are not authorization to proceed with work requiring
32 additional compensation. If additional compensation is required, the Contractor
33 shall immediately advise the Architect, and Owner.
34
35 B. Proposal Request (**PR**)
36 1. Should the owner contemplate making a change in the work, the architect will issue
37 a Proposal Request (PR) to the Contractor. If the described change impacts cost
38 and/or time, the Contractor will prepare a proposal for submission to the Architect.
39 The Contractor's proposed bid shall be broken down completely giving quantity and
40 unit costs by each trade of each item, labor cost with hourly rates, allowable
41 overhead and profit (both adds and deducts). The Owner and Architect will review
42 the pricing to determine if a change order will be issued. Contractors are not to
43 proceed with additional work until written authorization has been received. No
44 additional amount will be paid for submittal in this form or for resubmittal should the
45 breakdown be considered inadequate by the Architect and Owner.
46
47 C. Change Orders (**CO**)
48 1. If the Owner determines that a Proposal Request will be accepted, the Architect
49 will prepare a change order (CO) which will be dated and numbered sequentially.
50 The change order will describe the change or changes, will refer to the Proposal
51 Request and Proposal number and becomes valid when signed by the Owner,
52 the Architect and the Contractor.
53 2. Where unit prices are not required by the bid documents and value of changes or
54 extra work is determined by estimate and acceptance in a lump sum, by cost and
55 percentages, or by cost and a fixed fee, the percentages for overhead and profit,
56 or commission to be allowed for net increases shall in no case exceed the figures
57 identified on the bid form.

3. Estimates for material shall be based on reasonable current market value at which materials are available to the Contractor and Subcontractor. Upon request, submit satisfactory evidence of such costs. Labor unit costs shall include associated insurance.
4. When authorized by the Owner, time and material accounting of a change in work may be used. The Contractor shall maintain an accurate account of labor and material involved in each change. Such time and material records are subject to verification. Notify Architect and Owner when work on each change is to start and when it has been completed. To receive full recognition, labor assigned to Contract changes must, insofar as possible, work continuously on the change, rather than interchanging between contract work and the change.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION

FINAL LIEN WAIVER AND RELEASE

Reference that certain Agreement between _____, as Contractor, and _____, as Owner, dated _____, on the project known as _____ located at _____ for work to be performed by said Contractor.

Reference also that certain invoice of Contractor to said Owner in the Amount of \$_____ for work, labor and materials installed in or furnished for said project by and through _____.

The receipt by Contractor of Owner's remittance for the amount said invoice, contingent upon the final clearance and payment of said remittance, shall constitute payment for the full contract amount, including change orders and all other claims or demands of any nature whatsoever which Contractor has or may have in connection with the Project or Contract referenced herein, of \$_____, for which Contractor (a) agrees to and does hereby waive and release said property, project and the Owner and all bond or payment sureties and guarantors from; and (b) does hereby agree to protect, indemnify, defend and hold harmless said property, project, Owner, sureties and guarantors against;

- (1) any and all liens, statutory or otherwise, and
- (2) any or all obligations under any bond or guaranty for payment furnished by or to said Owner, whether pursuant to agreement or requirement of law, and
- (3) any and all other claims whatsoever, statutory or otherwise,

for any and all work, labor and materials furnished by or through said Contractor, its subcontractors and material suppliers for the entirety of said project.

The remittance of the Owner, identified as payment of said above invoice and endorsed by Contractor and marked "paid" or otherwise canceled by the bank against which said remittance was drawn shall constitute conclusive proof that said invoice was paid and the payment thereof was received by the Contractor, and thereupon, this final lien waiver shall become effective automatically and without requirement of any further act, acknowledgment or receipt of the part of said Contractor.

Contractor does further warrant that Contractor has not and will not assign its claims for payment nor its right to perfect a lien against said property and project, and the undersigned representative of the contractor has the right to execute this waiver and release thereof.

The undersigned representative of Contractor does hereby certify under oath that he is fully authorized and empowered to execute this instrument for and in behalf of said Contractor and to bind them hereto and does in fact so execute this final lien release.

Dated this _____ day of _____, 20__.

Contractor:

By:

Title:

Subscribed and affirmed to before me, the undersigned Notary Public within and for the State of _____ and the County of _____, this _____ day of _____, 20__, in the City of _____.

Notary Public within and for said County and State

NON-NEGOTIABLE
BAILMENT RECEIPT

Receipt Number

BAILOR: Owner _____

BAILEE: Contractor/Supplier _____

PROJECT: _____

LOCATION OF STORAGE: _____

The goods and materials described below are held and stored pursuant to the Contract by and between Bailee, as Contractor/Supplier, and Bailer as Owner for Work to be performed at the above referenced Project location. Said goods and materials are to be transferred or delivered to the project site in conjunction with the performance of Bailee's contract referenced above or upon the direction of Bailor or the Architect and no other. The Bailee acknowledges that it has no ownership rights or title in, nor shall claim any lien or interest in or upon, said goods and materials.

QUANTITY	DESCRIPTION OF ITEM
----------	---------------------

Received and Acknowledged Contractor/Supplier

DATED: _____ BY: _____ Authorized Signature

The undersigned representative of Contractor does hereby certify under oath that he is fully authorized and empowered to execute this instrument for and in behalf of said Contractor and to bind them hereto and does in face so execute this final lien release.

Dated this _____ day of _____, 20 ____.

Contractor: _____

By: _____

Title: _____

Subscribed and affirmed to before me, the undersigned Notary Public within and for the State of

_____ and the County of _____, this _____ day of _____, 20 _____,

in the City of _____.

Notary Public within and for said County and State

SECTION 01040 - COORDINATION

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Coordination.
- B. Coordination Drawings.
- C. Lockout/Tagout Procedures
- D. General Installation Provisions
- E. Cleaning and Protection

1.02 COORDINATION

- A. Coordinate scheduling, submittals, and Work of the various sections of specifications to assure efficient and orderly sequence of the project.
- B. Verify that utility requirements for the project have been properly installed and that such water, phone, and electrical hookup is compatible with other construction and demolition operations occurring at the site. Coordinate Work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.
- C. Coordinate space requirements and installation of all Work including mechanical and electrical Work that is indicated diagrammatically on drawings prior to initiating Work on site. Bring discrepancies to the attention of the Architect in a timely manner, follow routing shown for pipes, ducts, and conduit, as closely as practicable; place runs parallel with the line of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
- D. In finished areas, except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.
- E. The Contractor is to coordinate his Work with the Work of the Owner's Contractors.
- F. Coordinate completion and clean up of Work of separate sections in preparation for Substantial Completion and for portions of Work designated for Owner's partial occupancy.
- G. After Owner occupancy of premises, coordinate access to site for correction of defective Work and Work not in accordance with contract documents, to minimize disruption of Owner's activities. This will include off-hour Work to avoid conflict with Owner's activities.
- H. Coordinate construction activities included under various sections of these specifications to assure efficient, safe, and orderly installation of each part of the Work. Coordinate construction operations included under different sections of the specifications that are dependent upon each other for proper installation, connection, and operations.
 - 1. Where installation of one part of the Work is dependent on installation of other components either before or after its own installation, schedule construction activities in the sequence required to obtain the best results.

2. Where availability of space is limited, coordinate installation of different components to assure maximum accessibility for required maintenance, service and repair.
 - I. Where necessary, prepare memoranda for distribution to each party involved outlining special procedures required for coordination. Include such items as required notices, reports, and attendance at meetings.
 1. Prepare similar memoranda for the Owner and separate Contractors where coordination of their Work is required.
 - J. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other activities to avoid conflicts and ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:
 1. Preparation of schedules.
 2. Installation and removal of temporary facilities.
 3. Delivery and processing of submittals.
 4. Conducting progress meetings.
 5. Orchestrating pre-installation and quality assurance meetings.
 6. Project closeout activities.
- 1.03 COORDINATION DRAWINGS (Include as specifically applicable to the project.)
- A. Coordination Drawings: Prepare and submit coordination drawings where close and careful coordination is required for installation of products and materials fabricated off-site by separate entities, and where limited space availability necessitates maximum utilization of space for efficient installation of different components.
 1. Show the interrelationship of components.
 2. Indicate required installation sequences.
 3. Comply with requirements contained in Section "Submittals".
 4. Refer to Division-15 Section "Basic Mechanical Requirements" and Division-16 Section "Basic Electrical Requirements" for specific coordination drawing requirements for mechanical and electrical installations.
 5. In addition to coordination drawings listed in the individual sections, prepare coordination drawings for:
 - a. Mechanical equipment rooms.
 - b. Electrical equipment rooms.
 - c. Elevator equipment rooms.
 - d. Roof plan with ALL penetrations, equipment supports, etc., including mechanical and electrical items.
 - e. Ductwork, piping, electrical conduit.
 6. Submit coordination drawings to the Architects as an "Informational Submittal" prior to commencing work. The Architect will not take responsive action.
- 1.04 LOCKOUT/TAGOUT PROCEDURES
- A. Comply with the most recent requirements of OSHA Regulations for the safety of the workers. All equipment shall be locked/ tagged out to a zero energy state when new installation, replacement, repair, maintenance or servicing is done on machinery or equipment to protect against accidental or inadvertent operation when such operation could cause injury to personnel.
 - B. Contractors are required to lockout/ tagged out machinery and equipment prior to maintenance or service. Compliance with this policy/procedure is mandatory.
 - C. Contractor employees must be able to:
 1. Prepare equipment for shut down

2. Shut down equipment
 3. Isolate equipment
 4. Apply lockout/ tagged out devices
 5. Control any stored energy
 6. Verify equipment isolation
 7. Remove the lockout
- D. When a lockout is placed on a piece of equipment or a system, it shall have a tag attached with a written warning from the person attaching the lockout.
- E. If the energy source cannot be locked out, the tag should clearly state that there is no lockout on the equipment and that it has been de-energized for service.
- F. Procedures:
1. Preparation
Contractor(s) performing lockouts must verify which switches, valves or other energy isolating devices apply to the equipment being serviced.
 2. Shutdown
 - a) Notify any affected personnel (includes other contractors and/or district staff) of the equipment or machinery being locked/tagged out.
 - b) Shut the equipment down using its normal operating controls.
 3. Isolation
 - a) Isolate the equipment or machinery from every power source.
 - b) Insure any secondary power is isolated from the equipment or machinery.
 4. Application of Lockout/Tagged out
 - a) Lockout the energy isolating device with an assigned lock. Only locks assigned for lockout purposes shall be used. General purpose locks shall not be utilized.
 5. Stored Energy
 - a) Insure all moving parts are stopped.
 - b) Release any stored energy from the equipment or machinery. Spring pressure, elevated parts, rotating parts, hydraulics, air, gas, steam, water, etc., must be dissipated or restrained by other methods such as grounding, blocking or bleeding down.
 6. Isolation & Verification
 - a) Insure no personnel are exposed to the equipment or machinery.
 - b) Operate the controls of the equipment or machinery to make sure the equipment or machinery will not operate.
 - c) Return the controls to the off position.
 - d) Electrical testing equipment shall be used to verify electrical isolation.
 7. Restoring Equipment/Machinery to Operation
 - a) Upon completion of maintenance or service, verify the equipment/machinery is safe to operate.
 - b) Remove all tools from the work area.
 - c) Insure the system is fully assembled.
 - d) Be sure all personnel are clear of the equipment.
 - e) Inform everyone affected by the equipment or machinery that the lockout/tagout is being removed.
 - f) Remove the lockout/ tagged out devices. Devices are only to be removed by the person that put them on, except in the case of an emergency.

1.05 GENERAL INSTALLATION PROVISIONS

- A. Inspection of Conditions: Require the Installer of each major Work component to inspect both the substrate and conditions under which Work is to be performed. Do not proceed until unsatisfactory conditions have been corrected in an acceptable manner.

- 1 B. Manufacturer's Instructions: Comply with manufacturer's installation instructions and
2 recommendations, to the extent that those instructions and recommendations are more
3 explicit or stringent than requirements contained in contract documents.
4 1. Where applicable, comply with manufacturer's instructions, including each step in
5 sequence.
6 2. Should manufacturer's instructions with contract documents, request clarification
7 from Architect before proceeding.
8 3. Installation must be performed to conform to the requirements of manufacturer's
9 warranty.
10 C. Inspect materials or equipment immediately upon delivery and again prior to installation.
11 Reject damaged and defective items.
12
13 D. Provide attachment and connection devices and methods necessary for securing Work.
14 Secure Work true to line and level. Allow for expansion and building movement.
15
16 E. Visual Effects: Provide uniform joint widths in exposed Work. Arrange joints in exposed
17 Work to obtain the best visual effect. Refer questionable choices to the Architect for final
18 decision.
19
20 F. Recheck measurements and dimensions, before starting each installation.
21
22 G. Install each component during weather conditions and project status that will ensure the
23 best possible results. Isolate each part of the completed construction from incompatible
24 material as necessary to prevent deterioration.
25
26 H. Coordinate temporary enclosures with required inspections and tests, to minimize the
27 necessity of uncovering completed construction for that purpose.
28
29 I. Mounting Heights: Where mounting heights are not indicated (install individual
30 components at standard mounting heights recognized within the industry for the particular
31 application indicated). Refer questionable mounting height decisions to the Architect for
32 final decision.
33

34 1.06 CLEANING AND PROTECTION 35

- 36 A. Clean and maintain construction area as frequently as necessary throughout the project.
37 Contractor to provide up to and have use of at least one dumpster during the course of
38 the Work. The dumpster to be located as coordinated with the Owner. The Contractor
39 shall be responsible for any damages and shall repair and/or replace grass sod, concrete
40 curbing, sidewalks, paved surfaces or other items if damaged due to the Contractor's
41 activities.
42
43 B. Limiting Exposures: Supervise construction activities to ensure that no part of the
44 construction, completed or in progress, is subject to harmful, dangerous, damaging, or
45 otherwise deleterious exposure during the construction period. Where applicable, such
46 exposures include, but are not limited to, the following:
47 1. Excessive static or dynamic loading.
48 2. Excessive internal or external pressures.
49 3. Excessively high or low temperatures.
50 4. Thermal shock.
51 5. Excessively high or low humidity.
52 6. Air contamination or pollution.
53 7. Water or ice.
54 8. Solvents.
55 9. Chemicals.
56 10. Light.

11. Radiation.
12. Puncture.
13. Abrasion.
14. Heavy traffic.
15. Soiling, staining and corrosion.
16. Bacteria.
17. Rodent and insect infestation.
18. Combustion.
19. Electrical current.
20. High speed operation.
21. Improper lubrication.
22. Unusual wear or other misuse.
23. Contact between incompatible materials.
24. Destructive testing.
25. Misalignment.
26. Excessive weathering.
27. Unprotected storage.
28. Improper shipping or handling.
29. Theft.
30. Vandalism.

C. Comply with Environmental Protection Agency Standards for Lead Renovation, Repair, and Painting Program (RRP); 40 CFR Part 745 and Kansas Department of Health and Environment Regulations K.A.R. 28-72-1 to 28-72-54.

1. Conduct pre-renovation education and notification.
2. Supervise construction activities to ensure that lead safe work practices are performed and take proper precautions concerning presumed lead materials.
3. Prevent discharge, dispersal, release or escape of lead dust and debris.
4. Isolate work areas and ensure that renovation dust or debris does not spread beyond contract limits or the project work areas. If latent emissions occur, perform cleaning, re-cleaning, and subsequent cleaning verifications as necessary. The Contractor shall not leave lead dust hazards in Owner facilities. Lead dust hazard means surface dust that contains a dust-lead loading (area concentration of lead) at or exceeding the levels promulgated by State of Kansas and Federal regulations. The Contractor shall not impair the Owner's ability to occupy work areas under this contract beyond substantial completion dates by leaving lead dust hazards.
5. During construction the Contractor shall perform visual inspections and cleaning verifications and shall weigh and assess the risks presented by the actual or presumed presence of lead-based paint and/or lead-based paint hazards.
6. The Contractor shall comply with State of Kansas and Federal lead safe work practices to clean and reclean each work area for safe post renovation occupancy by unprotected workers, children, and other building occupants.
7. Comply with the US Occupational Safety and Health Administrations's Lead in Construction Rule, 29 CFR Part 1926 et al. 29 CFR Part 1910 et al.
 - a. Communicate information concerning lead hazards according to the requirements of OSHA's Hazard Communication Standard for the construction industry, 29 CFR 1926.59.
 - b. Employee notification: Prior to the commencement of work activities, make available to the affected parties information developed for the hazard communication standard for this purpose.

- 1 c. The Contractor shall properly clean all areas where suspect or
2 identified lead-based paint products are disturbed prior to project
3 completion.
4 8. At the Pre-Construction Meeting the Contractor shall submit documents
5 which indicate:
6 d. Contractor and subcontractors are lead certified firms.
7 e. That each firm employees at least one lead certified renovator
8 who is specifically trained to supervise and direct lead safe work
9 practices, post signage, and perform cleaning verifications.
10 f. That individual workers are trained to use lead safe work
11 practices.
12
13 9. Product Prohibition: Do not install lead-based paints or coatings. Do not
14 install lead bearing materials. The Contractor shall not install lead or
15 lead-bearing products as defined by the US Consumer Product Safety
16 Commission's Ban of Lead-Containing Paint and Certain Products
17 Bearing Lead-Containing Paint 16 CFR 1303 et. Al.
18

19
20 **PART 2 - PRODUCTS**

21 Not used.
22
23

24
25 **PART 3 - EXECUTION**

26 Not used.
27
28
29
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31
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33 **END OF SECTION 01040**

SECTION 01095 - REFERENCE STANDARDS AND DEFINITIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Related documents
- B. Definition
- C. Specification Format and Content Explanation
- D. Industry Standards
- E. Governing Regulations/Authorities
- F. Submittals

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to this section.

1.03 DEFINITIONS

- A. Indicated: The term "indicated" refers to graphic representations, notes, or schedules on the drawings, other paragraphs or schedules in the specifications, and similar requirements in the contract documents. Where terms such as "shown", "noted", "scheduled", and "specified" are used, it is to help the reader locate the reference; no limitation on locating is intended.
- B. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the architect/consultant", "requested by the architect/consultant", and similar phrases.
- C. Approve: The term "approved", where used in conjunction with the architect/consultant's action on the Contractor's submittals, applications, and requests, is limited to the architect/consultant's duties and responsibilities as stated in General, Supplementary, and Special Provisions.
- D. Regulation: The term "Regulations" includes laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, as well as rules, conventions, and agreements within the asbestos removal, hazardous waste, and construction industries that control performance of the work.
- E. Furnish: The term "furnish" is used to mean "supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations".
- F. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations".
- G. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use".

- H. Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, Subcontractor, or sub-subcontractor, for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.
1. The term "experienced" when used with the term "Installer" means having a minimum of five previous projects similar in size and scope to this project, being familiar with the precautions required, and having complied with requirements of the authority having jurisdiction.
 2. Trades: Use of titles such as "carpentry" is not intended to imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter". It also does not imply that requirements specified apply exclusively to trades persons of the corresponding generic name.
- I. Assignment of Specialists: Certain sections of the specifications require that specific construction activities shall be performed by specialists who are recognized experts in the operations to be performed. The specialists must be engaged for those activities, and assignments are requirements over which the Contractor has no choice or option. Nevertheless, the ultimate responsibility for fulfilling contract requirements remains with the Contractor.
1. This requirement shall not be interpreted to conflict with enforcement of building codes and similar regulations governing the work. It is also not intended to interfere with local trade union jurisdictional settlements and similar conventions.
- J. Project Site is the space available to the Contractor for performance of activities, either exclusively or in conjunction with others performing other work as part of the project. The extent of the Project Site is shown on the drawings and may or may not be identical with the description of the actual Project Site. All dimensions and locations should be field verified and noted by the Contractor.
- K. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

1.04 SPECIFICATION FORMAT AND CONTENT EXPLANATION

- A. Specification Format: The specifications are organized into divisions and sections based somewhat on the Construction Inspection Institute's 16-Division format and MASTER FORMAT numbering system.
- B. Specification Content: This specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:
1. Abbreviated Language: Language used in specifications and other contract documents is the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and the full context of the contract documents so indicates.
 2. Imperative and streamlined language is used generally in the specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.
 - a. The words "shall be" shall be included by inference wherever a colon (:) is used within a sentence or phrase.

1 1.05 INDUSTRY STANDARDS

- 2
- 3 A. Applicability of Standards: Except where the contract documents include more stringent
- 4 requirements, applicable construction industry standards have the same force and effect
- 5 as if bound or copied directly into the contract documents. Such standards are made a
- 6 part of the contract documents by reference.
- 7
- 8 B. Publication Dates: Where the date of issue of a referenced standard is not specified,
- 9 comply with the standard in effect as of date of contract documents.
- 10
- 11 C. Conflicting Requirements: Where compliance with two or more standards is specified,
- 12 and the standards establish different or conflicting requirements for minimum quantities or
- 13 quality levels, refer requirements that are different, but apparently equal, and uncertainties
- 14 to the consultant for a decision before proceeding.
- 15 1. Minimum Quantity or Quality Levels: The quantity level shown or specified shall
- 16 be the minimum provided or performed. In complying with these requirements,
- 17 indicated numeric values are minimum or maximum, as appropriate for the
- 18 context of the requirement. Refer uncertainties to the consultant for a decision
- 19 before proceeding.
- 20
- 21 D. Copies of Standards: Each entity engaged in activities on the project is required to be
- 22 familiar with industry standards applicable to that entity's construction activity. Copies of
- 23 applicable standards are not bound with the contract documents.
- 24 1. Where copies of standards are needed for performance of a required activity, the
- 25 Contractor shall obtain copies directly from the publication source.
- 26
- 27 E. Abbreviations and Names: Trade association names and titles of general standards are
- 28 frequently abbreviated. Where such acronyms or abbreviations are used in the
- 29 specifications or other contract documents, they mean the recognized name of the trade
- 30 association, standards generating organization, authority having jurisdiction, or other
- 31 entity applicable to the context of the text provision. Refer to the "Encyclopedia of
- 32 Associations", published by Gale Research Co., available in most libraries.
- 33

34 1.06 GOVERNING REGULATIONS/AUTHORITIES

35

- 36 A. The architect has contacted authorities having jurisdiction to obtain information necessary
- 37 for preparation of contract documents. Contact authorities having jurisdiction directly for
- 38 information and decisions having a bearing on the work.
- 39

40 1.07 SUBMITTALS

41

- 42 A. Permits, Licenses, and Certificates: For the Owner's records, submit copies of permits,
- 43 licenses, certifications, inspection reports, releases, jurisdictional settlements, notices,
- 44 receipts for fee payments, judgments, and similar documents, correspondence, and
- 45 records established in conjunction with compliance with standards and regulations
- 46 bearing upon performance of the work.
- 47

48 **PART 2 – PRODUCTS** (Not Applicable)

49

50 **PART 3 – EXECUTION** (Not Applicable)

51

52 **END OF SECTION**

53

54

55

SECTION 01200 - PROJECT MEETINGS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Related Documents
- B. Summary
- C. Pre-Construction Conference
- D. Pre-Installation Conference
- E. Progress Meetings

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division-1 specification sections, apply to this section.

1.03 SUMMARY

- A. This section specifies administrative and procedural requirements for project meetings including, but not limited to:
 - 1. Preconstruction conference.
 - 2. Preinstallation conferences.
 - 3. Coordination meetings.
 - 4. Progress meetings.
- B. Construction schedules are specified in another Division-1 section.

1.04 PRECONSTRUCTION CONFERENCE

- A. The Contractor shall schedule a preconstruction and organizational meeting at the project site or other convenient location within fourteen (14) days of contract execution, and at least seven (7) days prior to commencement of any construction activities. The Contractor shall conduct the meeting to review responsibilities and personnel assignments.
- B. Attendees: Shawnee Mission School District, the Architects/Consultants, the Contractor and its superintendent, major subcontractors, manufacturers, suppliers and other concerned parties shall each be represented at the conference by persons familiar with and authorized to conclude matters relating to the work.
- C. Agenda: Discuss items of significance that could affect progress, including such topics as:
 - 1. Tentative construction schedule.
 - 2. Critical work sequencing.
 - 3. Designation of responsible personnel.
 - 4. Procedures for processing field decisions and change orders.
 - 5. Procedures for processing applications for payment.
 - 6. Distribution of contract documents.
 - 7. Submittal of Shop Drawings, Product Data and Samples.
 - 8. Preparation of record documents.
 - 9. Use of the premises.
 - 10. Office, work and storage areas.
 - 11. Equipment deliveries and priorities.

12. Safety procedures.
13. Lead safe work practices and lead hazard prevention procedures.
14. First aid.
15. Security.
16. Housekeeping.
17. Working hours.
18. Testing agencies and procedures.
19. Temporary utilities; water, electric, phone.
20. Temporary lavatory facilities.
21. Quality control.

- D. The Contractor shall record meeting minutes and distribute copies to everyone in attendance and to others affected by decisions of actions resulting from the meeting.

1.05 PREINSTALLATION CONFERENCES

- A. The General Contractor shall convene a preinstallation conference at the site before each construction activity that requires coordination with other construction. The Installer and representatives of manufacturers and fabricators involved in or affected by the installation, and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise the architect and owner of scheduled meeting dates. All related submittals must be approved prior to convening of this meeting.
- B. Review the progress of the construction activities and preparations for the particular activity under consideration at each preinstallation conference, including requirements for:
1. Contract documents.
 2. Options.
 3. Related Change Orders.
 4. Purchases.
 5. Deliveries.
 6. Shop drawings, product data and quality control samples.
 7. Possible conflicts.
 8. Compatibility problems.
 9. Time schedules.
 10. Weather limitations.
 11. Manufacturer's recommendations.
 12. Compatibility of materials.
 13. Acceptability of substrates.
 14. Temporary facilities.
 15. Space and access limitations.
 16. Governing regulations.
 17. Safety and application of associated Lock Out/Tag Out procedures.
 18. Safety.
 19. Inspection and testing requirements.
 20. Required performance results.
 21. Recording requirements.
 22. Protection.
- C. Notify architect/owner four days in advance of meeting date when their attendance is required.
- D. The Contractor shall prepare agenda, preside at the conference and record significant discussions and agreements and disagreements of each conference, along with the approved schedule. The Contractor shall distribute the meeting record to everyone concerned.
- E. Do not proceed if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of work and reconvene the conference at the earliest feasible date.

- F. Where schedule allows, schedule any pre-installation meetings immediately following a regular progress meeting.

1.06 PROGRESS MEETINGS

- A. Conduct progress meetings at the Project Site at a minimum of bi-weekly intervals or as directed by the Architect. Notify the Owner and Architect of scheduled meeting dates. Coordinate dates of meetings with preparation of the payment request.
- B. Attendees: In addition to representatives of the Owner and Architect, each subcontractor, supplier or other entity concerned with current progress or involved in planning, coordination or performance of future activities shall be represented at these meeting by persons familiar with the Project and authorized to conclude matters relating to progress.
- C. Agenda: Review and correct or approve minutes of the previous progress meeting. Review other items of significance that could affect progress. Include topics for discussion as appropriate to the current status of the project.
1. Contractor's Schedule: Review progress since the last meeting. Determine where each activity is in relation to the Contractor's schedule, whether on time or ahead or behind schedule. Determine how operations behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed with the contract time.
 2. Review present and future needs of each entity present, including such items as:
 - a. Interface requirements.
 - b. Time.
 - c. Sequences.
 - d. Deliveries.
 - e. Off site fabrication status.
 - f. Access.
 - g. Site utilization.
 - h. Temporary facilities and services.
 - i. Hours of work.
 - j. Hazards and risks.
 - k. Housekeeping.
 - l. Quality and work standards.
 - m. Change orders.
 - n. Documentation of information for payment requests.
 - o. Outstanding items; submittals, proposal requests, RFIs.
 - p. Quality assurance.
 - q. Safety and application of necessary Lock Out/Tag Out procedures.
 - r. Performance of lead safe work practices.
 - s. Designate responsible parties along with timeframe to resolve all issues.
- D. Reporting: No later than three days after each progress meeting date, the Contractor is to distribute copies of minutes of the meeting to each party present and to other parties who should have been present identifying responsible parties to any open issues. Include a brief summary, in narrative form, of progress since the previous meeting and reports.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

SECTION 01210 - CASH ALLOWANCES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes administrative and procedural requirements governing the use of cash allowances.
 - 1. A cash amount is specified in the Contract Document as a cash allowance. This allowance has been established to address additive cost changes in the Work to undesigned conditions associated with construction. The use of the cash allowance is solely at the discretion of the Owner, and cannot be authorized by the Architect, Engineer, or other consultant.
- B. Related Sections include the following:
 - 1. Division 1 Section 01020 "Contract Considerations" for procedures for submitting and handling Change Orders.
 - 2. Divisions 2 through 16 Sections for items of Work that may be covered by allowances.

1.03 USE OF ALLOWANCES

- A. At Architect's request, obtain cost proposals for the corrections of the noted undesigned conditions.
- B. Based on cost proposals received, the Owner will make a decision to utilize available allowance amounts to correct the applicable undesigned condition. The correction of individual undesigned conditions may be funded utilizing cash allowances or a formal change order at the Owner's discretion.

1.04 SUBMITTALS

- A. Submit proposals for additive costs for undesigned conditions in the same form specified for proposal requests.

1.05 RESPONSIBILITIES

- A. Architect Responsibilities:
 - 1. Consult with Owner in consideration and selection of additive cost items for consideration for application using cash allowances.
 - 2. Prepare Proposal Requests and assess proposals for application of cash allowances for Owner approval.
- B. Contractor Responsibilities:
 - 1. Identify conditions as they may occur and advise the Architect and Owner.
 - 2. Obtain proposals and offer recommendations.
 - 3. On notification of approval of cash allowance, execute agreement with designated supplier and/or sub-contractor as applicable.
 - 4. Arrange for and process applicable shop drawings, product data, and samples. Arrange for delivery.
 - 5. Coordinate and install Work of approved Cash Allowances.

- 1 6. The Contractor shall include in his Bid all fees for all Cash Allowances.
- 2
- 3 C. Funds will be drawn from Cash Allowances only by written authorization of the Owner.
- 4
- 5 1.06 SCHEDULE OF VALUES
- 6
- 7 A. The Contractor will submit to the Architect a Schedule of Values that includes all major
- 8 categories of work, including applicable Cash Allowances.
- 9
- 10 1.07 COORDINATION
- 11
- 12 A. Coordinate allowance items with other portions of the Work. Furnish templates as
- 13 required to coordinate installation.
- 14
- 15 1.08 ALLOWNACE COSTS
- 16
- 17 A. Allowance shall include cost to Contractor of products and materials, freight and delivery
- 18 to Project Site, labor, and installation.
- 19
- 20 B. Contractor's costs for overhead and profit, and similar costs of Bonds and Insurance shall
- 21 be included as part of the Contract Sum and not part of the allowance.
- 22
- 23 C. Any unused portion of the Allowance shall be credited to the Owner at the completion of
- 24 the Work via a Deductive Change Order, along with the associated overhead and profit.
- 25 Refer to Contract Documents for procedures and mark-ups for Deductive Change
- 26 Orders.
- 27

28 **PART 2 – PRODUCTS** (Not Used)

29

30 **PART 3 -- EXECUTION**

31

32 3.01 EXAMINATION

33

- 34 A. Examine products covered by an allowance promptly on delivery for damage or defects.
- 35 Return damaged or defective products to manufacturer for replacement.
- 36

37 3.02 PREPARATION

38

- 39 A. Coordinate materials and their installation for each allowance with related materials and
- 40 installations to ensure that each allowance item is completely integrated and interfaced
- 41 with related work.
- 42

43 3.03 SCHEDULE OF ALLOWANCES

44

- 45 A. **Cash Allowance #1: Indian Hills Middle:**
- 46 Include a \$30,000.00 (Thirty thousand dollars) cash allowance in the Base Bid for
- 47 “undesignated conditions” as the Owner deems necessary.
- 48
- 49
- 50

51 **END OF SECTION 01210**

SECTION 01230 - ALTERNATES

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This section includes administrative and procedural requirements governing alternates.

1.03 DEFINITIONS

- A. Definition: An alternate is an amount proposed by bidders and stated on the bid form for certain work defined in the bidding requirements that may be added to or deducted from the base bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be completed, or in the products, materials, equipment, systems, or installation methods described in the contract documents.
 - 1. The cost or credit for each alternate is the net addition to or deduction from the contract sum to incorporate the alternate into the work. No other adjustments are made to the contract sum.

1.04 PROCEDURES

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

PART 2 – PRODUCTS (NOT APPLICABLE)

PART 3 – EXECUTION

3.01 SCHEDULE OF ALTERNATES

Alternate No.1: Remove and dispose of existing elevator including cab, hoistway and all components in it's entirely for a clean and empty shaft. Disconnect and remove back to source any and all electrical, HVAC, plumbing and security services. Provide new floor slab at Ground, First and Second floors, tie-in to existing structural slab. Infill existing openings with gyp. bd. partition and provide three (3) 3'x 7' new HM doors, frames, w/ keyed closet locks.

END OF SECTION

1 **SECTION 01300 - SUBMITTALS**

2
3 **PART 1 - GENERAL**

4
5 1.01 SECTION INCLUDES:

- 6
7 A. Related Documents.
8
9 B. Summary.
10
11 C. Submittal Procedures.
12
13 D. Contractor's Construction Schedules.
14
15 E. Submittal Schedule.
16
17 F. Daily Construction Reports.
18
19 G. Pre-existing Conditions Video Survey.
20
21 H. Shop Drawings.
22
23 I. Product Data.
24
25 J. Samples.
26
27 K. Communications Facilitating Contract Administration.
28
29 L. Architect's Action.
30
31 M. Contractor's Action on Returned Submittals.

32
33 1.02 RELATED DOCUMENTS

- 34
35 A. Drawings and general provisions of the contract, including General and Supplementary
36 Conditions and other Division-1 Specification Sections, apply to this section.
37

38 1.03 SUMMARY

- 39
40 A. This section specifies administrative and procedural requirements for submittals required
41 for performance of the work, including:
42 1. Submittal procedures.
43 2. Contractor's construction schedule.
44 3. Submittal schedule.
45 4. Daily construction reports.
46 5. Construction photographs.
47 6. Shop drawings.
48 7. Product data.
49 8. Samples.
50 9. Informational submittals.
51 10. Communications.
52
53 B. Administrative Submittals: Refer to other Division-1 sections and other contract
54 documents for requirements for administrative submittals. Such submittals include, but
55 are not limited to:

1. Permits.
2. Applications for payment.
3. Performance, payment bonds, and statutory bond.
4. Insurance certificates.
5. List of subcontractors.

C. The "Schedule of Values" submittal is included in Division-1 Section "Applications for Payment."

D. Inspection and test reports are included in Division-1 Section "Quality Control Services."

E. The "Product List" submittal is included in Division-1 Section "Materials and Equipment."

1.04 SUBMITTAL PROCEDURES

A. General: All documents transmitted for purposes of administration of the contract are to be in electronic (PDF) format and transmitted via an Internet-based submittal service that receives, logs and stores documents, and notifies addressees via email.

1. Beyond submittals for review, information, and closeout, this procedure applies to requests for information (RFIs), progress documentation, contract modification documents (e.g. supplementary instructions, change proposals, change orders), applications for payment, field reports and meeting minutes, and any other document any participant wishes to make part of the project record. The intent shall be that construction phase documentation be paperless to the greatest extent possible.
2. Developer/Contractor and Architect are required to use this service.
3. It is Developer/Contractor's responsibility to submit documents in PDF format.
4. Subcontractors, suppliers, and Architect's consultants will be permitted to use the service at no extra charge.
5. Users of the service need an email address, Internet access, and PDF review software that includes ability to mark up and apply electronic stamps (such as Adobe Acrobat, www.adobe.com, or Bluebeam PDF Revu, www.bluebeam.com), unless such software capability is provided by the service provider.
6. Paper document transmittals will not be reviewed; emailed PDF documents will not be reviewed.
7. All other specified submittal and document transmission procedures apply, except that electronic document requirements to not apply to actual physical samples or color selection charts. Transmittals for these items must still be posted to the service so that team members may take action on them, however, and to act as a record of the submittal made, selections determined and action taken.

B. Cost: The cost of the service will be the responsibility of the awarded contractor (please contact service provider for cost information).

C. Submittal Service: Provide the most cost effective service of the two:

1. eCommunication by Drexel Technologies, Damien Illum, (913) 371-4430, www.drexeltech.com.
2. Submittal Exchange, www.submittalexchange.com, Sarah Stanley 515-393-2257

D. Training: One, one-hour, web-based training session will be arranged for all participants, with representatives of Architect and Developer/Contractor participating; further training is the responsibility of the user of the service.

E. Project Closeout: Contractor will determine when to terminate the service for the project and is responsible for obtaining archive copies of files for Owner and Architect.

- 1 F. Electronic copies of CAD Drawings of the Contract Drawings will be provided as
2 determined appropriate by Architect for Contractor's use in preparing submittals. The
3 Architect may be contacted for providing electronic copies to the successful bidder for a
4 service fee of \$25.00 per sheet plus a \$25.00 handling fee for email/shipping. Include
5 release of liability form and payment of fees will be required prior to release of any files.
6
- 7 G. Coordination: Coordinate preparation and processing of submittals with performance of
8 construction activities.
9 1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other
10 submittals, and related activities that require sequential activity.
11 2. Coordinate transmittal of different types of submittals for related parts of the
12 Work so processing will not be delayed because of need to review submittals
13 concurrently for coordination.
14 a. Architect reserves the right to withhold action on a submittal requiring
15 coordination with other submittals until related submittals are received.
16
- 17 H. Processing Time: Allow enough time for submittal review, including time for resubmittals,
18 as follows. Time for review shall commence on Architect's receipt of submittal.
19 1. Initial Review: Allow 5 calendar days for initial review of each submittal. Allow
20 additional time if processing must be delayed to permit coordination with
21 subsequent submittals. Architect will advise Contractor when a submittal being
22 processed must be delayed for coordination.
23 2. Concurrent Review: Where concurrent review of submittals by Architect's
24 consultants, Owner, or other parties is required, allow 10 calendar days for initial
25 review of each submittal.
26 3. If intermediate submittal is necessary, process it in same manner as initial
27 submittal.
28 4. Allow 5 calendar days for processing each re-submittal.
29 5. No extension of the Contract Time will be authorized because of failure to
30 transmit submittals enough in advance of the Work to permit processing.
31

32 1.05 CONTRACTOR'S BAR CHART CONSTRUCTION SCHEDULES

33

- 34 A. The Contractor shall provide a detailed bar chart schedule. The schedule shall include as
35 many activities as necessary to sufficiently detail the work to be performed.
36
- 37 B. Scope: The schedule as a minimum, shall provide for 1) work sequence as identified in
38 Section 01010 Summary of Work; 2) provisions for adverse weather as identified in the
39 General Conditions; and, 3) the following:
40 1. Long lead time procurement activities.
41 2. Contractor phasing activities.
42 3. Activation and testing activities.
43 4. Milestone dates for contract phasing requirements.
44 5. Owner furnished equipment activities.
45 6. Utility tie-in activities.
46 7. Clean-up and punch list activities and Owner move-in activities.
47 8. Activity durations in working days.
48 9. Work activities performed by subcontractors.
49 10. Concurrent work activities under separate contract.
50 11. Shop drawing, submittals and approval.
51 12. Weather constraints.
- 52 C. Developing the Schedule: The Contractor shall meet jointly with the subcontractors, and
53 suppliers, when developing the schedule.
54

- 1 D. Owner's Review: Within five (5) working days after receipt of the Contractor's schedule,
2 the Owner and Architect shall meet with the Contractor for the final review of the
3 schedule. Review of the schedule by the Owner does not relieve the Contractor's
4 responsibility for the schedule's accuracy or the ability of the Contractor to meet the dates
5 set forth therein, nor does such review constitute an acknowledgement or admission by
6 the Owner of the reasonableness of durations or logic of the schedule.
7
8 E. Important of Update Submittals: The updated bar chart submittal, including a written
9 schedule recovery statement if required, shall accompany the Contractor's Application for
10 Payment. The Contractor's Application for Payment will not be processed until the update
11 bar chart schedule has been received by the Owner.
12
13 F. Schedule Slippage: Whenever the current schedule update reflects that the project is five
14 (5) or more working days behind schedule, the Contractor shall submit a written statement
15 to the Architect describing the cause of the slippage and the actions being considered by
16 the Contractor to recover the time slot. The written schedule recovery statement shall be
17 submitted with the monthly schedule update.
18
19 G. The progress schedule shall indicate the monthly anticipated adverse weather days, if any,
20 pursuant to the Supplemental and General Conditions and indicate the constraints of
21 anticipated adverse weather on planned activities. Update submittals of the progress
22 schedule shall indicate actual adverse weather days and their impact on planned activities.
23
24 H. Any adjustments in Contract Time executed by Change Order shall be included in the
25 update submittals of the project schedule.
26

27 1.07 SUBMITTAL SCHEDULE

- 28
29 A. After development and acceptance of the Contractor's schedule, prepare a complete
30 schedule of submittals. Submit the schedule within ten (10) days of the date required for
31 establishment of the Contractor's construction schedule.
32 1. Coordinate submittal schedule with the list of subcontracts, schedule of values and
33 the list of products as wells as the Contractor's Construction Schedule.
34 2. Prepare the schedule in chronological order; include submittals required during
35 the construction. Provide the following information.
36 a. Scheduled date for the first submittal.
37 b. Related section number.
38 c. Submittal category.
39 d. Name of subcontractor.
40 e. Description of the part of the work covered.
41 f. Scheduled date for resubmittal.
42
43 B. Distribution: Following response to initial submittal, print and distribute copies to the
44 Architect, Owner, subcontractors, and other parties required to comply with submittal
45 dates indicated. Post copies in the project meeting room and field office.
46 1. When revisions are made, distribute to the same parties and post in the same
47 locations. Delete parties from distribution when they have completed their
48 assigned portion of the work and are no longer involved in project activities.
49 C. Schedule Updating: Revise the submittal schedule after each meeting or activity, where
50 revisions have been recognized or made relating to submittals. Issue the updated
51 schedule concurrently with report of each such meeting.
52
53
54
55

1 1.08 DAILY CONSTRUCTION REPORTS

- 2
- 3 A. The Contractor's Superintendent shall prepare a daily construction report, recording the
- 4 following information, in a narrative format, concerning events at the site; and submit
- 5 original documents to the Architect at weekly intervals.
- 6 1. List of subcontractors at the site.
- 7 2. Approximate count of all personnel at the site, identifying the number of workers
- 8 and supervisors.
- 9 3. High and low temperatures, general weather conditions.
- 10 4. Accidents and unusual events.
- 11 5. Meetings and significant decisions.
- 12 6. Stoppages, delays, shortages, losses.
- 13 7. Emergency procedures.
- 14 8. Orders and requests of governing authorities.
- 15 9. Change orders received, implements.
- 16 10. Services connected, disconnected.
- 17 11. Equipment or system tests and start-ups.
- 18 12. Partial completions and occupancies.
- 19 13. Type and usage of major pieces of heavy equipment.
- 20

21 1.09 PRE-EXISTING CONDITIONS VIDEO SURVEY

- 22
- 23 A. Submit a pre-existing condition list and video prior to commencing Work. Specifically note
- 24 pre-existing conditions, particularly of site areas (drive, sidewalk, curb, landscape/yard
- 25 areas etc.), interior spaces and adjacent condition which may be damaged during the
- 26 work and be required to be restored to original pre-construction conditions and could
- 27 result in a potential dispute with the Owner.
- 28

29 1.10 SHOP DRAWINGS

- 30
- 31 A. Submit newly prepared information, drawn to accurate scale. Highlight, encircle, or
- 32 otherwise indicate deviations from the contract documents. Do not reproduce contract
- 33 documents or copy standard information as the basis of shop drawings. Standard
- 34 information prepared without specific reference to the project is not considered shop
- 35 drawings. Shop drawings' quality is subject to approval.
- 36
- 37 B. Shop drawings include fabrication and installation drawings, setting diagrams, schedules,
- 38 patterns, templates and similar drawings. Include the following information:
- 39 1. Dimensions.
- 40 2. Relationship to building grids or coordinates.
- 41 3. Interface with adjacent construction.
- 42 4. Identification of products and materials included.
- 43 5. Compliance with specified standards.
- 44 6. Notation of dimensions established by field measurement.
- 45 C. Sheet Size: Except for templates, patterns and similar full-size drawings, submit shop
- 46 drawings on sheets 8½" x 11", 11" x 17", or 30" x 42". No other sizes will be accepted.
- 47 D. Do not use shop drawings without an appropriate final stamp indicating action taken in
- 48 connection with construction.
- 49

50 1.11 PRODUCT DATA

- 51
- 52 A. Collect product data into a single submittal for each specified product. Product data
- 53 includes printed information such as catalog cuts, Material Safety Data Sheets (MSDS),
- 54 and other performance information.

1. Mark each copy to show applicable choices and options. Where printed product data includes information on several products, some of which are not required, mark copies to indicate the applicable information. Include the following information:
 - a. Manufacturer's printed recommendation.
 - b. Compliance with recognized trade association standards.
 - c. Compliance with recognized testing agency standards.
 - d. Application of testing agency labels and seals.
 - e. Notation of dimensions verified by field measurement.
 - f. Notation of coordination requirements.
 - g. Any limitations on warranty or guarantee of manufacturer.
 2. Do not submit product data until compliance with requirements of the contract documents has been confirmed.
- B. Distribution: Furnish copies of final submittal to installers, subcontractors, suppliers, manufacturers, fabricators, and others required for performance of construction activities. Show distribution on transmittal form.
1. Do not proceed with installation until a copy of the applicable product data is in the Installer's possession.
 2. Provide copies for record documents described in Section 01700 – Project Closeout.
- C. Do not permit use of unmarked copies of product data in connection with construction.
- 1.12 SAMPLES
- A. Submit full-size, full fabricated samples cured and finished as specified (where applicable) and physically identical with the material or product proposed. Samples include partial sections of manufactured or fabricated components, cuts or container of materials, color range sets, and swatches showing color, texture and pattern.
1. Mount, display, or package samples in the manner specified to facilitate review of qualities indicated. Prepare samples to match the Architect's sample. Include the following:
 - a. General description of the sample.
 - b. Sample sources
 - c. Product name or name of manufacturer.
 - d. Compliance with recognized standards.
 - e. Availability and delivery time.
 2. Submit samples for review of kind, color, pattern, and texture, for a final check of these characteristics with other elements, and for a comparison of these characteristics between the final submittal and the actual component as delivered and installed.
 - a. Where variation in color, pattern, texture or other characteristics are inherent in the material or product represented, submit multiple units (not less than three), that show approximate limits of the variations.
 - b. Refer to other specification sections for requirements for samples that illustrate workmanship, fabrication techniques, details of assembly, connections, operation and similar construction characteristics.
 - c. Refer to other sections for sample to be returned to the Contractor for incorporation in the work. Such samples must be undamaged at time of use. On the transmittal, indicate special requests regarding disposition of sample submittals.

- 1 B. Submittals: Except for samples illustrating details, workmanship, fabrication techniques,
2 connections, operation and similar characteristics, submit three sets: One set will be
3 returned with comments.
- 4 C. Maintain sets of samples, as returned, at the project site, for quality comparisons
5 throughout the course of construction.
- 6 1. Unless non-compliance with contract documents provisions is observed, the
7 submittal may serve as the final submittal.
- 8 2. Sample sets may be used to obtain final acceptance of the construction
9 associated with each set.
- 10
- 11 D. Distribution of Samples: prepare and distribute additional sets to subcontractors,
12 manufacturers, fabricators, suppliers, installers, and others as required for performance of
13 the work. Show distribution on transmittal forms.
- 14
- 15 E. Field Samples: Field samples specified in individual sections are special types of samples.
16 Field samples are full-size samples erected on site to illustrate finishes, coatings, or finish
17 materials and to establish the standard by which the work will be judged.
- 18 1. Comply with submittal requirements to the fullest extent possible. Process
19 transmittal forms to provide a record of activity.
- 20 2. Allow at least seven (7) days after completion and curing (where applicable) of
21 field sample for Architect's review. Notify Architect in writing upon completion of
22 field sample.
- 23 3. Where required, give Architect notice and an opportunity to observe field erection
24 or application of field sample.
- 25
- 26 1.13 COMMUNICATIONS FACILITATING CONTRACT ADMINISTRATION
- 27
- 28 A. Except as otherwise provided in the contract documents or when direct communications
29 have been specially authorized, the Owner and Contractor shall endeavor to
30 communicate through the Architect. Communications by and with subcontractors and
31 material suppliers shall be through the Contractor.
- 32
- 33 B. All requests for information regarding or clarification of the plans and specifications shall
34 be made in writing referencing the specification section and statement requiring
35 clarification. Deliver to Architect's business address.
- 36
- 37 1.14 ARCHITECT'S ACTION
- 38
- 39 A. Except for submittals for record, information or similar purposes, where action and return
40 is required or requested, the Architect will review each submittal, mark to indicate action
41 taken, and return promptly.
- 42 1. Compliance with specified characteristics is the Contractor's responsibility.
- 43
- 44 B. Submittal Stamp: The Architect will stamp each submittal with a uniform, self-explanatory
45 submittal stamp. The stamp will be appropriately marked, as follows, to indicate the
46 action taken:
- 47 1. Action A – Reviewed: Where submittals are marked "Reviewed", that part of the
48 work covered by the submittal may proceed provided it complies with
49 requirements of the contract documents; final acceptance will depend upon that
50 compliance.
- 51 2. Action B – Reviewed – Additional Information Required: Where submittals are
52 marked "Reviewed – Additional Information Required", the information submitted
53 has been reviewed and approved as noted. However, additional information as
54 noted and/or required by contract documents need to be submitted.

3. Action C – Furnish as Corrected: When submittal is marked “Furnish as Corrected”, that part of the work covered by the submittal may proceed provided it complies with notations or corrections on the submittal and requirements of the contract documents; final acceptance will depend on that compliance.
4. Action D – Revise and Resubmit: When submittal is marked “Revise and Resubmit”, do not proceed with that part of the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise or prepare a new submittal in accordance with the notations; resubmit without delay. Repeat if necessary to obtain a different action mark.
 - a. Do not permit submittals marked “Revise and Resubmit” to be used at the project site, or elsewhere where work is in progress.
5. Action E – Rejected: When submittal is marked “Rejected”, information submitted is not in compliance with contract documents. Resubmit submittal as required by contract documents.

D. Meaning of Architect’s Approval: Review is only for conformance with the design concept and for compliance with the information given in the contract documents. Approval does not authorize changes involving additional cost unless stated in separate change order or letter. Contractor is not relieved of responsibility for any deviations in submittals from requirements of the contract documents. Contractor is responsible for dimensions to be confirmed and correlated at the site; for information that pertains solely to the fabrication processes or to means, methods, techniques, sequences and procedures of construction; and for coordination of the work of all trades. Approval of a specific item does not indicate approval of an assembly of which the item is a component.

E. The Architect is contracted with the Owner to perform one (1) initial review and one (1) re-review of the submittals. Any submittals presented by the Contractor, which are incomplete or have not been reviewed and stamped with the Contractor’s approval will be rejected and will be considered as the initial submittal. All re-submittals by the Contractor, whether required to provide complete or corrected initial submittal information will be reviewed and considered as the one (1) re-review submittal. Any submittal required after the initial and re-reviewed submittals will be reviewed at the Contractor’s expense. The Architect will bill the Owner, at the then current hourly/expense rates, for all services time required to receive, review, and return the submittal plus any reimbursable expenses for mileage to/from job site, printing, postage/shipping, etc. Cost for the additional services, charged to the Owner for submittal reviews, will be adjusted by Change Order in the Contractor’s final payment.

1.15 CONTRACTOR’S ACTION ON RETURNED SUBMITTALS

- A. The Contractor shall coordinate distribution of all product data/samples for the project.
- B. The Contractor is responsible to reproduce and distribute copies of stamped returned submittals as required for use or in corrections for resubmittal.
- C. The Contractor is responsible to reproduce and distribute copies of stamped returned submittals as required for his use and subcontractor’s use in preparing and submitting other submittals such as, close-out, maintenance manuals, etc., Refer to other sections of the specifications for requirements.
 1. The Contractor shall maintain a current set of plans and specifications which shall be available to the Architect at the job site during the work.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

1 **SECTION 01400 - QUALITY CONTROL**

2
3 **PART 1 - GENERAL**

4
5 1.01 SECTION INCLUDES

- 6
7 A. Contractor's Quality Control
8
9 B. Contractor's Quality Control Program
10
11 C. Pre-Installation Conferences
12
13 D. Initial and Follow-up Inspections
14
15 E. Mock Up
16
17 F. Field Samples
18
19 G. Manufacturer's Field Services and Reports
20
21 H. References
22
23 I. Inspection and Testing Laboratory Services
24
25 J. Quality Assurance and Control of Installation
26
27 K. Safety

28
29 1.02 RELATED SECTIONS

- 30
31 A. Section 01040 - Coordination and Meetings
32
33 B. Section 01300 - Submittals
34
35 C. Section 01700 - Contract Closeout
36

37 1.03 CONTRACTOR'S QUALITY CONTROL

- 38
39 A. The quality of all work shall be the responsibility of the Contractor. Sufficient inspections
40 and tests of all items of work, including that of subcontractors, to ensure conformance to
41 applicable specifications and drawings with respect to the quality of materials,
42 workmanship, construction finish, functional performance, and identification shall be
43 performed on a continuing basis. The Contractor shall furnish qualified personnel,
44 appropriate facilities, instruments and testing devices necessary for the performance of
45 the quality control function. The controls shall be adequate to cover all construction
46 operations both on and off site, shall be keyed to the proposed construction sequence
47 and shall be correlated by the Contractor's quality control personnel.
48

49 1.04 CONTRACTOR'S QUALITY CONTROL PROGRAM

- 50
51 A. The Contractor shall submit to the Architect a copy of the proposed written quality control
52 program prior to submission of the Contractor's first application and certificate for
53 payment. The Contractor's written quality control plan shall include as a minimum:
54 1. Identification of the project team for this project. Team members include, but are
55 not necessarily limited to, the Owner's Project Manager, Architect, Mechanical
56 Consultant, Electrical Consultant, Site Engineer, Structural Consultant, General

Contractor and major subcontractors. List company name, address, contact and telephone number.

2. Name and identification of the Contractor's key representatives from this project. Include the contract executive, Project Manager, Superintendent, Assistant Superintendents (if applicable), and Quality Control representative (may be the superintendent or other key contract representative). Also include a brief description of proposed duties and qualifications. The quality control representative must have the authority to make all decisions relating to quality control issues.
3. General summary and mission statement outlining general procedures for implementation of the program.
4. List by specification section the method of performing, documenting and enforcing quality control operations of both prime and subcontract work including proposed and required inspection and testing. Include preinstallation conferences, follow-up inspections, mockups, field samples and manufacturer's inspection.
5. The Contractor's quality control program shall be submitted and accepted prior to consideration of the Contractor's first certificate and application for payment.

1.05 PREINSTALLATION CONFERENCES

- A. Pre-installation conferences shall be performed prior to beginning each feature of work for any on-site construction work. Preparatory inspections for the applicable feature of work shall include: review of submittal requirements and all other contract requirements with the foreman or supervisors directly responsible for the performance of the work; check to assure that provisions have been made to provide required field control testing; examine the work area to ascertain that all preliminary work has been completed; verify all field dimensions and advise the project Architect of any discrepancies; and perform a physical examination of materials and equipment to assure that they conform to approved shop drawings or submittal data and that all materials and/or equipment are on hand; review special requirements, review shop drawings and sample construction mockups as appropriate.
- B. Pre-installation conferences shall be planned and held prior to or immediately after scheduled on-site progress meetings only.
- C. The Contractor shall prepare agenda, preside at conference, record minutes, and distribute copies within five (5) days after conference to participants, with copies to the Architect and Owner.

1.06 INITIAL AND FOLLOW UP INSPECTIONS

- A. An initial inspection shall be performed as soon as a representative portion of the particular feature of the work is complete and shall include examination of the quality of workmanship as well as a review of the work for compliance with contract requirements. The initial inspection shall be performed by the Contractor's Quality Control representative and results noted in the Contractor's daily reports. Any deviations from the contract requirements shall be brought to the immediate attention of the Architect.

1.07 MOCK UP

- A. Where mock up is specified in individual sections to be removed, clear area after mock up has been accepted by the Architect.

1.08 FIELD SAMPLES

- A. Install field samples at the site as required by individual specifications sections for review.

- B. Acceptable samples represent a quality level for the work.
- C. Where field sample is specified in individual sections to be removed, clear area after field sample has been accepted by the Architect.

1.09 MANUFACTURERS' FIELD SERVICES AND REPORTS

- A. Submit qualifications of observer to Architect thirty (30) days in advance of required observations. Observer shall be subject to approval of Architect and Owner.
- B. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start up of equipment, and test, adjust, and balance of equipment as applicable, and to initiate instructions when necessary.
- C. Individuals to report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturer's written instructions.
- D. Submit report within fifteen (15) days of observation to the Architect for review, except if required submission prior to meeting Substantial Completion.

1.10 REFERENCES

- A. Conform to reference standard by date of issue or current date of contract documents.
- B. Obtain copies of standards when required by contract documents.
- C. Should specified reference standards conflict with contract documents, request clarification from Architect before proceeding.
- D. The contractual relationship of the parties to the contract shall not be altered from the contract documents by mention or inference otherwise in any reference document.

1.11 INSPECTION AND TESTING LABORATORY SERVICES

- A. Owner will appoint, employ, and pay for services of an independent firm to perform inspection and testing, except when a specification section specifically states that testing of that work be provided for and coordinated by the Contractor where required.
- B. The independent firm will perform inspections, tests, and other services specified in individual specification sections and as required by the Architect.
- C. Reports will be submitted by the independent firm to the Architect, in duplicate, indicating observations and results of tests and indicating compliance or noncompliance with contract documents.
- D. Cooperate with independent firm; furnish samples of materials, design mix, equipment, tools, storage and assistance as requested.
 - 1. Notify Architect and independent firm forty-eight hours prior to expected time for operations requiring services.
 - 2. Make arrangements with independent firm and pay for additional samples and tests required for Contractor's use.
- E. Retesting required because of nonconformance to specified requirements shall be performed by the same independent firm on instructions by the Architect. Payment for

retesting will be charged to the Contractor by deducting inspection or testing charges from the contract sum.

1.12 QUALITY ASSURANCE/CONTROL OF INSTALLATION

- A. Maintain quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce work of specified quality.
- B. Comply fully with manufacturer's instructions, including each step in sequence.
- C. Should manufacturer's instructions conflict with contract documents, request clarification from Architect before proceeding.
- D. Comply with specified standards as a minimum quality for the work except when more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.
- E. Perform work by persons qualified to produce workmanship of specified quality. Work that properly should be done by skilled labor shall not be attempted with common laborers. The Contractor shall have on the job, at all times, ample equipment to carry on the work properly, including such tools as may be necessary to meet emergency requirements.

1.13 SAFETY

- A. Contractors who perform any work under this contract will fully comply with the provisions of the Federal Occupational Safety and Health Act of 1970 and to the rules and regulations promulgated pursuant to this Act.
 - 1. Contractor must submit a safety program to the Architect prior to starting work on the site. This program should indicate the Contractor's plan to comply with OSHA requirements for the various conditions of the project. The Contractor shall appoint a safety representative on site. The safety program and Contractor's representative names must both be posed.
 - 2. The Architect will take no action on the Contractor's safety program, but will forward it to the Owner for information only. The Contractor is responsible for safety on the project site per the contract documents.
- B. Hazardous Material: In the event the Contractor encounters material on the site, reasonably believe to be asbestos or polychlorinated biphenyl (PCB) that has not been rendered harmless, the Contractor shall immediately stop work and notify the Architect and Owner. Such notification shall be documented in writing.
- C. Provide any and all measures of protection required by the applicable local municipality for the protection of the public and employees during excavation operations and at completion of work. Measures taken shall include, but not be limited to, sidewalks, barricades, warning lights and signs/ and shall comply with American Standard Safety Code and all local laws and ordinances. Maintain in good condition during operations.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION (Not Used)

END OF SECTION

SECTION 01500 – CONSTRUCTION FACILITIES AND TEMPORARY CONTROLS

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Related Documents
- B. Summary
- C. Submittals
- D. Quality Assurance
- E. Project Conditions
- F. Temporary Construction and Support Facilities
- G. Security and Protection Facilities Installation
- H. Operation, Termination, and Removal

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions and other Division-1 Specification sections, apply to this section.

1.03 SUMMARY

- A. This section specifies requirements for temporary services and facilities, including utilities, construction and support facilities, security and protection.
- B. Temporary utilities that may be required include, but are not limited to:
 - 1. Water service and distribution.
 - 2. Temporary electric power and light.
 - 3. Gas service.
 - 4. Telephone service.
 - 5. Storm sewer.
- C. Temporary construction and support facilities may be required include, but are not limited to:
 - 1. Temporary heat.
 - 2. Field offices and storage sheds.
 - 3. Temporary roads and paving.
 - 4. Sanitary facilities, including drinking water.
 - 5. Dewatering facilities and drains.
 - 6. Temporary enclosures.
 - 7. Hoists and lifts.
 - 8. Temporary project identification signs and bulletin boards.
 - 9. Waste disposal services.
 - 10. Rodent and pest control.
 - 11. Construction aids and miscellaneous services and facilities.
- D. Security and protection facilities required include, but are not limited to:
 - 1. Temporary fire protection.
 - 2. Barricades, warning signs, lights.
 - 3. Environmental protection.

1 1.04 SUBMITTALS

- 2
- 3 A. Temporary Utilities: Submit reports of tests, inspections, meter readings and similar
- 4 procedures performed on temporary utilities.
- 5

6 1.05 QUALITY ASSURANCE

- 7
- 8 A. Regulations: Comply with industry standards and applicable laws and regulations if
- 9 authorities having jurisdiction, including but not limited to:
- 10 1. Building Code requirements.
- 11 2. Health and safety regulations.
- 12 3. Utility company regulations.
- 13 4. Police, Fire Department and Rescue Squad rules.
- 14 5. Environmental protection regulations.
- 15
- 16 B. Standards: Comply with NFPA Code 241, "Building Construction and Demolition
- 17 Operations", ANSI-A10 Series standards for "Safety Requirements for Construction and
- 18 Demolition", and NECA Electrical Design Library "Temporary Electrical facilities."
- 19 1. Refer to "Guidelines for Bid Conditions for Temporary Job Utilities and Services",
- 20 prepared jointly by AGC and ASC, for industry recommendations.
- 21 2. Electrical Service: Comply with NEMA, NECA and UL standards and regulations
- 22 for temporary electric service. Install service in compliance with National Electric
- 23 Code (NFPA temporary electric service. Install service in compliance with National
- 24 Electrical Code (NFPA 70).
- 25
- 26 C. Inspections: Arrange for authorities having jurisdiction to inspect and test each temporary
- 27 utility before use. Obtain required certifications and permits.
- 28

29 1.06 PROJECT CONDITIONS

- 30
- 31 A. Temporary Utilities: Prepare a schedule indicating dates for implementation and
- 32 termination of each temporary utility. At the earliest feasible time, when acceptable to the
- 33 Owner, change over from use of temporary service to use of the permanent service.
- 34
- 35 B. Conditions of Use: Keep temporary services and facilities clean and neat in appearance.
- 36 Operate in a safe and efficient manner. Take necessary fire prevention measures. Do not
- 37 overload facilities, or permit them to interfere with progress. Do not allow hazardous
- 38 dangerous or unsanitary conditions, or public nuisances to develop or persist on the site.
- 39

40 **PART 2 – PRODUCTS (Not Used)**

41

42 **PART 3 – EXECUTION**

43

44 3.01 TEMPORARY CONSTRUCTION AND SUPPORT FACILITIES

- 45
- 46 A. Locate field offices, storage sheds, sanitary facilities and other temporary construction and
- 47 support facilities of ready access within project limit lines.
- 48 1. Maintain temporary construction and support facilities until near substantial
- 49 completion. Personnel remaining after substantial completion will be permitted to
- 50 use permanent facilities, under conditions acceptable to the Owner.
- 51 2. Location of all temporary buildings shall be subject to the approval of the Owner
- 52 and the governing authority.
- 53
- 54 B. Provide incombustible construction for offices, shops and sheds located within the
- 55 construction area, or within 30 feet of building lines. Comply with requirements of NFPA
- 56 241.

- 1 C. Temporary Heat: Provide temporary heat required by construction activities, for curing or
2 drying of completed installations or protection if installed construction from adverse effect of
3 low temperatures or high humidity. Select safe equipment that will not have a harmful effect
4 on completed installations or elements being installed. Coordinate ventilation requirement to
5 produce the ambient condition required and minimize consumption of energy.
- 6
- 7 D. Heating Facilities: Except where use of the permanent system is authorized, provide
8 vented self-contained LP gas or fuel oil heaters with individual space thermostatic control.
9 1. Use of gasoline-burning space heaters, open flame, or salamander type heating
10 units is prohibited.
- 11
- 12 E. Field Offices: Provide insulated, weather tight temporary offices of sufficient size to
13 accommodate required office personnel at the project site. Keep the office clean and
14 orderly for use of small progress meetings. Furnish and equip offices.
- 15
- 16 F. Storage Trailers: Place storage trailers, sized, furnished and equipped to accommodate
17 materials and equipment involved, including temporary utility service. Trailers are to be
18 fully enclosed and placed on the site with prior approval of the Owner.
- 19
- 20 G. Temporary Roads: Construct and maintain temporary roads to adequately support the
21 construction activity and loading, during the construction period. Locate temporary roads,
22 storage areas and parking where the same permanent facilities will be located, if possible.
23 1. Coordinate temporary road development with subgrade grading, compaction,
24 installation and stabilization of subbase, and installation of base and finish courses
25 of permanent paving.
26 2. Install temporary roads to minimize the need to rework the installations and to
27 result in permanent roads and paved areas that are without damage or
28 deterioration when occupied by the Owner.
29 3. Extend temporary roads in and around the construction area as necessary to
30 accommodate delivery and storage of materials, equipment usage, administration
31 and supervision.
- 32
- 33 H. Sanitary facilities include temporary toilets and drinking water fixtures. Comply with
34 regulations and health codes for the type, number, location, operations and maintenance
35 of fixtures and facilities. All sanitary conveniences shall be satisfactory to the Owner and
36 shall conform to the regulations of the City, County, and State Health Departments.
37 1. Install where facilities will best serve the project's needs.
38 2. Provide toilet tissue, paper cups and similar disposable materials for each facility.
39 Provide covered waste containers for used material.
- 40
- 41 I. Toilets: Install well-contained toilet units. Shield toilets to ensure privacy. Use of pit-type
42 privies will not be permitted.
- 43
- 44 J. Dewatering Facilities and Drains: For temporary drainage and dewatering facilities and
45 operations not directly associated with construction activities included under individual sections,
46 comply with dewatering requirements of applicable Division-2 sections. Where feasible, utilize
47 the same facilities. Maintain the site, excavations and construction free of water.
- 48
- 49 K. Temporary Enclosures: Provide temporary enclosure of protection of construction in
50 progress and completed, from exposure, foul weather, other construction operations and
51 similar activities.
52 1. Where heat is needed and the permanent building enclosure is not complete,
53 provide temporary enclosures where there is no other provision for containment of
54 heat. Coordinate enclosure with ventilating and material drying or curing
55 requirements to avoid dangerous conditions and effects.
56 2. Install tarpaulins securely, with incombustible wood framing and other materials.
57 Close openings with plywood or similar materials.

3. Close openings through floor or roof decks and horizontal surfaces with load-bearing wood-framed construction.
 - L. Temporary Enclosures for Lead Safe Work Area Isolation.
 1. Before beginning the renovation, the Contractor shall isolate the work area so that no dust or debris leaves the work area while the renovation is being performed. Prevent latent dust emissions. Protect other areas of the facility from contamination by fugitive dusts.
 2. In addition, the Contractor shall maintain the integrity of the containment by ensuring that any plastic or other impermeable materials are not torn or displaced, and taking any other steps necessary to ensure that no dust or debris leaves the work area while the renovation is being performed.
 3. The Contractor must also ensure that containment is installed in such a manner that it does not interfere with occupant and worker egress in an emergency.
 - M. Temporary Lifts and Hoists: Provide facilities for hoisting materials and employees. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.
 - N. Project Identification and Temporary Signs: The Contractor will not erect free-standing or post any signs on property under the control of the Shawnee Mission School District without prior approval by the Owner. This includes signs on construction trailers, portable sheds, etc., which might legitimately be temporarily parked on said property by and for the Contractor's use as part of this project. The Owner may provide and erect one or more project signs as they deem necessary.
 - O. Collection and Disposal of Waste: Collect waste from construction areas and elsewhere daily. Comply with requirements of NFPA 241 for removal of combustible waste material and debris. Enforce requirements strictly. Do not hold materials more than seven days during normal weather or three days when the temperature is expected to rise above 80 degrees. Handle hazardous, dangerous, or unsanitary waste materials separately from other waste by containerizing properly. Dispose of material in a lawful manner.
 - P. Stairs: Until permanent stairs are available, provide temporary stairs where ladders are not adequate. Cover finished permanent stairs with a protective covering of plywood or similar material, so finish will be undamaged at the time of acceptance.
- 3.02 SECURITY AND PROTECTION FACILITIES INSTALLATION
- A. Except for use of permanent fire protection as soon as available, do not change over from use of temporary security and protection facilities to permanent facilities until Substantial Completion, or longer, as requested by the Architect.
 - B. Temporary Fire Protection: Until fire protection needs are supplied by permanent facilities, install and maintain temporary fire protection facilities of the types needed to protect against reasonable predictable and controllable fire losses. Comply with NFPA 10 "Standard for Portable Fire Extinguisher", and NFPA 241 "Standard for Safeguarding Construction, Alterations and Demolition Operations."
 1. Locate fire extinguisher where convenient and effective for their intended purpose, but not less than one extinguisher on each floor at or near each usable stairwell.
 2. Store combustible materials in containers in fire-safe locations.
 3. Maintain unobstructed access to fire extinguisher, fire hydrants, temporary fire protection facilities, stairways and other access routes for fighting fires. Prohibit smoking in hazardous fire exposure areas.
 4. Provide supervision of welding operations, combustion type temporary heating units, and similar sources of fire ignition.

- 1 C. Permanent Fire Protection: At the earliest feasible date in each area of the project,
2 complete installation of the permanent fire protection facility, including connected services,
3 and place into operations and use. Instruct key personnel on use of facilities.
4
- 5 D. Barricades, Warning Signs and Lights: Comply with standards and code requirements for
6 erection of structurally adequate barricades. Paint with appropriate colors, graphics and
7 warning signs to inform personnel and the public of the hazard being protected against.
8 Where appropriate and needed provide lighting, including flashing red or amber lights.
9
- 10 E. Enclosure Fence: Prior to demolition or excavation, install an enclosure fence with
11 lockable entrance gates. Locate where indicated, or enclose the entire site or the portion
12 determined sufficient to accommodate construction operations. Install in a manner that will
13 prevent people, dogs, and other animals from easily entering the site, except by the
14 entrance gates.
- 15 1. Provide an open mesh chain link construction fence and gates, minimum 6'-0"
16 high, with galvanized steel pipe posts.
 - 17 2. Utilize concrete block or pegged steel pipe stabilizer brackets where fence panels
18 adjoin or end.
 - 19 3. Upon removal of the fencing, repair any disturbed areas to restore to original
20 condition.
 - 21 4. Locate the construction fence and gates to facilitate all jurisdictional exit and entry
22 requirements from existing buildings and new construction.
 - 23 5. If requested by the owner, the gates shall be double locked (lock to lock) with the
24 contractor's lock and the owner's lock to allow owner access.
 - 25 6. Locate the fence and gates to facilitate owner operations that may be in progress
26 during construction.
 - 27 7. Maintain the fence and gates throughout construction.
28
- 29 F. Security Enclosure and Lockup: Install substantial temporary enclosure of partially
30 completed areas of construction. Provide locking entrances to prevent unauthorized
31 entrance, vandalism, theft and similar violations of security.
- 32 1. Storage: Where materials and equipment must be stored, and are of value or
33 attractive for theft, provide a secure lockup. Enforce discipline in connection with
34 the installation and release of material to minimize the opportunity for theft and
35 vandalism.
36
- 37 G. Environmental Protection: Provide protection, operate temporary facilities and conduct
38 construction in ways and by methods that comply with environmental regulations, and
39 minimize the possibility that air, waterways and subsoil might be contaminated or polluted,
40 or that other undesirable effects might result. Avoid use of tools and equipment that
41 produce harmful noise. Restrict use of noise making tools and equipment harmful to
42 humans so as to minimize complaints from persons or firms near the site.
- 43 1. Contractor shall comply with all Federal, state and local laws and regulations
44 relating to environmental protection. Daily clean up of adjacent streets, sidewalks,
45 and public structures due to construction debris shall be required at Contractor's
46 expense.
47

48 3.03 OPERATION, TERMINATION AND REMOVAL

49

- 50 A. Maintenance: Maintain facilities in good operating condition until removal. Protect from
51 damage by freezing temperatures and similar elements.
- 52 1. Maintain operation of temporary enclosures, heating, cooling, humidity control,
53 ventilation and similar facilities on a 24-hour day basis where required to achieve
54 indicated results and to avoid possibility of damage.
 - 55 2. Protection: Prevent water filled piping from freezing. Maintain markers for
56 underground lines. Protect from damage during excavation operations.

1 B. Termination and Removal: Unless the Architect requests that it be maintained longer,
2 remove each temporary facility when the need has ended, or when replaced by authorized
3 use of a permanent facility, or not later than substantial completion. Complete, or if
4 necessary, restore permanent construction that may have been delayed because of
5 interference with the temporary facility. Repair damaged work, clean exposed surfaces
6 and replace construction that cannot be satisfactorily repaired.

7 1. Materials and facilities that constitute temporary facilities are property of the
8 Contractor. The Owner reserves the right to take possession of project
9 identification signs.

10 2. At substantial completion, clean and renovate permanent facilities that have been
11 used during the construction period, including but not limited to:

- 12 a. Replace air filters and clean inside of ductwork and housings.
13 b. Replace significantly worn parts and parts that have been subject to
14 unusual operating conditions.
15 c. Replace lamps that are burned out or noticeably dimmed by substantial
16 hours of use.
17
18
19

20 **END OF SECTION**

SECTION 01600 - MATERIALS AND EQUIPMENT

PART 1 GENERAL

1.01 SECTION INCLUDES:

- A. Related Documents
- B. Summary
- C. Definitions
- D. Submittals
- E. Quality Assurance
- F. Product Requirements and Selection Procedures

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to this section.

1.03 SUMMARY

- A. This section specifies administrative and procedural requirements governing the Contractor's selection of products for use on p.
- B. The Contractor's construction schedule and the schedule of submittals are included under Division 1 Section "Submittals."
- C. Standards: Refer to Division 1 Section "Reference Standards and Definitions" for applicability of industry standards to products specified.
- D. Administrative procedures for handling requests for substitutions made after award of the contract are included under Division 1 Section "Product Substitutions."

1.04 DEFINITIONS

- A. Definitions used in this article are not intended to change the meaning of other terms used in the contract documents, such as "specialties," "systems," "structure," "accessories," and similar terms. Such terms such are self-explanatory and have well recognized meanings in the construction industry.
 - 1. "Products" are items purchased of incorporation in the Work, whether purchased for the Project or taken from previously purchased stock. The term "product" includes the terms "material," "equipment," "system," and terms of similar intent.
 - a. "Named Products" are items identified by manufacturer's product name, including make or model designation, indicated in the manufacturer's published product literature, that is current as of the date of the Contract Documents.
 - 2. "Materials" are products that are substantially shaped, cut, worked, mixed, refined, finished, or otherwise fabricated, processed, or utilized to form a part of the Work.
 - 3. "Equipment" is a product with operational parts, whether motorized or manually operated, that requires service connections such as wiring or piping.

1.05 SUBMITTALS

- A. Product List Schedule: Prepare a schedule showing products specified in a tabular form acceptable to the Architect. Include generic names of products required. Include the manufacturer's name and proprietary product names of each item listed.
1. Coordinate the product list schedule with the Contractor's Construction Schedule and the Schedule of Submittals.
 2. Form: Prepare the product listing schedule with information of each item tabulated under the following column headings:
 - a. Related Specification Section Number.
 - b. Generic Name Used in Contract Documents.
 - c. Proprietary Name, Model Number and Similar Designations.
 - d. Manufacturer's Name and Address.
 - e. Supplier's Name and Address.
 - f. Installer's Name and Address.
 - g. Projected Delivery Date, or Time Span of Delivery Period.
 3. Initial Submittal: Within twenty (20) days after date of commencement of the work, submit three (3) copies of an initial product list schedule. Provide a written explanation for data omissions, and known variations from contract requirements.
 4. Architect's Action: The Architect will respond in writing to the Contractor within two weeks of receipt of the completed product list schedule. No response within this time period constitutes no objection to listed manufacturers or product, but does not constitute a waiver of the requirement that products comply with contract documents. The Architect's response will include the following:
 - a. A list of unacceptable product selections, containing a brief explanation of reasons for this action.

1.06 QUALITY ASSURANCE

- A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.
- B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the project, the product selected shall be compatible with products previously selected products that were also options.
- C. Nameplates: Except for required labels and operating data, do not attached or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces or products which will be exposed to view in occupied spaces or on the exterior.
1. Labels: Locate required product labels and stamps on a concealed surface or, where required of observation after installation, on an accessible surface that is not conspicuous.
 2. Equipment Nameplates: Provide a permanent nameplate on each item of service-connected or power-operated equipment. Locate on an easily accessible surface that is inconspicuous in occupied spaces. The nameplate shall contain the following information and other essential operating data:
 - a. Name of product and manufacturer.
 - b. Model and serial number.
 - c. Capacity.
 - d. Speed.
 - e. Ratings.

1.07 PRODUCT DELIVERY, STORAGE AND HANDLING

- A. General Product Requirements: Provide products that comply with the Contract Documents, that are undamaged and, unless otherwise indicated, unused at the time of installation.

1. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.
2. Standard products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

B. Product Selection Procedures: Product selection is governed by the Contract Documents and government regulations, not by previous project experience. Procedures governing product selection include the following:

1. Proprietary Specification Requirements: Where only a single product or manufacturer is named, provide the product indicated. No substitutions will be permitted.
2. Semi-Proprietary Specification Requirements: Where two or more products or manufacturers are named, provide one of the products indicated. No substitutions will be permitted.
3. Non-Proprietary Specifications: When the specifications list products or manufacturers that are available and may be incorporated in the work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with contract requirements. Comply with contract document provisions concerning "substitutions" to obtain approval for use of an unnamed product.
4. Descriptive Specification Requirements: Where specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with contract requirements.
5. Performance Specification Requirements: Where specifications require compliance with performance requirements, provide products that comply with these requirements, and are recommended by the manufacturer for the application indicated. General overall performance of a product is implied where the product is specified for a specific application.
 - a. Manufacturer's recommendations may be contained in published product literature, or by the manufacturer's certification of performance.

END OF SECTION

SECTION 01631 - POST-BID PRODUCT SUBSTITUTIONS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Related Documents
- B. Summary
- C. Definition
- D. Submittals
- E. Substitution

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to this section.

1.03 SUMMARY

- A. This section specifies administrative and procedural requirements for handling requests for substitutions made after award for the contract.
 - 1. Certain materials, products or systems are specified for which no substitutions are allowed. Refer to individual specification sections for specific items.
- B. Refer to AIA Document A701 "Instructions to Bidders" for substitution requirements made prior to bid opening.
- C. The Contractor's construction schedule and the schedule of submittals are included under Division-1 Section "Submittals".
- D. Standards: Refer to Division-1 Section "Reference Standards and Definitions" for applicability of industry standards to products specified.
- E. Procedural requirements governing the Contractor's selection of products and product options are included under Division-1 Section "Materials and Equipment:

1.04 DEFINITIONS

- A. Definitions used in the article are not intended to change or modify the meaning of other terms used in the contract documents.
- B. Substitutions: Requests for changes in product, materials, equipment, and methods of constructing required by Contract Documents proposed by the Contractor after award of the contract are considered requests for post-bid product substitutions. The following are NOT considered substitutions:
 - 1. Substitutions requested by Bidders during the bidding period, and accepted prior to award of contract, are considered as included in the contract documents and are not subject to requirements specified in this section for post-bid substitutions.
 - 2. Revisions to contract documents requested by the Owner or Architect.
 - 3. Specified options of products and construction methods included in Contract Documents.

- 1 4. The Contractor's determination of and compliance with governing regulations and
2 orders issued by governing authorities.
3

4 1.05 SUBMITTALS
5

- 6 A. Post Bid Substitution Request Submittal: No Post-bid Substitutions will be considered,
7 unless requested by the Owner. If a post bid substitution is requested, The Contractor
8 shall submit as follows:
9 1. Submit three (3) copies of each request for substitution for consideration. Submit
10 requests in the form and in accordance with procedures stated herein. Use form
11 depicted at end of this section. Contractor is responsible for reproduction of
12 forms.
13 2. Identify the product, or the fabrication or installation method to be replaced in
14 each request. Include related specification section and drawing numbers.
15 Provide complete documentation showing compliance with the requirements for
16 substitutions, and the following information, as appropriate:
17 a. Product data, including drawings and descriptions of products, fabrication and
18 installation procedures.
19 b. Samples, where applicable or requested.
20 c. A detailed comparison of significant qualities of the proposed substitution with
21 those of the work specified. Significant qualities may include elements such as
22 size, weight, durability, performance and visual effect. Units of weights and
23 measure shall be the same as used in the contract documents.
24 d. Coordination information, including a list of changes or modifications needed to
25 other parts of the work and to construction performed by the Owner and separate
26 Contractors that will become necessary to accommodate the proposed
27 substitution.
28 e. A statement indicating the substitution's effect on the Contractor's Construction
29 Schedule without approval of the substitution. Indicate the effect of the proposed
30 substitution on overall contract time.
31 f. Cost information, including a proposal of the net change, if any, in the Contract
32 Sum.
33 g. Certification by the Contractor that the substitution proposed is equal to or better
34 in every significant respect to that required by the contract documents, and that it
35 will perform adequately in the application indicated. Include the Contractor's
36 waiver of rights to additional payment or time that may subsequently become
37 necessary because of the failure of the substitution to perform adequately.
38 3. Architect's Action: Within one week of receipt of the request for substitution, the
39 Architect will request additional information or documentation necessary for
40 evaluation of the request. Within two weeks of the receipt of the request, or one
41 week of the receipt of the additional information or documentation, the Architect
42 will notify the Contractor of acceptance or rejection of the proposed substitution.
43 If a decision on use of a proposed substitute cannot be made or obtained within
44 the time allocated, use the product specified.
45

46 **PART 2 – PRODUCTS (Not Applicable)**
47

48
49 **PART 3 – EXECUTION (Not Applicable)**
50

51
52
53
54 **END OF SECTION**

POST-BID SUBSTITUTION REQUEST FORM

ONE ITEM PER FORM
FILL IN ALL BLANKS

Project: _____

Date: _____

We hereby submit for your review the following post-bid substitution for the following specified material for the above project.

Section Page Paragraph Specified Material

PROPOSED POST-BID SUBSTITUTION:

Attach complete technical data, including laboratory tests, if applicable. Include complete information on changes to drawings and/or specifications which proposed substitution will require for its proper installation.

A. Does the substitution effect dimensions shown on drawings in any way?

B. Will the undersigned pay for any changes to the building design, including engineering and detailing costs caused by the requested substitution?

C. What effect does substitution have on schedule or other trades?

D. What effect does substitution have on cost?

E. Differences between proposed substitution and specified items are:
_____ Same _____ Different (Explain)

F. Contractor represents that he has investigated the proposed product and determined that it meets or exceeds the quality of the specified product.

SUBMITTED BY:

____ Accepted

____ Accepted as Noted

____ Not Accepted

____ Received Too Late

(Firm)

(Address)

(By)

(Date)

(Telephone)

(Remarks)

(Signature)

SECTION 01650 - STARTING OF SYSTEMS

PART 1 – GENERAL

1.01 SECTION INCLUDES:

- A. Starting systems.
- B. Demonstration and instructions.
- C. Testing, adjusting, and balancing.

1.02 RELATED SECTIONS

- A. Section 01400 – Quality Control: Manufacturer's field reports.
- B. Section 01700 – Contract Closeout: System operations and maintenance data and extra materials.

1.03 STARTING SYSTEMS

- A. Coordinate schedule for start-up of various equipment and systems.
- B. Notify Architect and Owner fourteen (14) days prior to start up of each item.
- C. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions that may cause damage.
- D. Verify that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify wiring and support components for equipment are complete and tested.
- F. Execute start up under supervision of responsible manufacturer's representative in accordance with manufacturer's instructions.

1.04 DEMONSTRATION AND INSTRUCTIONS

- A. Demonstrate operation and maintenance of products to Owner's personnel two weeks prior to date of substantial completion. Contractor will prepare and distribute meeting minutes of each demonstration and associated instruction.
- B. For equipment or systems requiring seasonal operation, perform demonstration for another season as soon as practical prior to the season. Demonstration shall be performed under applicable seasonal conditions.
- C. Utilize 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 start up, operation, control, adjustment, troubleshooting, servicing, maintenance, and shutdown of each item of equipment at a scheduled agreed upon time, at designated location.

- E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.
- F. The minimum amount of time required for instruction on each item of equipment and system may be specified in individual sections. Reference individual sections for requirements.

1.05 TESTING, ADJUSTING AND BALANCING

- A. Contractor will appoint, employ, and pay for services of an independent firm to perform testing, adjusting and balance.
- B. The independent firm will perform services specified in Section 15950.
- C. Reports will be submitted by the independent firm to the Architect indicating observations and results of tests and indicating compliance or noncompliance with specified requirements and with the requirements of the contract documents.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

1 **SECTION 01700 - PROJECT CLOSEOUT**

2
3 **PART 1 - GENERAL**

4
5 1.01 SECTION INCLUDES:

- 6
7 A. Related documents.
8
9 B. Summary.
10
11 C. Completion of a building and/or phase.
12
13 D. Final completion and final payment.
14
15 E. Record document submittals.
16
17 F. Starting systems.
18
19 G. Operating and maintenance instructions.
20
21 H. Final cleaning.

22
23 1.02 RELATED DOCUMENTS

- 24
25 A. Drawings and general provisions of the contract, including General and Supplementary
26 Conditions and other Division-1 Specification sections, apply to this section.
27
28 B. Refer to Section 01020 for Final Lien Waiver.
29

30 1.03 SUMMARY

- 31
32 A. This section specifies administrative and procedural requirements for project
33 closeout, including but not limited to:
34 1. Inspection procedures.
35 2. Project record document submittal.
36 3. Operating and maintenance manual submittal.
37 4. Submittal of warranties.
38 5. Final cleaning.
39
40 B. Closeout requirements for specific construction activities are included in the
41 appropriate sections in Divisions-2 through 16.
42 C. Refer to Division-1 Section "Warranties and Bonds" for specific requirements.
43

44 1.04 SUBSTANTIAL COMPLETION

- 45
46 A. Substantial Completion:
47 1. The Contractor and each Subcontractor shall carefully and regularly check their
48 work for conformance with the contract documents as the Work is being done.
49 Unsatisfactory work shall be corrected as the Work progresses and not be
50 permitted to remain and become a part of the punch list.
51 2. The Contractor shall conduct a pre-punch list inspection. The written pre-punch
52 list shall be distributed to affected subcontractors, for correction of noted items.
53 The Contractor shall provide a copy of the pre-punch list inspection and advise
54 the Architect of the correction of the pre-punch list. This notification shall so
55 serve to notify the Architect that the work is ready for the Architect's punch list
56 inspection.

3. The Architect shall make arrangements for his punch list inspection at the earliest possible date following Contractor notification of correction of the pre-punch list. Transmittal of the Punch List to the Contractor shall set the date for a re-inspection prior to issuance of a Certificate of Substantial Completion. Upon receipt of the Punch List, the Contractor shall, within seven (7) days, bring to the attention of the Architect, in writing, any questions that he or any of his subcontractors may have concerning the requirements of the Punch List.
4. When advised by the Contractor that the Punch List items have been completed, the Architect shall conduct a re-inspection with the Contractor and any needed subcontractors (and the Owner's representative where applicable) to determine whether the Certificate of Substantial Completion can be issued. A Certificate of Substantial Completion will only be issued after codes administration authorities document approval and permit occupancy of the building or phase. Also note Paragraph 12 of this section.
5. When issued, the Certificate of Substantial Completion shall name the date, triggering the beginning of the warranty period (with any items to have a later starting date specifically noted). The certificate shall also have attached to it any uncompleted Punch List items, and shall name the date for their final completion. The Certificate of Substantial Completion shall also state the responsibilities of the Owner and the Contractor for maintenance, heat, air conditioning, utilities, insurance and building security.
6. Acknowledgement of the date of substantial completion by the signature of all parties on the certificate implies possession of the premises by the Owner. The subsequent completion of incomplete punch list items by the Contractor and the subcontractors shall occur at the Owner's convenience. The Owner shall cooperate in permitting the Contractor reasonable access to the work for the completion of punch list items.
7. A Certificate of Substantial Completion for the work, or portion of work as applicable, will only be issued after the requirements for the demonstration and instruction of operation and maintenance procedures as defined elsewhere by the Contract Documents, to the Owner's personnel have been satisfied by the Contractor.
8. A list of items required for submission at Substantial Completion is listed at the end of this section. This list may include specific maintenance agreements, maintenance manuals, tools, keys, spare parts, extra stock materials, operational instruction to Owner's operating personnel, etc. Any items not here-in specifically listed as required at Substantial Completion shall be submitted at Final Completion.
9. Substantial Completion Cleaning: At Substantial Completion for each project or portion of the project, clean the entire work area to a level acceptable to the Owner, for finish cleaning by the Owner's custodial personnel. Remove non-permanent protection and labels, polish glass, clean exposed finishes, touch-up minor finish damage, clean or replace filters of mechanical systems, remove debris and broom clean non-occupied spaces, sanitize plumbing/food service facilities, clean light fixtures and replace burned out/dimmed lamps, sweep and wash paved areas, police yards and grounds. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compound and other substances that are noticeable vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Clean exposed exterior and interior hard-surfaced finishes to a dust-free condition, free of stains, films and similar foreign substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces. Mop VCT or seamless floor surfaces clean. Wipe surfaces of mechanical and electrical equipment. Remove excess lubrication and other substances. Clean plumbing fixtures to a sanitary condition. Clean light fixtures and lamps.

10. Lead Safe Project Report: The Contractor shall furnish a single report documenting compliance with recordkeeping and reporting of requirements of 40 CFR Part 745.85 including documentation that a certified renovator was assigned to the project, that the certified renovator provided on-the-job training for workers used on the project, that the certified renovator performed or directed workers who performed all of the tasks described in Part 745.85, and that the certified renovator performed the post-renovation cleaning verification described in Part 745.85. If the renovation firm was unable to comply with all of the requirements of this rule due to an emergency as defined in Part 745.82, the Contractor shall document the nature of the emergency and the provisions of the rule that were not followed. This documentation must include a copy of the certified renovator's training certificate, and a certification by the certified renovator assigned to that project that:
- a. Training was provided to workers (topics must be identified for each worker).
 - b. Pre-renovation education and hazard communication was performed before and updated during the project.
 - c. Warning signs were posted at the entrances to the work area.
 - d. The work area was contained by:
 - (1) Removing or covering all objects in the work area (interiors).
 - (2) Closing and covering all HVAC ducts in the work area (interiors).
 - (3) Closing all windows in the work area (interiors) or closing all windows in and within 20 feet of the work area (exteriors).
 - (4) Closing and sealing all doors in the work area (interiors) or closing and sealing all doors in and within 20 feet of the work area (exteriors).
 - (5) Covering doors in the work area that were being used to allow passage but prevent spread of dust.
 - (6) Covering the floor surface, including installed carpet, with taped-down plastic sheeting or other impermeable material in the work area 6 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to contain the dust, whichever is greater (interiors) or covering the ground with plastic sheeting or other disposable impermeable material anchored to the building extending 10 feet beyond the perimeter of surfaces undergoing renovation or a sufficient distance to collect falling paint debris, whichever is greater, unless the property line prevents 10 feet of such ground covering, weighted down by heavy objects (exteriors).
 - (7) Installing (if necessary) vertical containment to prevent migration of dust and debris to adjacent property (exteriors).
 - e. Waste was contained on-site and while being transported off-site.
 - f. The work area was properly cleaned after the renovation by:
 - (1) Picking up all chips and debris, misting protective sheeting, folding in dirty side inward, and taping it for removal.
 - (2) Cleaning the work area surfaces and objects using a HEPA vacuum and/or wet clothes or mops (interiors).
 - g. The certified renovator performed the post-renovation cleaning verification (the results of which must be briefly described, including the number of wet and dry cloths used).
11. Substantial Completion Drain Clearing. At Substantial Completion for each project or portion of the project, perform drain clearing in each building area affected by new construction or renovation work. Clear drains of debris and/or construction materials using methods acceptable to the school district. Test all affected drains to ensure proper operation prior to turn-over to the district. As required, demonstrate proper operation.

12. The Owner has contracted with the Architect/Engineer to perform one (1) initial punch list inspection and one (1) re-inspection. If the Owner incurs additional cost from the Architect/Engineer for the performance of more than one initial punch list inspection and one re-inspection, costs for any necessary additional re-inspections will be assessed to the Contractor in the way of a deductive cost change order.

B. Final Completion:

1. Submit executed warranties, workmanship bonds, remaining maintenance agreements, inspection certificates and similar required documentation for specific units of work, enabling Owner's unrestricted occupancy and use.
2. Submit maintenance manuals, tools, keys, spare parts, extra stock materials not required at substantial completion.
3. Complete instruction of Owner's operating personnel with start up of all systems, not previously required at substantial completion.
4. Complete final cleaning and remove temporary facilities.
 - a. Final Cleaning: At closeout time of each building, or applicable portion, reclean the work affected by punch list corrections. Remove non-permanent protection, polish glass, clean exposed finishes, touch-up minor finish damage, remove debris and broom clean non-occupied spaces, sanitize plumbing/food service facilities, clean light fixtures, sweep and wash paved areas, police yards and grounds, and perform similar clean up operations needed to produce a "clean" condition as judged by Architect and Owner.
5. All punch list work must be completed, reviewed and accepted by the Architect.

1.05 FINAL COMPLETION AND FINAL PAYMENT

- A. Provide submittals to Architect that are required by governing or other authorities. Confirm that all submittals required by the construction documents have been transmitted.
- B. Final Completion: For the purpose of determining a date at which the project is finished, final completion may be defined to include, but is not limited to:
1. Substantial completion.
 2. Submission and acceptance by the Architect of project record drawings.
 3. Operation and maintenance data (including all air and water balance reports).
 4. All applicable Owner training sessions with meeting notes distributed (video tapes, if applicable).
 5. Final cleaning.
 6. Adjusting (hardware, HVAC, etc.)
 7. Warranties submitted by General Contractor and accepted by Architect.
 8. Spare parts and maintenance materials turned over to proper District personnel.
 9. All Punch List work completed, reviewed and accepted by the Architect.
 - a. All of the above items are as required by individual specification requirements as found in the contract documents. These individual requirements shall take precedence over this definition if any conflict should arise.
- D. Upon written notice by the Contractor that the reinspection punch list items are completed, the Architect shall verify this by inspection and shall issue to the Owner a final certificate of payment state that, to the best of their knowledge, information and belief, the work has been completed in accordance with the terms and conditions of the contract documents, and that the entire balance found to be due the Contractor, and noted in said final certificate of payment, is due and payable. The Owner shall endeavor to make final payment within thirty (30) days.

1 1.06 RECORD DOCUMENT SUBMITTAL

- 2
- 3 A. General: Do not use record documents for construction purposes; protect from
- 4 deterioration and loss in a secure, fire-resistive location; provide access to record
- 5 documents for the Architect's reference during normal working hours.
- 6
- 7 B. Record Drawings: A set of blue- or black-line drawings of the original bidding documents
- 8 will be provided by the Architect to the Contractor for the following use:
- 9 1. If the Contractor elects to vary the work from the Contract Documents, and
- 10 secures prior approval from the Architect, he shall record in a neat, readable
- 11 manner, all such variances on the blue- or black-line drawings furnished.
- 12 2. For plumbing; heating; ventilating; and air conditioning; electrical and fire
- 13 protection work, record document drawings shall be maintained by the Contractor
- 14 as the work progresses and as follows:
- 15 a. All deviations from the sizes, locations, and from all other features of all
- 16 installations showing the contract documents shall be recorded.
- 17 b. In addition, it shall be possible, using these drawings, to correctly and
- 18 easily locate, identify and establish sizes of piping, direction etc., as well
- 19 as all other features of work that will be concealed.
- 20 1. Locations of underground work shall be established by
- 21 dimensions to column lines or walls, by locating all turns, etc.,
- 22 and by properly referenced centerline or invert elevations and
- 23 rates of fall.
- 24 2. For work concealed in the building, sufficient information shall be
- 25 given so it can be located with reasonable accuracy and ease. In
- 26 some cases, this may be by dimension; in others, it may be
- 27 sufficient to illustrate the work on the drawings in relation to the
- 28 spaces in the building near which it was actually installed.
- 29 Architect's decision in this matter shall be final.
- 30 3. Identify all change order work on the documents and post all
- 31 addendum drawings.
- 32 3. Blue- or black-line record drawings shall be kept up to date during the entire
- 33 course of the work and shall be available upon request for examination by the
- 34 Architect.
- 35 4. The following requirements apply to all record document drawings:
- 36 a. They shall be maintained at the Contractor's expense.
- 37 b. All such drawings shall be done carefully and neatly by a competent
- 38 draftsman and in an approved form.
- 39 c. Additional drawings shall be provided as necessary for clarification.
- 40 d. The record document drawings (both blue- and black-line) shall be
- 41 returned to the Architect upon completion of the work and are subject to
- 42 the approval of the Architect.
- 43 e. Delete Architect title block and seal from record document drawings.
- 44
- 45 C. Record Specifications: Maintain one complete copy of the project manual, including
- 46 addenda, and one copy of other written construction documents such as change orders
- 47 and modifications. Give particular attention to substitutions, selection of options and
- 48 similar information on elements that are concealed or cannot otherwise be readily
- 49 discerned later by direct observation. Note related record drawing information and
- 50 product data.
- 51 1. Legibly mark and record at each product section description of actual products
- 52 installed, including the following:
- 53 a. Manufacturer's product name and product model number.
- 54 b. Product substitutions or alternates utilized.
- 55 c. Changes made by addenda and modifications.
- 56

2. Upon completion of the work, submit record specifications to the Architect for the Owner's records.
3. Record project manual shall be maintained at the Contractor's expense.
4. Record project manual shall be maintained in a neat, readable manner. Contract work variations shall be recorded in the correct corresponding technical section of the project manual.
5. Delete Architect seal from record project manual.
6. Complete final cleaning and remove temporary facilities.

D. Record Shop Drawings: Maintain a clean, undamaged set of blue or black line white prints of shop drawings as finally approved. Mark the set to show the actual installation where the installation varies substantially from the work as originally shown. Mark drawings accurately; record a cross reference at the corresponding location on the contract drawings. Give particular attention to concealed elements that would be difficult to measure and record at a later date.

1. Mark record sets with red erasable pencil; use other colors to distinguish between variations in separate categories of the work.
2. Mark new information that is important to the Owner, but was not shown on shop drawings.
3. Note related change order numbers where applicable.
4. Organize record shop drawing sheets into manageable sets, bind with durable paper cover sheets, and print suitable titles, dates and other identification on the cover of each set.

E. Record Product Data: Maintain one copy of each product data submittal. Mark these documents to show significant variations in actual work performed in comparison with information submitted. Include variations in products delivered to the site, and from the manufacturer's installation instruction and recommendations. Give particular attention to concealed products and portions of the work that cannot otherwise be readily discerned later by direct observation. Note related change orders and mark up of record drawings and specifications.

1. Upon completion of mark ups, submit complete set of record product data to the Architect for the Owner's records.

F. Record Documents and Shop Drawings: Contractor to supply one complete set of approved shop drawings. Legibly mark each item to record actual construction including:

1. Measured depths of foundations in relation to fine (main) floor datum.
2. Measured horizontal and vertical locations of underground utilities and appurtenance, referenced to permanent surface improvements.
3. Measured locations of internal utilities and appurtenance concealed in construction, referenced to visible and accessible features of the work.
4. Field changes of dimension and detail.
5. Details not on original contract drawings.

G. Record Sample Submitted: Immediately prior to the date or dates of substantial completion, the Contractor will meet at the site with the Architect and the Owner's personnel to determine which of the submitted samples that have been maintained during progress of the work are to be transmitted to the Owner for record purposes. Comply with delivery to the Owner's sample storage area.

H. Miscellaneous Record Submittal: Refer to other specification sections for requirements of miscellaneous recordkeeping and submittal in connection with actual performance of the work. Immediately prior to the date or dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Architect for the Owner's records.

- I. Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Submit one set prior to Substantial Completion or final inspection, as applicable. Bind properly indexed data in individual heavy-duty, three inch, three ring vinyl-covered binders, 8½ x 11 inch test page format, with pocket folders for folded sheet information.
1. Prepare binder covers with printed title "OPERATION AND MAINTENANCE INSTRUCTIONS", title of project, and subject matter of binder when multiple binders are required.
 2. Internally subdivide the binder contents with permanent page dividers, logically organized as described below; with tab titling clearly printed under reinforced laminated plastic tabs.
 3. Contents: Prepare a Table of Contents for each volume, with each product or system description identified.
 4. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, subcontractors, and major equipment suppliers where they can be reached for emergency service at all times, including nights, weekends, and holidays.
 5. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of subcontractors and suppliers. Identify the following:
 - a. Significant design criteria.
 - b. List of equipment.
 - c. Parts list for each component.
 - d. Operating instructions.
 - e. Maintenance instructions for equipment and systems.
 - f. Maintenance instructions
 - g. Emergency instructions.
 - h. Spare parts list.
 - i. Wiring diagrams.
 - j. Recommended "turn around" cycles.
 - k. Inspection procedures.
 6. Part 3: Project documents and certificates, including the following:
 - a. Shop drawings and product data.
 - b. Air and water balance reports.
 - c. Certificates.
 - d. Photo copies of warranties and bonds.
 7. Submit one copy of completed volumes in final form fifteen (15) days prior to the applicable submission requirement. This copy will be returned after review, with Architect comments. Revise content of documents as required prior to final submittal for the applicable submission requirement.
 8. Submit final volumes revised, within the (10) days after Architect review and comment.
- J. The Owner has contracted with the Architect/Engineer to perform one (1) initial Record Document review and one (1) re-review. If the Owner incurs additional cost from the Architect/Engineer for the performance of more than one (1) initial Document Review and one (1) re-review, costs for any necessary additional reviews will be assessed to the Contractor in the way of a deductive cost change order.

PART 2 – PRODUCTS (Not Used)

PART 3 -- EXECUTION

3.01 STARTING SYSTEMS

- A. Coordinate schedule of start up of various equipment and systems.
- B. Notify Architect and Owner fourteen (14) days prior to start up of each item.
- C. Verify and document that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, or other conditions that may cause damage.
- D. Verify and document that tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.
- E. Verify and document wiring and support components for equipment are complete and tested.
- F. Execute start up under supervision of responsible manufacturer's representative (Contractor's personnel) in accordance with manufacturer's instructions.
- G. When specified in individual specification sections, require manufacturer to provide authorized representative to be present at site to inspect, check and approve equipment or system installation prior to start up, and to supervise placing equipment or system in operation.
- H. Submit a written report in accordance with Section 01400 that equipment or system has been properly installed and is functioning correctly.

3.02 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. General: Arrange for each Installer of equipment that requires regular maintenance to meet with the Owner's personnel to provide instruction in proper operation and maintenance, if applicable. If Installers are not experienced in procedures, provide instruction by manufacturer's representatives. Include a detailed review of the following items:
 - 1. Maintenance manuals.
 - 2. Record documents.
 - 3. Spare parts and materials.
 - 4. Tools.
 - 5. Lubricants.
 - 6. Fuels.
 - 7. Identification systems.
 - 8. Control sequences.
 - 9. Hazards.
 - 10. Cleaning.
 - 11. Warranties and bonds.
 - 12. Maintenance agreements and similar continuing commitments.
- B. As part of instruction for operating equipment, demonstrate the following procedures:
 - 1. Start up.
 - 2. Shutdown.
 - 3. Emergency operations.
 - 4. Noise and vibration adjustments.
 - 5. Safety procedures.
 - 6. Economy and efficiency adjustments.
 - 7. Effective energy utilization.

END OF SECTION

SECTION 01710 - CONSTRUCTION HOUSEKEEPING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Related Documents
- B. Summary
- C. Submittals
- D. Quality Assurance
- E. Project Conditions

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including general and supplementary conditions and other Division-1 Specification sections, apply to this section.

1.03 SUMMARY

- A. This section specifies requirements for maintaining housekeeping of the construction site and facilities during construction operations.

1.04 SUBMITTALS

- A. Submit a written narrative outlining the operational plan that will be employed by the contractor and subcontractors to maintain the construction site and facilities in a clean, safe, and organized condition that is free from recognized hazards that can cause serious physical harm or death to employees or the public.

1.05 QUALITY ASSURANCE

- A. Comply with Occupational Safety and Health Standards for the Construction Industry 29 CFR 1926.25.
- B. Comply with standards of authorities having jurisdiction, including but not limited to:
 - 1. Building Code requirements.
 - 2. Health and safety regulations.
 - 3. Police, Fire Department, and/or Rescue Squad requirements.
- C. Comply with directives issued by the Architect-Engineer and/or Owner. Contractors failing to comply with Architect-Engineer and/or Owner directives to properly maintain construction housekeeping may be subject to the withholding of Payment Applications until proper housekeeping conditions are adhered and maintained.

1.06 PROJECT CONDITIONS

- A. Keep construction areas free of the accumulation of dirt, debris, trash, water, liquids, and or hazards that deter from the safety of the construction site and facilities. Neatly organize and store materials so as to not co-mingle waste materials and construction materials, tools, and equipment.

1 **PART 2 – PRODUCTS (NOT APPLICABLE)**

2
3
4 **PART 3 – EXECUTION**

5
6 3.01 WORK PRACTICES

- 7
8 A. Housekeeping occurs constantly on the job, not just once a week or at the end of the
9 project.
10
11 B. Everyone does housekeeping, not just laborers or certain trades.
12
13 C. Trained personnel shall use lead-safe work practices contained in EPA's renovation,
14 repair, and painting rule as applicable.
15
16 D. Workers pick up anything they see lying around that can trip a person or fall on them.
17
18 E. Extension cords, lines, welding leads, hoses, etc. are coiled up when not in use.
19
20 F. Tools are returned to the gang box or tool room.

21
22 3.02 HAZARD IDENTIFICATION, REMOVAL, AND CLEANUP

- 23
24 A. Ensure that trained personnel perform lead safe work practices and take proper
25 precautions concerning presumed lead bearing materials. If latent dust emissions occur,
26 establish containment, post signage, and perform cleaning, recleaning, and subsequent
27 cleaning verifications as necessary. Assess risks presented by the actual or presumed
28 presence of lead-based paint and lead-based paint hazards. The Contractor shall not
29 leave lead dust hazards in Owners facilities. Lead dust hazard means surface dust that
30 contains a dust-lead loading (area concentration of lead) at or exceeding the levels
31 promulgated by State of Kansas and Federal regulations. The Contractor shall not impair
32 the Owner's ability to occupy work areas under this contract beyond substantial
33 completion dates by leaving lead dust hazards.
34
35 B. Debris is cleaned from work surfaces, passages, and stairs.
36
37 C. Ground within 6 feet of a building under construction is free of irregularities.
38
39 D. Storage areas and walkways are reasonably free of dangerous depressions, obstructions,
40 and debris.
41
42 E. All walking and working surfaces are reasonably dry and free from grease or oil.
43
44 F. Spills of oil, grease, and other liquids are removed at once, or covered with sand or other
45 absorbent material until cleaned up.
46
47 G. Sufficient waste or trash containers are provided, used and emptied when appropriate.
48
49 H. Workers wear heavy gloves and heavy soled or safety shoes when handling scrap
50 material.
51
52 I. All walking and working surfaces are free of protruding nails.
53
54 J. Nails or fasteners are removed when opening crates, cartons, kegs, or when stripping
55 small forms.
56

- K. Nails are bent down or removed before scrap material is discarded.
- L. Scrap and debris are piled neatly.
- M. Materials, waste, or tools are not thrown from buildings or structures to areas where workers may be located.
- N. Any object protruding at head height has been removed or flagged.
- O. Protective caps are used on exposed rebar.
- P. Chutes are used to remove waste and/or debris from above grade floors.
- Q. Hoses, power cords, welding leads, etc. are not laying in heavily traveled walkways or areas.
- R. Structural openings are covered/protected adequately (i.e., sumps, shafts, floor openings, etc.).

3.03 BULK MATERIAL STORAGE

- A. All piled or stacked material is stable and cannot fall, slip, or collapse.
- B. The face of a pile of bags (containing cement or other material) more than 5 feet high is tapered back, or the sacks are tied in horizontal layers to prevent them from falling or collapsing.
- C. Lumber piles are no more than 16' high if handled manually or 20' high if handled by equipment. Headpieces, crosspieces, or other means are used as needed to prevent slipping, tipping, or collapsing.
- D. Piles of bricks, tiles, masonry blocks, and similar materials are stabilized by the use of headers at least every sixth layer.
- E. Brick stacks are not over 7 feet high. Brick stacks over 4 feet high are tapered back.
- F. Masonry stacks over 6 feet high are tapered back.
- G. The way that material is going to be taken off the pile is planned at the time the material is first stored.
- H. Workers and their equipment have room to move material off a pile.
- I. Material is piled on surfaces that will hold its weight.
- J. Material is piled on ground stable enough for a heavy load (not too near an excavation).
- K. Pipe or rod is stored in racks if more than one layer high.
- L. Surplus materials are returned to the stockpile.
- M. Materials are at least 2m (5 ft.) from openings, roof edges, excavations or trenches.

3.04 HAZARDOUS MATERIAL STORAGE AND DISPOSAL

- A. Flammable material is always stored in separate closed containers.

- B. Incompatible chemical products (which may cause a hazardous reaction if they come in contact) are not stored together.
- C. Flammable liquids are not stored near sources of ignition (sparks, electricity, flames, or hot objects).
- D. Where more than 25 gallons of flammable liquids are present, they are kept in a storage cabinet approved by the National Fire Protection Association (NFPA).
- E. Indoor storage areas for flammable liquids are ventilated and have one clear aisle, at least three feet wide.
- F. Flammable liquids stored outdoors are at least 50 feet from the property line and 10 feet from any public way.
- G. Outdoor flammable liquid storage areas are graded to divert spills away from buildings.
- H. Flammable and combustible scrap, debris, and waste are removed promptly from buildings or structures.
- I. Covered metal waste cans are available for oily and paint-soaked waste.
- J. Appropriate cleanup materials are available for leaks or spills of flammables or other hazardous materials.
- K. Leftover hazardous products and waste are properly stored, labeled, and disposed of according to the instructions on the product's Material Safety Data Sheet (MSDS).

3.05 SANITATION

- A. Toilets and washing facilities are clean and sanitary. Toilets are design to ensure user privacy, and are supplied with toilet paper.
- B. Sufficient toilets and washing facilities are available.
- C. Adequate supplies of potable water are available.
- D. Drinking water is stored and dispensed in clearly marked containers that are not used for any other purpose.
- E. All pipes and containers for non-potable water have been clearly labeled, and only potable water is used for washing or drinking.

3.06 ENVIRONMENT

- A. Lighting and ventilation are adequate.
- B. Burned out lights are reported and replaced.

END OF SECTION

SECTION 01711 - CLEANING

PART 1 - GENERAL

1.01 SECTION INCLUDES

- A. Description
- B. Disposal Requirements
- C. Materials
- D. During Construction
- E. Dust Control
- F. Final Cleaning

1.02 DESCRIPTION

- A. Contractor will be responsible to execute daily cleaning, during progress of the Work and at completion of the Work, as required by General Conditions. The Contractor is to daily, broom clean debris and remove all refuse, rubbish, scrap material caused by his operation. The Contractor shall remove all excess spoils.

1.03 CLEANING AND DISPOSAL REQUIREMENTS

- A. Conduct cleaning and disposal operations to comply with Scope of Work Section 01710 Construction Housekeeping, codes, ordinances, regulations, and anti-pollution laws.

1.04 MATERIALS

- A. Use only those cleaning materials which will not create hazards to health or property and which will not damage surfaces.
- B. Use only those cleaning materials and methods recommended by the manufacturer of the surface material to be cleaned.
- C. Use only cleaning materials on surfaces as recommended by cleaning material manufacturer.

1.05 DURING CONSTRUCTION

- A. Contractor at all times shall keep the premises free from accumulation of waste materials or rubbish caused by his operations or his subcontractor's operations and ensure that building and grounds are maintained free from accumulations of waste materials and rubbish. Do not allow waste materials, rubbish and debris to accumulate and become an unsightly or hazardous condition.
- B. Transport waste materials in a controlled manner with as few handling as possible; do not drop or throw materials from heights. Schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces. Sprinkle dusty debris with water.
- C. Burning or burying of rubbish and waste materials on the project site is not permitted. Disposal of volatile fluid wastes (such as mineral spirits, oil, or paint thinner) in storm or sanitary sewer systems is not permitted. Remove waste materials, rubbish and debris

1 from the site and legally dispose of at public or private dumping areas off the Owner's
2 property.

3
4 **1.06 DUST CONTROL**

- 5
6 A. Clean interior spaces prior to the start of finish painting and/or other applicable work, and
7 continue cleaning on as as-needed basis until such work is finished.
8
9 B. Schedule operations so that dust and other contaminants resulting from cleaning process
10 will not fall on wet or newly-coated surfaces.
11
12 C. Broom clean interior building areas when ready to receive finish painting and/or other
13 applicable work, and continue cleaning on as-need basis until building is ready for
14 acceptance or occupancy.
15

16 **1.07 FINAL CLEANING**

- 17
18 A. At completion of construction and just prior to acceptance or occupancy, the Contractor
19 will conduct a final inspection of exposed interior and exterior surfaces. Perform final
20 cleaning and maintain cleaning until building or portion thereof, is accepted by Owner.
21
22 B. Remove grease, dust, dirt, stains, labels, fingerprints, and other foreign materials from
23 interior and exterior surfaces. Repair, patch and touch-up marred surfaces to match
24 adjacent finishes. Broom clean paved surfaces; rake clean other surfaces of grounds.
25
26 C. Clean all glass and all other finish surfaces, replace all broken and scratched glass;
27 remove stains, spots marks and dirt from decorated work; clean all hardware; remove
28 paint spots and smears from all surfaces, clean all fixtures and wash or vacuum all floors;
29 leaving work in a clean and spotless condition.
30
31 D. Mechanical subcontractor shall replace air conditioning filters if units were operated during
32 construction. Clean ducts, blowers and coils if air conditioning units were operated without
33 filters during construction.
34
35 E. Remove all waste materials and rubbish from and about the Project as well as all tools,
36 construction equipment, machinery and surplus materials.
37
38 F. Use experienced workmen or professional cleaners for final cleaning.
39
40 G. Comply with cleaning instructions contained in the Specifications. In absence of specific
41 cleaning instructions, follow accepted cleaning practices or the recommendations of the
42 manufacturer of the material to be cleaned.
43

44 **PART 2 – PRODUCTS (NOT APPLICABLE)**

45
46
47 **PART 3 – EXECUTION (NOT APPLICABLE)**

48
49
50 **END OF SECTION**
51

1 **SECTION 01731 - CUTTING AND PATCHING**

2
3 **PART 1 GENERAL**

4
5 1.01 SECTION INCLUDES:

- 6
7 A. Summary
8
9 B. Submittals
10
11 C. Quality Assurance
12
13 D. Products
14
15 E. Cleaning
16
17 F. Renovation Supplemental Project Procedures
18

19 1.02 SUMMARY

- 20
21 A. This section specifies administrative and procedural requirements for cutting and
22 patching.
23
24 B. Refer to other sections for specific requirements and limitations applicable to cutting and
25 patching individual parts of the work.
26 1. Requirements of this section apply to mechanical and electrical installations.
27 Refer to Division-15 and Division-16 sections for other requirements and
28 limitations applicable to cutting and patching mechanical and electrical
29 installations.
30

31 1.03 SUBMITTALS

- 32
33 A. Cutting and Patching Description: Where approval of procedures for cutting and patching
34 is required before proceeding, submit a description of the procedures well in advance of
35 the time cutting and patching will be performed and request approval to proceed. Include
36 the following information, as applicable, in the proposal:
37 1. Describe the extent of cutting and patching required and how it is to be
38 performed; indicate why it cannot be avoided.
39 2. Describe anticipated results in terms of changes to existing construction; include
40 changes to structural elements and operating components as well as changes in
41 the building's appearance and other significant visual elements.
42 3. List products to be used and firms or entities that will perform work.
43 4. Indicate dates when cutting and patching is to be performed.
44 5. List utilities that will be disturbed or affected, including those that will be relocated
45 and those that will be temporarily out-of-service. Indicate how long service will be
46 disrupted.
47 6. Where cutting and patching involves addition of reinforcement to structural
48 elements, submit details and engineering calculations signed and sealed by a
49 qualified profession engineer licensed in the State of Kansas to show how
50 reinforcement is integrated with the original structure.
51 7. Approval by the Architect to proceed with cutting and patching does not waive the
52 Architect's right to later require complete removal and replacement of a part of
53 the work found to be unsatisfactory.
54
55
56

1.04 QUALITY ASSURANCE

- A. Requirements for Structural Work: Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.
 - 1. Obtain approval of the cutting and patching description before cutting and patching the following structural elements:
 - a. Foundation construction.
 - b. Bearing and retaining walls.
 - c. Structural concrete.
 - d. Structural steel.
 - e. Lintels.
 - f. Structural decking.
 - g. Miscellaneous structural metals.
 - h. Equipment supports.
 - i. Piping, ductwork, vessels and equipment.
- B. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increase maintenance, or decreased operational life or safety.
 - 1. Obtain approval of the cutting and patching description before cutting and patching the following operating elements or safety related systems:
 - a. Primary operational systems and equipment.
 - b. Air or smoke barriers.
 - c. Water, moisture, or vapor barriers.
 - d. Membranes and flashings.
 - e. Fire protection systems.
 - f. Noise and vibration control elements and systems.
 - g. Control systems.
 - h. Communication systems.
 - i. Electrical wiring systems.
- C. Visual Requirements: Do not cut and patch construction exposed on the exterior or in occupied spaces, in a manner that would, in the Architect's opinion, reduce the building's aesthetic qualities, or result in visual evidence of cutting and patching. Remove and replace work that has been cut and patched in a visually unsatisfactory manner.

PART 2 PRODUCTS

2.01 MATERIALS

- A. Use materials that are identical to existing materials. If identical materials are not available or cannot be used where exposed surfaces are involved, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect. Use materials whose installed performance will equal or surpass that of existing materials.

PART 3 EXECUTION

3.01 INSPECTION

- A. Before cutting existing surfaces, examine surfaces to be cut and patched and conditions under which cutting and patching is to be performed. Take corrective action before proceeding, if unsafe or unsatisfactory conditions are encountered.

3.02 PREPARATION

- A. Temporary Support: Provide temporary support of work to be cut.

- B. Protection: Protect existing construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of the project that might be exposed during cutting and patching operations.
- C. Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.
- D. Take all precautions necessary to avoid cutting existing pipe, conduit or ductwork serving the building, but scheduled to be removed or relocated until provisions have been made to bypass them.

3.03 PERFORMANCE

- A. General: Employ skilled workmen to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time and complete without delay.
 - 1. Cut existing construction to provide for installation of other components or performance of other construction activities and the subsequent fitting and patching required to restore surfaces to their original condition.
- B. Cutting: Cut existing construction using methods least likely to damage elements to be retained or adjoining construction. Where possible, review proposed procedures with the original installer; comply with the original installer's recommendations.
 - 1. In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut holes and slots neatly to size required with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.
 - 2. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.
 - 3. Cut through concrete and masonry using a cutting machine such as a carborundum saw or diamond core drill.
 - 4. Comply with requirements of applicable sections of Division-2.
 - 5. By-pass utility services such as pipe or conduit, before cutting, where services are shown or required to be removed, relocated or abandoned. Cut-off pipe or conduit in walls or partitions to be removed. Cap, valve or plug and seal the remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after by-passing and cutting.
- C. Patching: Patch with durable seams that are as invisible as possible. Comply with specified tolerances.
 - 1. Where feasible, inspect and test patched areas to demonstrate integrity of the installation.
 - 2. Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

3.04 CLEANING

- A. Thoroughly clean areas and spaces where cutting and patching is performed or used as access. Remove completely paint, mortar, oils, putty and items of similar nature. Thoroughly clean piping, conduit and similar features before painting or other finishing is applied. Restore damaged pipe covering to its original condition.

3.04 RENOVATION SUPPLEMENTAL PROJECT PROCEDURES

- A. Materials: As specified in Product Sections; match existing products and work for patching and extending work.

- 1 B. Close openings in exterior surfaces to protect existing work from weather and extremes of
2 temperature and humidity.
- 3
- 4 C. Remove, cut and patch work in a manner to minimize damage and to provide a means of
5 restoring products and finishes to original condition.
- 6
- 7 D. Refinish visible existing surfaces to remain in renovated rooms and spaces, to specified
8 condition for each material, with a neat transition to adjacent finishes.
- 9
- 10 E. Where new work abuts or aligns with existing, perform a smooth and even transition,
11 allowing patched work to match existing adjacent work in texture and appearance.
- 12
- 13 F. When finished surfaces are cut so that a smooth transition with new work is not possible,
14 terminate existing surface along a straight line at a natural line of division and make
15 recommendation to Architect.
- 16
- 17 G. Where a change of plane of ¼-inch or more occurs, submit recommendation for providing
18 a smooth transition for Architect review.
- 19
- 20 H. Patch or replace portions of existing surfaces which are damaged, lifted, discolored, or
21 showing other imperfections.
- 22
- 23 I. Finish surfaces as specified in individual product sections.
- 24
- 25
- 26

27 **END OF SECTION**

SECTION 01732 - SELECTIVE DEMOLITION

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. This Section includes the following:
Concrete, foundations, masonry, steel, roofing, sheet metal, doors and frames, glass, windows, gyp. board partitions, EIFS, ceilings, floor finishes, plumbing, mechanical, electrical and equipment and fire alarm.
- B. Related Sections include the following:
 - 1. Division 1 Section "Summary of Work" for use of the premises and phasing requirement.
 - 2. Division 1 Section "Construction Facilities and Temporary Controls" for temporary construction and environmental-protection measures for selective demolition operations.
 - 3. Division 1 Section "Cutting and Patching" for cutting and patching procedures for selective demolition operations.
 - 4. Division 23 Sections for demolishing, cutting, patching, or relocating mechanical items.
 - 5. Division 26 Sections for demolishing, cutting, patching, or relocation electrical items.

1.03 DEFINITIONS

- A. Remove: Detach items from existing construction and legally dispose of them off-site, unless indicated to be removed and salvaged or removed and reinstalled.
- B. Remove and Salvage: Detach items from existing construction and deliver them to Owner ready for reuse.
- C. Remove and Reinstall: Detach items from existing construction, prepare them for reuse, and reinstall them where indicated.
- D. Existing to Remain: Existing items of construction that are not to be removed and that are not otherwise indicated to be removed, removed and salvaged, or removed and reinstalled.

1.04 MATERIALS OWNERSHIP

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

1. Coordinate with Owner to establish special procedures for removal and salvage.
- C. Specific items may be identified for salvage and turn-over to the Owner at the completion of the project. Any items so identified, are the property of the Owner but shall be protected and maintained by the Contractor for the duration of the construction project. Carefully remove and salvage each item or object in a manner to prevent damage, and protect such items in a secure location for prompt delivery to the Owner at the conclusion of the project.
- 1.05 SUBMITTALS
- A. Qualification Data: For firms and person specified in "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.
- B. Proposed Dust-Control and Noise-Control Measures: Submit statement or drawing that indicates the measures proposed for use, proposed locations, and proposed time frame for their operation. Identify options if proposed measures are later determined to be inadequate.
- C. Schedule of Selective Demolition Activities: Indicate the following:
1. Detailed sequence of selective demolition and removal work, with starting and ending dates for each activity. Ensure Owner's on-site operations are uninterrupted.
 2. Interruption of utility services.
 3. Coordination for shutoff, capping and continuation of utility services.
- D. Inventory: After selective demolition is complete, submit a list of items that have been removed and salvaged.
- E. Landfill Records: Indicate receipt and acceptance of hazardous wastes by a landfill facility licensed to accept hazardous wastes.
- 1.06 QUALITY ASSURANCE
- A. Regulatory Requirements: Comply with governing EPA notification regulations before beginning selective demolition. Comply with hauling and disposal regulations of authorities having jurisdiction.
- B. Standards: Comply with ANSI A10.6 and NFPA 241.
- C. Pre-demolition Conference: Conduct conference at Project site to comply with requirements in Division 1 Section "Project Meetings." Review methods and procedures related to selective demolition including, but not limited to, the following:
1. Inspect and discuss condition of construction to be selectively demolished.
 2. Review and finalize selective demolition schedule and verify availability of materials, demolition personnel, equipment, and facilities needed to make progress and avoid delays.
 3. Review requirements of work performed by other trades that rely on substrates exposed by selective demolition operations.
- 1.07 PROJECT CONDITIONS
- A. Owner will occupy portions of the site/building in and around the demolition area. Conduct selective demolition so Owner's operations will not be disrupted. Provide not less than 72 hours' notice to Owner of activities that will affect Owner's operations.
- B. Maintain access to existing access ways other occupied or used facilities.

1. Do not close or obstruct access way, or other occupied or used facilities without written permission from authorities having jurisdiction.
- C. Owner assumes no responsibility for condition of areas to be selectively demolished.
 1. Conditions existing at time of inspection for bidding purpose will be maintained by Owner as far as practical.
- D. Hazardous Materials: It is not expected that hazardous materials will be encountered in the Work.
 1. Hazardous materials will be removed by Owner before start of the Work, except lead based paints and coatings.
 2. If other non-lead containing materials suspected of containing hazardous materials are encountered, do not disturb; immediately notify Architect and Owner. Non-lead bearing hazardous materials will be removed by Owner under a separate contract.
 3. The Contractor is fully and solely responsible for work involving lead bearing materials.
- E. Storage or sale of removed items or materials on-site will not be permitted.
- F. Utility Service: Maintain existing utilities indicated to remain in service and protect them against damage during selective demolition operations.
 1. Maintain fire protection facilities in service during selective demolition operations.

PART 2 – PRODUCTS

- A. Use repair materials identical to existing materials.
 1. If identical materials are unavailable or cannot be used for exposed surfaces, use materials that visually match existing adjacent surfaces to the fullest extent possible.
 2. Use materials with installed performance equal or surpassing that of existing materials.
- B. Comply with material and installed requirements specified

PART 3 -- EXECUTION

3.01 EXAMINATION

- A. Verify that utilities have been disconnected and capped.
- B. Survey existing conditions and correlate with requirements indicated to determine extent of selective demolition required.
- C. Inventory and record the condition of items to be removed and reinstalled and items to be removed and salvaged.
- D. When unanticipated mechanical, electrical, or structural elements that conflict with intended function or design are encountered, investigate and measure the nature and extent of conflict. Promptly submit a written report to Architect.
- E. Perform surveys as the Work progresses to detect hazards resulting from selective demolition activities.

3.02 UTILITY SERVICES

- A. Existing Utilities: Maintain services indicated to remain and protect them against damage during selective demolition operations.

- 1 B. Do not interrupt existing utilities serving occupied or operating facilities unless authorized in
2 writing by Owner and authorities having jurisdiction. Provide temporary services during
3 interruptions to existing utilities, as acceptable to Owner and to authorities having jurisdiction.
4 1. Provide at least 72 hours' notice to Owner if shutdown of service is required
5 during changeover.
6
7 C. Utility Requirements: Locate, identify, disconnect, and seal or cap off indicated utilities
8 serving areas to be selectively demolished.
9 1. Owner will arrange to shut off indicated utilities when requested by Contractor.
10 2. If utility services are required to be removed, relocated, or abandoned, before
11 proceeding with selective demolition provide temporary utilities that bypass area of
12 selective demolition and that maintain continuity of service to other parts of the building.
13 3. Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug
14 and seal remaining portion of pipe or conduit after bypassing.
15

16 3.03 PREPARATION
17

- 18 A. Dangerous Materials: Drain, purge, or otherwise remove, collect, and dispose of
19 chemicals, gases, explosives, acids, flammables, or other dangerous materials before
20 proceeding with selective demolition operations.
21

22 3.04 POLLUTION CONTROLS
23

- 24 A. Dust Control: Use suitable methods to limit spread of dust and dirt. Comply with
25 governing environmental protection regulations.
26 1. Do not use water when it may create hazardous or objectionable conditions, such
27 as ice, flooding, and pollution.
28
29 B. Disposal: Remove and transport debris in a manner that will prevent damage to adjacent
30 surfaces and areas.
31
32 C. Cleaning: Clean adjacent structures and improvements of dust, dirt, and debris caused
33 by selective demolition operations. Return adjacent areas to condition existing before
34 selective demolition operations began.
35

36 3.05 SELECTIVE DEMOLITION
37

- 38 A. General: Demolish and remove existing construction only to the extent required by new
39 construction and as indicated. Use methods required to complete the Work within
40 limitations of governing regulations and as follows:
41 1. Proceed with selective demolition systematically.
42 2. Use cutting methods least likely to damage construction to remain or adjoining
43 construction. Use hand tools or small power tools designed for sawing or grinding,
44 not hammering and chopping, to minimize disturbance of adjacent surfaces.
45 3. Do not use cutting torches until work area is cleared of flammable materials.
46 Maintain portable fire suppression devices during flame-cutting operations.
47 4. Remove decayed, vermin-infested, or otherwise dangerous or unsuitable
48 materials and promptly dispose of off site.
49 5. Dispose of demolished items and materials promptly.
50 6. Return elements of construction and surfaces that are to remain to condition
51 existing before selective demolition operations began.
52 B. Existing Facilities: Comply with Owner's requirements for using and protecting walkways,
53 driveways, entries, and other facilities during selective demolition operations.
54
55 C. Removed and Salvaged Items: Comply with the following:

1. Clean salvaged items.
 2. Pack or crate items after cleaning. Identify contents of containers.
 3. Store items in a secure area until delivery to Owner.
 4. Transport items to Owner's storage area designated by Owner.
 5. Protect items from damage during transport and storage.
- D. Removed and Reinstalled Items: Comply with the following:
1. Clean and repair items to functional condition adequate for intended reuse. Paint equipment to match new equipment.
 2. Pack or crate items after cleaning and repairing. Identify contents of containers.
 3. Protect items from damage during transport and storage.
 4. Reinstall items in locations indicated. Comply with installation requirements for new materials and equipment. Provide connections, supports, and miscellaneous materials necessary to make item functional for use indicated.
- E. Existing Items to Remain: Protect construction indicated to remain against damage and soiling during selective demolition.
- F. Existing Items to be Abandoned in Place: Fill underground piping systems to be abandoned with sand as required to prevent future collapse.
- G. Concrete: Demolish in small sections. Cut concrete to a depth of at least $\frac{3}{4}$ inch at junctures with construction to remain, using power-driven saw. Dislodge concrete from reinforcement at perimeter of areas being demolished, but reinforcement, and then remove remainder of concrete indicated for selective demolition. Neatly trim openings to dimensions indicated.
- H. Asphalt: Demolish in small sections. Cut asphalt to a depth of full depth within limits of new construction with using power-driven saw. Neatly trim areas for patching and repair.
- 3.06 PATCHING AND REPAIRS
- A. General: Promptly repair damage to adjacent construction caused by selective demolition operations.
- B. Patching: Comply with Division 1 Section "Cutting and Patching".
- 3.07 DISPOSAL OF DEMOLISHED MATERIALS
- A. General: Promptly dispose of demolished materials. Do not allow demolished materials to accumulate on site.
- B. Burning: Do not burn demolished materials.
- C. Disposal: Transport demolished materials off Owner's property and legally dispose of them.
- 3.08 SELECTIVE DEMOLITION SCHEDULE
- A. Existing construction to be removed is shown on the drawings reference demolition drawings.
- B. Existing items to be removed and salvaged are shown on the drawings, reference demolition drawings.
- END OF SECTION**

SECTION 01740 - WARRANTIES AND BONDS

PART 1 - GENERAL

1.01 SECTION INCLUDES:

- A. Related Documents
- B. Summary
- C. Definitions
- D. Warranty Requirements
- E. Submittals

1.02 RELATED DOCUMENTS

- A. Drawings and general provisions of the contract, including General and Supplementary Conditions and other Division-1 Specification sections, apply to this section.

1.03 SUMMARY

- A. This section specifies general administrative and procedural requirements for warranties and bonds required by the Contract Documents, including manufacturers' standard warranties on products and special warranties.
 - 1. Refer to the general conditions of the contract for construction of terms of Contractor's warranty of workmanship and materials.
 - 2. General closeout requirements are in Division-1, Section "Project Closeout".
 - 3. Specific requirements for warranties for the work and products and installations that are specified to be warranted, are included in the individual sections of Divisions-2 through 28.
 - 4. Certifications and other commitments and agreements for continuing services to Owner are specified elsewhere in the Contract Documents.
- B. Disclaimers and Limitations: Manufacturer's disclaimers and limitations on product warranties do not relieve the Contractor of the warranty on the work that incorporated the products, nor does it relieve suppliers, manufacturers, and subcontractors required to countersign special warranties with the Contractor.

1.04 DEFINITIONS

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

1.05 WARRANTY REQUIREMENTS

- A. Related Damages and Losses: When correcting warranted Work that has failed, remove and replace other work that has been damaged as a result of such failure or that must be removed and replaced to provide access for correction of warranted work.

- 1 B. Reinstatement of Warranty: When Work covered by a warranty has failed and has been
2 corrected by replacement or rebuilding, reinstate the warranty by written endorsement.
3 The reinstated warranty shall be equal to the original warranty with an equitable
4 adjustment for depreciation.
5
- 6 C. Replacement Cost: Upon determination that work covered by a warranty has failed,
7 replace or rebuild the Work to an acceptable condition complying with requirements of
8 Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding
9 defective work regardless of whether the Owner has benefited from use of the work
10 through a portion of its anticipated useful service life.
11
- 12 D. Owner's Recourse: Written warranties made to the Owner are in addition to implied
13 warranties, and shall not limit the duties, obligations, rights and remedies otherwise
14 available under the law, nor shall warranty periods be interpreted as limitations on time in
15 which the Owner can enforce such other duties, obligations, rights, or remedies.
16
- 17 E. The Owner reserves the right to refuse to accept Work for the Project where a special
18 warranty, certification, or similar commitment is required on such Work or part of the
19 Work, until evidence is presented that entities required to countersign such commitments
20 are willing to do so.
21

22 1.06 SUBMITTAL

23

- 24 A. Submit written warranties to the Architect prior to the date certified for Substantial
25 Completion. If the Architect's certificate of substantial completion designates a
26 commencement date for warranties other than the date of Substantial Completion of the
27 Work, or a designated portion of the Work, submit written warranties upon request of the
28 Architect.
29 1. When a designated portion of the Work is completed and occupied or used by the
30 Owner, by separate agreement with the Contractor during the construction period,
31 submit properly executed warranties to the Architect within fifteen (15) days of
32 completion of that designated portion of the Work.
33 2. In all other instances, warranty periods will not begin prior to Substantial
34 Completion, regardless of equipment use prior to dates of Substantial
35 Completion.
36
- 37 B. When a special warranty is required to be executed by the Contractor, or the Contractor
38 and a subcontractor, supplier or manufacturer, prepare a written document that contains
39 appropriate terms and identification, ready for execution by the required parties. Submit a
40 draft to the Owner through the Architect for approval prior to final execution.
41 1. Refer to individual sections of Divisions-2 through 28 for specific content
42 requirements, and particular requirements of submittal of special warranties.
43
- 44 C. Form of Submittal: At final completion, compile two copies of each required warranty and
45 bond properly executed by the Contractor, or the Contractor, subcontractor, supplier or
46 manufacturer. Organize the warranty documents into an orderly sequence based on the
47 table of contents of the project manual.
48
- 49 D. Bind warranties and bonds in heavy-duty, commercial quality, durable three-ring vinyl
50 covered loose-leaf binders, thickness as necessary to accommodate contents, and sized
51 to receive 8½" x 11" paper.
52 1. Provide heavy paper dividers with celluloid covered tabs for each separate
53 warranty. Mark the tab to identify the product or installation. Provide a typed
54 description of the product or installation, including the name of the product, and
55 the name, address and telephone number of the installer.

2. Identify each binder on the front and the spine with the typed or printed title 'WARRANTIES AND BONDS', the project title or name, and the name of the Contractor.
3. When operating and maintenance manuals are required for warranted constitution, provide additional copies of each required warranty, as necessary, for inclusion in each required manual.

PART 2 – PRODUCTS (Not Applicable)

PART 3 – EXECUTION (Not Applicable)

END OF SECTION

SECTION 02230 – SITE CLEARING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Removal of surface debris.
 - 2. Removal of Site vegetation.
 - 3. Topsoil stripping.
 - 4. Clearing of Site work within limits.
 - 5. Protection of existing vegetation to remain.
- B. Related Sections:
 - 1. Section 02300 – Earthwork.
 - 2. Section 02913 – Landscape Grading.

1.2 DEFINITIONS

- A. Topsoil: Friable natural loam surface found in a depth of not less than 2 inches, reasonably free of subsoil, clay lumps, brush, weeds, and other litter, and free of roots, stumps, stones larger than ½ inch, in any dimension, and other extraneous or toxic matter harmful to plant growth.
- B. Vegetation: Trees, shrubs, groundcovers, grass, and other plants.

1.3 QUALITY ASSURANCE

- A. Regulatory Requirements: Conform with applicable code for environmental requirements and disposal of debris.

1.4 INFORMATIONAL SUBMITTALS

- A. Existing Conditions: Documentation of existing plantings, adjoining construction, and site improvements that establishes preconstruction conditions that might be misconstrued as damage caused by site clearing.
 - 1. Use sufficiently detailed photographs or videotape.
 - 2. Include plans and notations to indicate specific damage conditions of other plants designated to remain.

1.5 PROJECT CONDITIONS

- A. Traffic: Minimize interference with adjoining roads, streets, walks, and other adjacent occupied or used facilities during site-clearing operations.
 - 1. Do not close or obstruct streets, walks, or other adjacent occupied or used facilities without permission from Owner and authorities having jurisdiction.
 - 2. Provide alternate routes around closed or obstructed traffic ways if required by Owner or authorities having jurisdiction.
- B. Salvable Improvements: Carefully remove items indicated to be salvaged and store on Owner's premises where indicated.
- C. Utility Locator Service: Call for area where Project is located before site clearing.
- D. Do not commence site clearing operations until temporary erosion- and sedimentation-control measures are in place.
- E. The following practices are prohibited within protection zones:
 - 1. Storage of construction materials, debris, or excavated material.
 - 2. Parking vehicles or equipment.
 - 3. Foot traffic.

4. Excavation or other digging unless otherwise indicated.

F. Soil Stripping, Handling, and Stockpiling: Perform only when the topsoil is dry or slightly moist.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Satisfactory Soil Material: Requirements for satisfactory soil material are specified in Division 1 Section "Earthwork."
 2. Obtain approved borrow soil material off-site when satisfactory soil material is not available on-site.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper and timely completion:
 1. Verify that erosion control systems are in place.
 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection:
 1. Protect lawns, other vegetation, and other features indicated on Drawings to remain, or not indicated to be removed.
 - a. Protect vegetation from unnecessary cutting, breaking or skinning of roots, skinning and bruising of bark, smothering by stockpiling construction materials or excavation materials within drip line, and excess foot and vehicular traffic.
 2. Repair or replace vegetation indicated to remain that are damaged by construction operations in a manner acceptable to the Owner.
 3. Protect bench marks, monuments, existing structures, existing fences, existing roads, existing sidewalks, existing paving, existing curbs and other features indicated on Drawings to remain, or not indicated to be removed, from damage and displacement.
 - a. If damaged or displaced, notify Architect and correct defects as directed by Owner.
 4. Protect above and below grade utilities which are to remain.
- B. Preparation:
 1. Use all means necessary to control dust on and near the Work, and on and near off-site storage, and spoil areas, if such dust is caused by performance of the Work of this Section, or if resulting from the condition in which Project Site is left by Contractor.
 2. Moisten surfaces as required to prevent dust from being a nuisance to the public, neighbors, and concurrent performance of other Work on Project Site.
 3. Identify above and below grade utilities.
 4. Locate, identify, stub off, and disconnect utility service companies before starting work and comply with their requirements.

3.3 CLEARING OF SITE

- A. Clear areas required for access to Site and execution of Work.
- B. Remove walks and concrete paving indicated on Drawings and as required to permit installation of new construction:
 1. Verify removal of items not indicated on Drawings to be removed.
 2. At locations abutting curbs, walks, or paving which is to remain, neatly saw cut edges at right angle to surface.
- C. Remove grass, and other vegetation, improvements, and obstructions

indicated on Drawings and as required to permit installation of new construction.

1. Verify removal of items not indicated on Drawings to be removed.

D. Clear undergrowth and deadwood without disturbing subsoil.

E. Remove rubble, loose surface soils, and other deleterious materials from building and pavement areas.

F. Fill depressions caused by clearing operations in accordance with Section 02300.

G. Existing Underground Utilities:

1. No known utilities are in this area, if locate identifies utility (unforeseen) in the Work area - remove abandoned utility lines and/or relocate existing utility lines which are in use.
 - a. Coordinate with utility companies to shutoff services if lines are active.
 - b. Perform excavation to sufficient width to accommodate heavy construction equipment for compaction of backfill.
2. Backfill excavations in accordance with Section 02300.

3.4 EXCAVATION OF TOPSOIL

A. Strip and remove full depth of topsoil from building areas, pavement areas, a lateral distance of 5 feet outside the building and pavement areas, and from area of grading limits indicated on Drawings.

1. Strip in a manner to prevent intermingling with underlying subsoil or other objectionable material:
 - a. Do not excavate wet topsoil.
2. Remove heavy growths of grass from areas prior to stripping topsoil.
3. Where existing trees are to remain, leave existing topsoil in place within drip line of tree.
4. Stockpile topsoil in storage piles:
 - a. Verify location of stockpile with Owner.
 - b. Construct storage piles to provide free drainage of surface water.
 - c. Cover storage piles as required.

3.5 DISPOSAL OF WASTE MATERIALS

A. Remove debris, demolished materials, rock, surplus soil material, unsuitable topsoil, and extracted plant life from Site.

B. Burning is not permitted on Project Site.

END OF SECTION

SECTION 02300 - EARTHWORK

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. This Section includes the following:
 - 1. Preparing and grading sub-grades for slab-on-grades, walks, and landscaping.
 - 2. Excavating and backfilling for buildings and structures.
 - 3. Drainage and moisture-control fill course for slabs-on-grade.
 - 4. Sub-base course for walks.
 - 5. Subsurface drainage backfill for walls and trenches.
 - 6. Excavating and backfilling trenches with building lines for underground utilities.
- B. Related Sections: The following Sections contain requirements that relate to this Section.
 - 1. Division 2 Section "Sodding" for finish grading, including placing and preparing topsoil for lawns.
 - 2. Division 3 Section "Cast-In-Place Concrete" for concrete foundations and sidewalks.

1.3 DEFINITIONS

- A. Excavation consists of the removal of material encountered to sub-grade elevations and the reuse or disposal of materials removed.
- B. Sub-grade: The uppermost surface of an excavation or the top surface of a fill or backfill immediately below sub-base, drainage fill, or topsoil materials.
- C. Borrow: Soil material obtained off-site when sufficient approved soil material is not available from excavations.
- D. Sub-base Course: The layer placed between the sub-grade and base course in a paving system or the layer placed between the sub-grade and surface of a pavement or walk.
- E. Base Course: The layer placed between the sub-base and surface pavement in a paving system.
- F. Drainage Fill: Course of washed granular material supporting slab-on-grade placed to cut off upward capillary flow of pore water.
- G. Unauthorized excavation consists of removing materials beyond indicated sub-grade elevations or dimensions without direction by the Architect. Unauthorized excavation, as well as remedial work directed by the Architect, shall be at the Contractor's expense.
- H. Structures: Buildings, footings, foundations, retaining walls, slabs, tanks, curbs, mechanical and electrical appurtenances, or other man-made stationary features constructed above or below ground surface.
- I. Utilities include on-site underground pipes, conduits, ducts, and cables, as well as underground services within building lines.

1.4 SUBMITTALS

- A. General: Submit the following according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Test Reports: In addition to test reports required under field quality control, submit:
 - 1. Classification according to ASTM D 2487 of each soil material proposed for fill and backfill from on-site and borrow sources.
 - 2. Laboratory compaction curve according to ASTM D 698, ASTM D 1557 each soil material proposed for fill and backfill from on-site and borrow sources.
- C. Photographs of existing adjacent structures and site improvements.

1.5 QUALITY ASSURANCE

- A. Perform earthwork complying with requirements of authorities having jurisdiction.
- B. Testing and Inspection Service: Contractor shall employ a qualified independent geotechnical engineering testing agency to observe and monitor earthwork operations, including review of grading, suitability of soils materials for support, and compaction.
- C. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
 - 1. Before commencing earthwork, meet with representatives of the Owner, Architect, Consultants, and the Geotechnical Engineer, and other concerned entities. Review earthwork responsibilities including testing and inspection requirements. Notify participants at least 10 working days prior to convening conference. Record discussions and agreements and furnish a copy to each participant.

1.6 PROJECT CONDITIONS

- A. Existing Utilities: Do not interrupt existing utilities serving facilities occupied by the Owner or others except when permitted in writing by the Architect and then only after acceptable temporary utility services have been provided.
- B. Provide a minimum 72-hours' notice to the Owner's Representative and the Architect and receive written notice to proceed before interrupting any utility.
- C. Demolish and completely remove from site existing underground utilities indicated to be removed. Coordinate with utility companies to shutoff services if lines are active.
- D. Contractor shall contact SMSD Operations and Maintenance Office prior to beginning any excavation work for onsite assistance in locating underground utilities in the area of work.
- E. Projects on privately owned property may require calling 1-800-DIG-SAFE for assistance in locating underground utilities not owned by the school district. Verify with SMSD.

PART 2 - PRODUCTS

2.1 SOIL MATERIALS

- A. General: Provide approved borrow soil materials from off-site when sufficient approved soil materials are not available from excavations.
- B. Satisfactory Soil Materials: ASTM D 2487 soil classification groups GW, GP, GM, SW, SP, and SM; free of rock or gravel larger than 2 inches in any dimension, debris, waste, frozen

materials, vegetation and other deleterious matter.

- C. Unsatisfactory Soil Materials: ASTM D 2487 soil classification groups GC, SC, ML, MH, CL, CH, OL, OH, and PT.
- D. Backfill and Fill Materials: Satisfactory soil materials.
- E. Sub-base and Base Material: Naturally or artificially graded mixture of natural or crushed gravel, crushed stone, and natural or crushed sand, ASTM D 2940, with at least 95% passing a 1-1/2-inch sieve and not more than 8% passing a No. 200 sieve.
- F. Bedding Material: Sub-base or base materials with 100% passing a 1-inch sieve and not more than 8% passing a No. 200 sieve.
- G. Drainage Fill: Washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, ASTM D 448, coarse aggregate grading size 57, with 100% passing a 1-1/2-inch sieve and not more than 5% passing a No. 8 sieve.
- H. Filtering Material: Evenly graded mixture of natural or crushed gravel or crushed stone and natural sand, with 100 percent passing a 1-1/2-inch sieve and 0 to 5% passing a # 50 sieve
- J. Impervious Fill: Clayey gravel and sand mixture capable of compacting to a dense state.
- K. AB-3: A minimum of 85% limestone or dolomite produced by mechanical crushing, mixed with a qualified binder material.

2.2 ACCESSORIES

- A. Detectable Warning Tape: Acid- and alkali-resistant polyethylene film warning tape manufactured for marking and identifying underground utilities, 6 inches wide and 4 mils thick minimum, 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 2'-6" deep and color coded 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 earthwork operations.
- B. Provide erosion control measures to prevent erosion or displacement of soils and discharge of soil-bearing water runoff or dust to adjacent properties and pavements.
- C. Strip and stockpile topsoil for salvage and reuse from all areas being disturbed for sub-surface construction and where noted on the drawings.

3.2 DEWATERING

- A. Prevent surface water and subsurface or ground water from entering excavations, from

ponding on prepared sub-grades, and from flooding Project site and surrounding area.

- B. Protect sub-grades from softening and damage by rain or water accumulation.

3.3 EXCAVATION

- A. Explosives: Do not use explosives.
- B. Unclassified Excavation: Excavation is unclassified and includes excavation to required sub-grade elevations regardless of the character of materials and obstructions encountered. No changes to Contract Sum or Contract Time will be authorized for excavation of rock or removal of obstructions.
 - 1. Earth excavation includes excavation of sidewalks, paving, and other obstructions visible on surface; underground structures, utilities, and other items indicated to be demolished and removed; together with soil and other materials encountered that are not classified as rock or unauthorized excavation.

3.4 STABILITY OF EXCAVATIONS

- A. Comply with local codes, ordinances, and requirements of authorities having jurisdiction to maintain stable excavations.

3.5 EXCAVATION FOR STRUCTURES

- A. Excavate to indicated elevations and dimensions within a tolerance of plus or minus 0.10 foot. Extend excavations a sufficient distance from structures for placing and removing concrete formwork, installing services and other construction, and for inspections.
- B. 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 WALKS

- A. Excavate surfaces under walks to indicated cross sections, elevations, and grades.

3.7 APPROVAL OF SUBGRADE

- A. Notify Geo-technical Engineer when excavations have reached required sub-grade. When Geo-technical Engineer determines that unforeseen unsatisfactory soil is present, continue excavation as approved by the Owner's representative and replace with compacted backfill or fill material as directed.
 - 1. Unforeseen additional excavation and replacement material will be paid according to the Contract provisions for changes in Work and the Unit Prices identified in the Bid.
- B. Reconstruct sub-grades damaged by freezing temperatures, frost, rain, accumulated water, or construction activities, as directed by the Geo-technical Engineer.

3.8 UNAUTHORIZED EXCAVATION

- A. Fill unauthorized excavation under foundations or wall footings by extending indicated bottom elevation of concrete foundation or footing to excavation bottom, without altering required top elevation. Lean concrete fill may be used to bring elevations to proper position when acceptable to the Geo-technical Engineer.
 - 1. Fill unauthorized excavations under other construction as directed by the Geo-technical Engineer.

2. Where indicated widths of utility trenches are exceeded, provide stronger pipe, or special installation procedures, as required by the Geo-technical Engineer.

3.9 STORAGE OF SOIL MATERIALS

- A. Stockpile excavated materials acceptable for backfill and fill soil materials, including acceptable borrow materials. Stockpile soil materials without intermixing. Place grade and shape stockpiles to drain surface water. Cover to prevent wind-blown dust.
 1. Stockpile soil materials away from edge of excavations. Do not store within drip line of remaining trees.

3.10 BACKFILL

- A. Backfill excavations promptly, but not before completing the following:
 1. Acceptance of construction below finish grade including, where applicable, dampproofing, waterproofing, and perimeter insulation.
 2. Surveying locations of underground utilities for record documents.
 3. Testing, inspecting, and approval of underground utilities.
 4. Concrete formwork removal.
 5. Removal of trash and debris from excavation.
 6. Removal of temporary shoring and bracing, and sheeting.
 7. Installing permanent or temporary horizontal bracing on horizontally supported walls.

3.11 FILL

- A. Preparation: Remove vegetation, topsoil, debris, wet, and unsatisfactory soil materials, obstructions, and deleterious materials from ground surface prior to placing fills.
- B. Plow strip, or break up sloped surfaces steeper than 1 vertical to 4 horizontal so fill material will bond with existing surface.
- C. When sub-grade or existing ground surface to receive fill has a density less than that required for fill, break up ground surface to depth required, pulverize, moisture-condition or aerate soil and recompact to required density.
- D. Place fill material in layers to required elevations for each location listed below.
 1. Under grass, use satisfactory excavated or borrow soil material.
 2. Under walks, use subbase or base material, or satisfactory excavated or borrow soil material.

3.12 MOISTURE CONTROL

- A. Uniformly moisten or aerate subgrade and each subsequent fill or backfill layer before compaction to within 2 percent of optimum moisture content.
- B. Do not place backfill or fill material on surfaces that are muddy, frozen, or contain frost/ice.
- C. Remove and replace, or scarify and air-dry satisfactory soil material that is too wet to compact to specified density.
- D. Stockpile or spread and dry removed wet satisfactory soil material.

3.13 COMPACTION

- A. Place backfill and fill materials in layers not more than 4 inches in loose depth for material compacted by hand-operated tampers.
- B. Place backfill materials evenly on all sides of structures to required elevations. Place

backfill uniformly along the full length of each structure.

- C. Percentage of Maximum Dry Density Requirements: Compact soil to not less than the following percentages of maximum dry density according to ASTM D 1557:
- D. Under structures and pavements, compact the top 12 inches below sub-grade and each layer of backfill or fill material at 95% maximum dry density.
- E. Under structurally support building slabs, place soil or drainage fill material un-compacted between existing subgrade and new required below slab drainage material to create a non-swelling sub-base.
- F. Under walkways, compact the top 6 inches below sub-grade and each layer of backfill or fill material at 95% maximum dry density.
- G. Under lawn or unpaved areas, compact the top 6 inches below sub-grade and each layer of backfill or fill material at 90% maximum dry density.

3.14 GRADING

- A. General: Uniformly grade areas to a smooth surface, free from irregular surface changes. Comply with compaction requirements and grade to cross sections, lines, and elevations indicated. Only granular fills will be allowed beneath walks and slabs-on-grade. Sand is prohibited from use as a fill material.
- B. Provide a smooth transition between existing adjacent grades and new grades.
- C. Cut out soft spots, fill low spots, and trim high spots to conform to required surface tolerances.
- D. Site Grading: Slope grades to direct water away from buildings and to prevent ponding. Finish sub-grades to required elevations within the following tolerances:
 - 1. Lawn or Unpaved Areas: Plus or minus 0.10 foot.
 - 2. Walks: Plus or minus 0.10 foot.

3.15 SUBBASE AND BASE COURSES

- A. Under walks, place sub-base course material on prepared sub-grades. Place base course material over sub-bases.
- B. Compact sub-base and base courses at optimum moisture content to required grades, lines, cross sections and thickness to not less than 95% of ASTM D 4254 relative density.
 - 1. Shape sub-base and base to required elevations and cross-slope grades.
 - 2. When thickness of compacted sub-base or base course is 6 inches or less, place materials in a single layer.

3.16 DRAINAGE FILL

- A. Under slabs-on-grade, place drainage fill course on prepared sub-grade.
 - 1. Compact drainage fill to required cross sections and thickness, compact as directed by the Structural Engineer.
 - 2. Compact drainage fill to required cross sections and thickness.
 - 3. When compacted thickness of drainage fill is 6 inches or less, place materials in a single layer.
 - 4. Drainage fill shall be a washed, evenly graded mixture of crushed stone, or crushed or uncrushed gravel, with 100% passing a 1 1/2" sieve and not more than 5%

passing a No. 4 sieve.

3.17 FIELD QUALITY CONTROL

- A. Testing Agency Services: Allow testing agency to inspect and test each sub-grade and each fill or backfill layer. Do not proceed until test results for previously completed work verify compliance with requirements.
- B. Perform field in-place density tests according to ASTM D 1556 (sand cone method), ASTM D 2167 (rubber balloon method), or ASTM D 2937 (drive cylinder method), as applicable.
- C. Field in-place density tests may also be performed by the nuclear method according to ASTM D 2922, provided that calibration curves are periodically checked and adjusted to correlate to tests performed using ASTM D 1556. With each density calibration check, check the calibration curves furnished with the moisture gages according to ASTM D 3017.
- D. When testing agency reports that sub-grades, fills, or backfills are below specified density, scarify and moisten or aerate, or remove and replace soil to the depth required, re-compact and retest until required density is obtained.
- E. Footing Sub-grade: At footing sub-grades, perform at least one test of each soil stratum to verify design bearing capacities. Subsequent verification and approval of other footing sub-grades may be based on a visual comparison of each sub-grade with related tested strata when acceptable to the Architect.
- F. Paved and Building Slab Areas: At sub-grade and at each compacted fill and backfill layer, perform at least one field in-place density test for every 2,000 sq. ft. or less of paved area or building slab, but in no case fewer than three tests.
- G. Foundation Wall Backfill: In each compacted backfill layer, perform at least one field in-place density test for each 100 feet or less of wall length, but no fewer than two tests along a wall face.

3.18 PROTECTION

- A. Protecting Graded Areas: Protect newly graded areas from traffic, freezing, and erosion. Keep free of trash and debris.
- B. Repair and re-establish grades to specified tolerances where completed or partially completed surfaces become eroded, rutted, settled, or lose compaction due to subsequent construction operations or weather conditions.
- C. Scarify or remove and replace material to depth directed by the Architect; reshape and re-compact at optimum moisture content to the required density.
- D. Settling: Where settling occurs during the Project correction period, remove finished surfacing, backfill with additional approved material, compact, and reconstruct surfacing.
- E. Restore appearance, quality, and condition of finished surfacing to match adjacent work, and eliminate evidence of restoration to the greatest extent possible.

3.19 DISPOSAL OF SURPLUS AND WASTE MATERIALS

- A. Disposal: Remove surplus satisfactory soil and waste material, including unsatisfactory soil, trash, and debris, and legally dispose of it off the Owner's property.

- 1 B. Remove waste material, including unsatisfactory soil, trash, and debris, and legally dispose
- 2 off the Owner's property.
- 3
- 4
- 5
- 6

END OF SECTION 02300

SECTION 02913 LANDSCAPE GRADING

PART 1 – GENERAL

1.1 SUMMARY

- A. Section includes:
 - 1. Final grade topsoil for finish landscaping.
- B. Related Sections:
 - 1. Section 02300 – Earthwork.
 - 2. Section 02928 - Sodding

1.2 SUBMITTALS

- A. Product Data: Manufacturer's specifications and technical data on soil stabilizers.
- B. Certifications: Submit statement certifying location of property from which imported topsoil is proposed to be obtained:
 - 1. Include names and addresses of property owners, depth of topsoil to be stripped, and crops grown during last 2 years.

1.3 QUALITY ASSURANCE

- A. Installer's Qualifications: Firm experienced in installation of systems similar in complexity to those required for this Project.

PART 2 - PRODUCTS

2.1 MATERIALS

- A. Stockpiled Topsoil: ASTM D5268, fertile, friable, natural silty clay loam, surface soil, reasonably free (less than 5 percent of total volume) of subsoil, clay lumps, brush, weeds, and other litter, and free of roots, stumps, stones larger than 3/8 inch, in any dimension, and other extraneous or toxic matter harmful to plant growth, approved by Contractor's testing agency.
 - 1. Acidity range (ph): 5.5 and 7.5.
 - 2. Organic matter content: 4 to 25 percent.
 - 3. Remove particles larger than 3/8 inch in size.
 - 4. Process, clean, and prepare existing topsoil to comply with above specified criteria.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper and timely completion.
 - 1. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protection:
 - 1. Protect trees, shrubs, lawns, other plant growth, and other features indicated on Drawings to remain.
 - 2. Protect bench marks, monuments, existing structures, existing fences, existing roads, existing sidewalks, existing paving, and existing curbs from damage and displacement.
- B. Preparation:
 - 1. Use all means necessary to control dust on and near Work if such dust is caused by performance of the work of this Section, of it resulting from the condition in which Project Site is left by Contractor.

- 16 2. Moisten surfaces as required to prevent dust from being a nuisance to the public,
- 17 neighbors, and concurrent performance of other Work on Project Site.
- 18 3. Identify required lines, levels, contours, and datum.
- 19 4. Identify above and below grade utilities.
- 20 5. Provide and maintain positive surface drainage.
- 21 6. Loosen subgrade not less than 4 inches.
- 22 7. Remove stones measuring over 3/8 inch in any dimension.
- 23 8. Remove sticks, rubbish, and other extraneous matter.

24 3.3 INSTALLATION

- 25 A. Grade Project Site to uniform slopes between points for which finish grades are indicated on
- 26 Drawings, or between such points and existing established grades.
- 27 1. Provide vertical curves or roundings at abrupt changes in slopes.
- 28 2. Grade using topsoil which is relatively dry.
- 29 3. Grade during dry weather.
- 30 B. Remove stone, roots, grass, weeds, debris and foreign matter larger than 3/8 inch in size from
- 31 topsoil.
- 32 C. Fine grade topsoil to eliminate rough or low area.
- 33 D. Manually spread topsoil around trees, building, and paving to prevent damager.
- 34 E. Roll placed topsoil.
- 35 1. Total thickness of topsoil after compaction shall be not less than 6 inches.
- 36 2. Import topsoil as required to achieve required total compacted thickness.
- 37 G. Tolerances:
- 38 1. Top of topsoil: Plus or minus 0.10 foot from grades indicated on Drawings.
- 39

41 **END OF SECTION 02913**

SECTION 02928 SODDING

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Sod
 - 2. Related accessories
- B. Related Sections:
 - 1. Section 02913

1.2 DEFINITIONS

- A. Weeds: Includes bent grass, bermuda grass, bindweed, blackberry, brome grass, canadian thistle, chickweed, crabgrass, cress, dandelion, horsetail, jimsonweed, johnson grass, lambsquarter, morning glory, mustard, nimble will, nutgrass, nut sedge, perennial sorrel, poison ivy, poison oak, quackgrass, rush grass, tansy ragwort, and wild garlic.

1.3 SUBMITTALS

- A. Submit in accordance with Section 01300 unless otherwise indicated.
- B. Quality Control Submittals:
 - 1. Certificates:
 - a. Inspection certificates required by governmental authorities.
 - b. Sod growers certification of grass species, identify source location.
 - c. Manufacturer's certified analysis of fertilizer materials.
 - 2. Address of sod grower.
 - 3. Location of growing field.
 - 4. Planting dates for sod.
 - 5. Nematode assay taken within last 24 months.
 - 6. Fertilizer and chemical application history for sod during past 24 months.
 - 7. Submit plant tissue fertility test results 30 days prior to harvesting of sod.

1.4 QUALITY ASSURANCE

- A. Sod Producer's Qualification: Firm experienced in sod production and harvesting with not less than 5 years' experience, and certified by the state in which Project is located.
- B. Installer's Qualifications: Firm experienced in installation of systems similar in complexity to those required for this Project, plus the following:
 - 1. Acceptable to sod producer.
 - 2. Not less than 3 years' experience with systems.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Packing and Shipping:
 - 1. Deliver fertilizer products in original unopened packaging with legible manufacturer's identification indicating weight, analysis, and name of manufacturer.
 - 2. Time delivery of sod to result in placing of sod within 24 hours after stripping.
 - 3. Do not harvest or transport sod when moisture content may adversely affect sod survival.
 - 4. Where required by law, inspection certificates shall accompany each shipment invoice or order to stock and on arrival.

- 1 B. Storage and Protection: Protect sod from sun, wind, and dehydration prior to installation.
- 2
- 3 1.6 SEQUENCE AND SCHEDULING
- 4
- 5 A. Planting Time: Proceed with, and complete Work of this Section as rapidly as portions of Site
- 6 become available, after planting and other work affecting ground surface has been completed,
- 7 and working within seasonal limitations for sod specified
- 8
- 9 1.7 SPECIAL WARRANTIES
- 10
- 11 A. Contractor shall warranty install system as indicated below, from the Date of Substantial
- 12 Completion against all of the conditions indicated below. When notified in writing from the
- 13 Owner, contractor shall promptly, and without inconvenience and cost to the Owner, correct
- 14 said deficiencies.
- 15 1. Unsatisfactory growth or death of sod: 90 days
- 16
- 17 1.8 MAINTENANCE
- 18
- 19 A. Maintenance Service:
- 20 1. Maintain Work of this Section beginning at time of planting through special warranty
- 21 period
- 22 2. Maintenance shall include, but not be limited to, the following:
- 23 a. Watering
- 24 b. Removal of weeds
- 25 c. Fertilizing
- 26 d. Resodding of defective areas
- 27
- 28 **PART 2 - PRODUCTS**
- 29
- 30 2.1 MATERIALS
- 31
- 32 A. Sod: Nursery grown, TPI approved, strongly rooted sod, not less than 2 years old, free of
- 33 weeds, undesirable native grasses, and soil borne insects, and disease damage.
- 34 1. Machine cut sod to pad thickness of 1 inch, plus or minus ¼ inch, excluding top growth
- 35 and thatch, in accordance with TPI guidelines.
- 36 2. Sod shall be capable of vigorous growth and development when planted.
- 37 3. Provide uniform pad sizes with maximum deviation of 5 percent in either length or width
- 38 a. Roll width: 42 inches, without net.
- 39 4. Sod pads shall be capable of supporting their own weight when suspended vertically
- 40 when firmly grasped by upper 10 percent of pad.
- 41 5. Composition: Turf type fine blade Fescue.
- 42
- 43 B. Fertilizer: Provide fertilizer with percentage of nitrogen required to provide not less than 1 ¾
- 44 pounds of actual nitrogen per 1,000 square feet of lawn area and not less than 3 pounds of
- 45 actual potassium per 1,000 square feet of lawn area, with not less than 4 percent phosphoric
- 46 acid.
- 47 1. Provide nitrogen in form that will be available to lawn during initial period of growth.
- 48 2. Not less than 50 percent of nitrogen shall be organic form.
- 49
- 50 C. Lime: Natural dolomitic limestone containing not less than 85 percent of total carbonates with a
- 51 minimum of 30 percent magnesium carbonates, ground so that not less than 90 percent passes
- 52 a No. 8 sieve, and not less than 20 percent passes a No. 100 sieve.
- 53
- 54 D. Water: Free of substances harmful to plan growth.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verification of Conditions: Examine areas and conditions under which Work is to be performed and identify conditions detrimental to proper and timely completion.
 - 1. Do not install sod over frozen ground.
 - 2. Do not proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination:
 - 1. Coordinate harvesting and planning of sod to prevent exposure of sod to the sun for not more than 30 minutes before covering and moistening.
- B. Harvesting of Sod:
 - 1. Do not harvest and transplant sod when moisture content of sod may adversely effect survival.
 - 2. Protect sod from drying and from contamination during delivery, on-Site storage, and handling.
 - a. Lightly sprinkle sod with water, cover with moist burlap, straw, or other acceptable covering.
 - 1) Provide covering that will allow air to circulate to eliminate heat buildup below covering.
 - b. Protect sod from exposure to wind and direct sunlight until planted.
 - 3. Damaged, dehydrated, or abused sod will not be accepted at Project Site.
 - a. Equip transportation vehicles with temperature control if required by travel distance.
- C. Preparation:
 - 1. Limit preparation to areas which will be immediately sodded.
 - 2. Loosen soil or areas to receive sod to a minimum depth of 4 inches.
 - 3. Remove stones measuring over 3/8 inch in any dimension.
 - 4. Remove sticks, rubbish, and other extraneous matter.
 - 5. Install initial fertilizer in accordance with manufacturer's instructions.
 - a. Install after smooth raking of topsoil and prior to installation of sod, but not more than 48 hours before installation of sod.
 - b. Mix fertilizer thoroughly into upper 2 inches of topsoil.
 - c. Install at a rate to achieve nitrogen/potassium/phosphoric acid specified under PART 2 of this section
 - 6. Install lime at areas scheduled to receive sod, at a rate of 40 pounds per 1000 square feet, or as required by topsoil test results to eliminate soil deficiencies.
 - 7. Dampen dry soil immediately prior to placement of sod.
 - a. Do not create muddy soil condition.

3.3 INSTALLATION

- A. Install sod immediately after delivery to Project Site, and within 24 hours after harvesting.
- B. Install sod to form solid mass with tightly fitted joints with top of grass ½ inch below top of adjacent curbs, sidewalks, drains and existing grass areas.
 - 1. Butt ends and sides of sod strips
 - a. Do not overlay edges.
 - 2. Stagger strips to offset joints in adjacent course not less than 12 inches.
 - 3. Remove excess sod to avoid smothering of adjacent grasses.

- 1 4. On slopes 1:2 and steeper, lay sod perpendicular to slope and secure each row with
- 2 wooden pegs spaced 24 inches on center.
- 3 a. Drive pegs flush with soil portion of sod.
- 4 5. Roll sodded areas to ensure contact with subgrade and to eliminate irregularities.
- 5 C. Water sodded areas immediately after installation, with a fine spray to penetrate subgrade at
- 6 least 4 inches.
- 7 3.4 PROTECTION
- 8 A. Restrict traffic from sodded areas until grass is established.
- 9 **END OF SECTION 02928**

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. Foundation walls.
 - 3. Slabs-on-grade.
 - 4. Sidewalks.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: fly ash and other pozzolans, subject to compliance with requirements.

1.4 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Material Certificates: For each of the following, signed by manufacturers:
 - 1. Cementitious materials.
 - 2. Admixtures.
 - 3. Form materials and form-release agents.
 - 4. Steel reinforcement and accessories.
 - 5. Curing compounds.
 - 6. Bonding agents.
 - 7. Adhesives.
 - 8. Vapor retarders.

9. Joint-filler strips.
10. Repair materials.

D. Material Test Reports: For the following, from a qualified testing agency, indicating compliance with requirements:

1. Aggregates.

E. Floor surface flatness and levelness measurements indicating compliance with specified tolerances.

F. Field quality-control reports.

G. Minutes of pre-installation conference.

1.6 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified 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. Testing Agency Qualifications: An independent agency, acceptable to authorities having jurisdiction, qualified according to ASTM C 1077 and ASTM E 329 for testing indicated.

D. 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.

E. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:

1. ACI 301, "Specifications for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

G. Concrete Testing Service: Engage a qualified independent testing agency to perform material evaluation tests and to design concrete mixtures.

H. Pre-installation Conference: Conduct conference at Project site.

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
 - a. Contractor's superintendent.
 - b. Independent testing agency responsible for concrete design mixtures.
 - c. Ready-mix concrete manufacturer.
 - d. Concrete subcontractor.
 - e. Special concrete finish subcontractor.
2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips,

forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Steel Reinforcement: Deliver, store, and handle steel reinforcement to prevent bending and damage.

PART 2 - PRODUCTS

2.1 FORM-FACING MATERIALS

- A. Smooth-Formed Finished Concrete: Form-facing panels that will provide continuous, true, and smooth concrete surfaces. Furnish in largest practicable sizes to minimize number of joints.
 - 1. Plywood, metal, or other approved panel materials.
 - 2. Exterior-grade plywood panels, suitable for concrete forms, complying with DOC PS 1
- B. Form-Release Agent: Commercially formulated form-release agent that will not bond with, stain, or adversely affect concrete surfaces and will not impair subsequent treatments of concrete surfaces.
 - 1. Formulate form-release agent with rust inhibitor for steel form-facing materials.
- C. Form Ties: Factory-fabricated, removable or snap-off metal or glass-fiber-reinforced plastic form ties designed to resist lateral pressure of fresh concrete on forms and to prevent spalling of concrete on removal.
 - 1. Furnish units that will leave no corrodible metal closer than 1 inch (25 mm) to the plane of exposed concrete surface.
 - 2. Furnish ties that, when removed, will leave holes no larger than 1 inch (25 mm) in diameter in concrete surface.
 - 3. Furnish ties with integral water-barrier plates to walls indicated to receive dampproofing or waterproofing.

2.2 STEEL REINFORCEMENT

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), deformed.
- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.
- D. Plain-Steel Wire: ASTM A 82/A 82M, as drawn.
- E. Plain-Steel Welded Wire Reinforcement: ASTM A 185/A 185M, plain, fabricated from as-drawn steel wire into flat sheets.

2.3 REINFORCEMENT ACCESSORIES

- A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60 (Grade 420), 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.

2.4 CONCRETE MATERIALS

- A. Cementitious Material: Use the following cementitious materials, of the same type, brand, and source, throughout Project:
 - 1. Portland Cement: ASTM C 150, Type I/II. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
- B. Normal-Weight Aggregates: ASTM C 33, Class 3M 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: 1 inch (25 mm) nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. Air-Entraining Admixture: ASTM C 260.
- B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.
 - 1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
 - 2. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
 - 3. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

2.6 VAPOR RETARDERS

- A. Sheet Vapor Retarder: ASTM E 1745, Class A. Include manufacturer's recommended adhesive or pressure-sensitive tape.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Carlisle Coatings & Waterproofing, Inc.; Blackline 400.
 - b. Grace Construction Products, W. R. Grace & Co.; Florprufe 120.
 - c. Meadows, W. R., Inc.; Perminator 15 mil.
 - d. Raven Industries Inc.; Vapor Block 15.
 - e. Stego Industries, LLC; Stego Wrap 15 mil Class A.
- B. Granular Fill: Clean mixture of crushed stone or crushed or uncrushed gravel; ASTM D 448, Size 57, with 100 percent passing a 1-1/2-inch (37.5-mm) sieve and 0 to 5 percent passing a No. 8 (2.36-mm) sieve.

2.7 CURING MATERIALS

- A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. BASF Construction Chemicals - Building Systems; Confilm.
 - b. ChemMasters; SprayFilm.
 - c. Conspec by Dayton Superior; Aquafilm.
 - d. Euclid Chemical Company (The), an RPM company; Eucobar.
 - e. Meadows, W. R., Inc.; EVAPRE.
 - f. Sika Corporation; SikaFilm.
 - g. SpecChem, LLC; Spec Film.

- 1
2 B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing
3 approximately 9 oz./sq. yd. (305 g/sq. m) when dry.
4
5 C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
6
7 D. Water: Potable.
8
9 E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B,
10 dissipating.
11 1. Products: Subject to compliance with requirements, available products that may be
12 incorporated into the Work include, but are not limited to, the following:
13
14 a. BASF Construction Chemicals - Building Systems; Kure 200.
15 b. ChemMasters; Safe-Cure Clear.
16 c. Conspc by Dayton Superior; W.B. Resin Cure.
17 d. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE
18 WB 30C.
19 e. Meadows, W. R., Inc.; 1100-CLEAR.
20 f. SpecChem, LLC; Spec Rez Clear.
21 g. Symons by Dayton Superior; Resi-Chem Clear.
22

23 2.8 RELATED MATERIALS

- 24
25 A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber.
26
27 B. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene
28 butadiene.
29
30 C. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing
31 and bonding to damp surfaces, of class suitable for application temperature and of grade to suit
32 requirements, and as follows:
33 1. Types I and II, non-load bearing, for bonding hardened or freshly mixed concrete to
34 hardened concrete.
35
36 D. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch (0.85 mm) thick,
37 with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of
38 concrete or debris.
39

40 2.9 REPAIR MATERIALS

- 41
42 A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be
43 applied in thicknesses from 1/8 inch (3.2 mm) and that can be feathered at edges to match
44 adjacent floor elevations.
45 1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement
46 as defined in ASTM C 219.
47 2. Primer: Product of underlayment manufacturer recommended for substrate, conditions,
48 and application.
49 3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as
50 recommended by underlayment manufacturer.
51 4. Compressive Strength: Not less than 4100 psi (29 MPa) at 28 days when tested
52 according to ASTM C 109/C 109M.
53
54 B. Repair Overlayment: Cement-based, polymer-modified, self-leveling product that can be
55 applied in thicknesses from 1/4 inch (6.4 mm) and that can be filled in over a scarified surface to
56 match adjacent floor elevations.

1. Cement Binder: ASTM C 150, portland cement or hydraulic or blended hydraulic cement as defined in ASTM C 219.
2. Primer: Product of topping manufacturer recommended for substrate, conditions, and application.
3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch (3.2 to 6 mm) or coarse sand as recommended by topping manufacturer.
4. Compressive Strength: Not less than 5000 psi (34.5 MPa) at 28 days when tested according to ASTM C 109/C 109M.

2.10 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: 15 percent.
- C. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- D. Admixtures: Use admixtures according to manufacturer's written instructions.
 1. Use water-reducing high-range 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.

2.11 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings and Foundation Walls: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 3500 psi (24.1 MPa) at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.50.
 3. Slump Limit: 4 inches (100 mm) 8 inches (200 mm) for concrete with verified slump of 2 to 4 inches (50 to 100 mm) before adding high-range water-reducing admixture or plasticizing admixture, plus or minus 1 inch (25 mm).
- B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 4000 psi (27.6 MPa) at 28 days.
 2. Maximum Water-Cementitious Materials Ratio: 0.46.
 3. Minimum Cementitious Materials Content: 540 lb/cu. yd. (321 kg/cu. m).
 4. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
 5. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
- C. Exterior Concrete: Proportion normal-weight concrete mixture as follows:
 1. Minimum Compressive Strength: 4500 psi (31 MPa) at 28 days.
 2. Minimum Cementitious Materials Content: 560 lb/cu.yd. (333 kg/cu. m).
 3. Maximum Water-Cementitious Materials Content: 0.42.
 4. Slump Limit: 4 inches (100 mm), plus or minus 1 inch (25 mm).
 5. Air Content: 5 percent to 7 percent.

2.12 FABRICATING REINFORCEMENT

- A. Fabricate steel reinforcement according to CRSI's "Manual of Standard Practice."

2.13 CONCRETE MIXING

- A. Ready-Mixed Concrete: Measure, batch, mix, and deliver concrete according to ASTM C 94/C 94M, and furnish batch ticket information.
1. When air temperature is between 85 and 90 deg F (30 and 32 deg C), reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F (32 deg C), reduce mixing and delivery time to 60 minutes.

PART 3 - EXECUTION

3.1 FORMWORK

- A. Design, erect, shore, brace, and maintain formwork, according to ACI 301, to support vertical, lateral, static, and dynamic loads, and construction loads that might be applied, until structure can support such loads.
- B. Construct formwork so concrete members and structures are of size, shape, alignment, elevation, and position indicated, within tolerance limits of ACI 117.
- C. Limit concrete surface irregularities, designated by ACI 347 as abrupt or gradual, as follows:
1. Class A, 1/8 inch (3.2 mm) for smooth-formed finished surfaces.
 2. Class B, 1/4 inch (6 mm) for rough-formed finished surfaces.
- D. Construct forms tight enough to prevent loss of concrete mortar.
- E. Fabricate forms for easy removal without hammering or prying against concrete surfaces. Provide crush or wrecking plates where stripping may damage cast concrete surfaces. Provide top forms for inclined surfaces steeper than 1.5 horizontal to 1 vertical.
1. Install keyways, reglets, recesses, and the like, for easy removal.
 2. Do not use rust-stained steel form-facing material.
- F. Set edge forms, bulkheads, and intermediate screed strips for slabs to achieve required elevations and slopes in finished concrete surfaces. Provide and secure units to support screed strips; use strike-off templates or compacting-type screeds.
- G. Provide temporary openings for cleanouts and inspection ports where interior area of formwork is inaccessible. Close openings with panels tightly fitted to forms and securely braced to prevent loss of concrete mortar. Locate temporary openings in forms at inconspicuous locations.
- H. Chamfer exterior corners and edges of permanently exposed concrete.
- I. Form openings, chases, offsets, sinkages, keyways, reglets, blocking, screeds, and bulkheads required in the Work. Determine sizes and locations from trades providing such items.
- J. Clean forms and adjacent surfaces to receive concrete. Remove chips, wood, sawdust, dirt, and other debris just before placing concrete.
- K. Retighten forms and bracing before placing concrete, as required, to prevent mortar leaks and maintain proper alignment.

- 1 L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written
2 instructions, before placing reinforcement.
3

4 3.2 EMBEDDED ITEMS 5

- 6 A. Place and secure anchorage devices and other embedded items required for adjoining work
7 that is attached to or supported by cast-in-place concrete. Use setting drawings, templates,
8 diagrams, instructions, and directions furnished with items to be embedded.
9 1. Install anchor rods, accurately located, to elevations required and complying with
10 tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and
11 Bridges."
12 2. Install reglets to receive waterproofing and to receive through-wall flashings in outer face
13 of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and
14 other conditions.
15 3. Install dovetail anchor slots in concrete structures as indicated.
16

17 3.3 REMOVING AND REUSING FORMS 18

- 19 A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does
20 not support weight of concrete may be removed after cumulatively curing at not less than 50
21 deg F (10 deg C) for 24 hours after placing concrete. Concrete has to be hard enough to not
22 be damaged by form-removal operations and curing and protection operations need to be
23 maintained.
24
25 B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or
26 otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply
27 new form-release agent.
28
29 C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints.
30 Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete
31 surfaces unless approved by Architect.
32

33 3.4 VAPOR RETARDERS 34

- 35 A. Sheet Vapor Retarders: Place, protect, and repair sheet vapor retarder according to
36 ASTM E 1643 and manufacturer's written instructions.
37 1. Lap joints 6 inches (150 mm) and seal with manufacturer's recommended tape.
38

39 3.5 STEEL REINFORCEMENT 40

- 41 A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
42 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before
43 placing concrete.
44
45 B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that
46 would reduce bond to concrete.
47
48 C. Accurately position, support, and secure reinforcement against displacement. Locate and
49 support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld
50 crossing reinforcing bars.
51 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
52
53 D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.
54
55 E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to
56 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.

3.6 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. Form keyed joints as indicated. Embed keys at least 1-1/2 inches (38 mm) into concrete.
 - 3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.
 - 4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.
 - 5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.
 - 6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
 - 7. Use epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. 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.

3.7 WATERSTOPS

- A. Flexible Waterstops: Install in construction joints and at other joints indicated to form a continuous diaphragm. Install in longest lengths practicable. Support and protect exposed waterstops during progress of the Work. Field fabricate joints in waterstops according to manufacturer's written instructions.
- B. Self-Expanding Strip Waterstops: Install in construction joints and at other locations indicated, according to manufacturer's written instructions, adhesive bonding, mechanically fastening, and firmly pressing into place. Install in longest lengths practicable.

3.8 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 (150 mm) 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 (4.4 deg C) 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.

G. Hot-Weather Placement: Comply with ACI 301 and as follows:

1. Maintain concrete temperature below 90 deg F (32 deg C) 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. Using liquid nitrogen to cool concrete is Contractor's option.
2. Fog-spray forms, steel reinforcement, and subgrade just before placing concrete. Keep subgrade uniformly moist without standing water, soft spots, or dry areas.

3.9 FINISHING FORMED SURFACES

A. Smooth-Formed Finish: As-cast concrete texture imparted by form-facing material, arranged in an orderly and symmetrical manner with a minimum of seams. Repair and patch tie holes and defects. Remove fins and other projections that exceed specified limits on formed-surface irregularities.

1. Apply to concrete surfaces exposed to public view, to be covered with a coating or covering material applied directly to concrete.

3.10 FINISHING FLOORS AND SLABS

A. General: Comply with ACI 302.1R recommendations for screeding, re-straightening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.

B. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots.

Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish.

C. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten 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 exposed to view or to be covered with resilient flooring, carpet, ceramic or quarry tile set over a cleavage membrane, paint, or another thin-film-finish coating system.

2. Finish and measure surface so gap at any point between concrete surface and an unlevelled, freestanding, 10-ft.- (3.05-m-) long straightedge resting on two high spots and placed anywhere on the surface does not exceed 1/4 inch (6 mm).

D. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces where ceramic or quarry tile is to be installed by either thickset or thin-set method. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness and levelness tolerances for trowel-finished floor surfaces.

E. Broom Finish: Apply a broom finish to exterior concrete platforms, steps, ramps, and elsewhere as indicated.

1. Immediately after float finishing, slightly roughen trafficked surface by brooming with fiber-bristle broom perpendicular to main traffic route. Coordinate required final finish with Architect before application.

3.11 MISCELLANEOUS CONCRETE ITEMS

A. Filling In: Fill in holes and openings left in concrete structures after work of other trades is in place unless otherwise indicated. Mix, place, and cure concrete, as specified, to blend with in-place construction. Provide other miscellaneous concrete filling indicated or required to complete the Work.

B. Curbs: Provide monolithic finish to interior curbs by stripping forms while concrete is still green and by steel-troweling surfaces to a hard, dense finish with corners, intersections, and terminations slightly rounded.

C. Equipment Bases and Foundations: Provide machine and equipment bases and foundations as shown on Drawings. Set anchor bolts for machines and equipment at correct elevations, complying with diagrams or templates from manufacturer furnishing machines and equipment.

3.12 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 (1 kg/sq. m 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.

- 1
2 D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed
3 surfaces, including floors and slabs, concrete floor toppings, and other surfaces.
4
5 E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
6 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the
7 following materials:
8 a. Water.
9 b. Continuous water-fog spray.
10 c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete
11 surfaces and edges with 12-inch (300-mm) lap over adjacent absorptive covers.
12 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover
13 for curing concrete, placed in widest practicable width, with sides and ends lapped at
14 least 12 inches (300 mm), and sealed by waterproof tape or adhesive. Cure for not less
15 than seven days. Immediately repair any holes or tears during curing period using cover
16 material and waterproof tape.
17 a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to
18 receive floor coverings.
19 b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to
20 receive penetrating liquid floor treatments.
21 c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining
22 cover or a curing compound that the manufacturer certifies will not interfere with
23 bonding of floor covering used on Project.
24 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller
25 according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall
26 within three hours after initial application. Maintain continuity of coating and repair
27 damage during curing period.
28 a. Removal: After curing period has elapsed, remove curing compound without
29 damaging concrete surfaces by method recommended by curing compound
30 manufacturer unless manufacturer certifies curing compound will not interfere with
31 bonding of floor covering used on Project.
32 4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a
33 continuous operation by power spray or roller according to manufacturer's written
34 instructions. Recoat areas subjected to heavy rainfall within three hours after initial
35 application. Repeat process 24 hours later and apply a second coat. Maintain continuity
36 of coating and repair damage during curing period.
37

38 3.13 JOINT FILLING

- 39
40 A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
41 1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until
42 construction traffic has permanently ceased.
43
44 B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact
45 faces of joint clean and dry.
46

47 3.14 CONCRETE SURFACE REPAIRS

- 48
49 A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove
50 and replace concrete that cannot be repaired and patched to Architect's approval.
51
52 B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two
53 and one-half parts fine aggregate passing a No. 16 (1.18-mm) sieve, using only enough water
54 for handling and placing.
55

- 1 C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks,
2 spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and
3 stains and other discolorations that cannot be removed by cleaning.
- 4 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than
5 1/2 inch (13 mm) in any dimension to solid concrete. Limit cut depth to 3/4 inch (19 mm).
6 Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and
7 brush-coat holes and voids with bonding agent. Fill and compact with patching mortar
8 before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs
9 secured in place with bonding agent.
 - 10 2. Repair defects on surfaces exposed to view by blending white portland cement and
11 standard portland cement so that, when dry, patching mortar will match surrounding
12 color. Patch a test area at inconspicuous locations to verify mixture and color match
13 before proceeding with patching. Compact mortar in place and strike off slightly higher
14 than surrounding surface.
 - 15 3. Repair defects on concealed formed surfaces that affect concrete's durability and
16 structural performance as determined by Architect.
- 17
- 18 D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and
19 verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces
20 sloped to drain for trueness of slope and smoothness; use a sloped template.
- 21 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts,
22 honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch (0.25 mm) wide or
23 that penetrate to reinforcement or completely through unreinforced sections regardless of
24 width, and other objectionable conditions.
 - 25 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 26 3. Correct localized low areas during or immediately after completing surface finishing
27 operations by cutting out low areas and replacing with patching mortar. Finish repaired
28 areas to blend into adjacent concrete.
 - 29 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment.
30 Prepare, mix, and apply repair underlayment and primer according to manufacturer's
31 written instructions to produce a smooth, uniform, plane, and level surface. Feather
32 edges to match adjacent floor elevations.
 - 33 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low
34 areas to ensure a minimum repair topping depth of 1/4 inch (6 mm) to match adjacent
35 floor elevations. Prepare, mix, and apply repair topping and primer according to
36 manufacturer's written instructions to produce a smooth, uniform, plane, and level
37 surface.
 - 38 6. Repair defective areas, except random cracks and single holes 1 inch (25 mm) or less in
39 diameter, by cutting out and replacing with fresh concrete. Remove defective areas with
40 clean, square cuts and expose steel reinforcement with at least a 3/4-inch (19-mm)
41 clearance all around. Dampen concrete surfaces in contact with patching concrete and
42 apply bonding agent. Mix patching concrete of same materials and mixture as original
43 concrete except without coarse aggregate. Place, compact, and finish to blend with
44 adjacent finished concrete. Cure in same manner as adjacent concrete.
 - 45 7. Repair random cracks and single holes 1 inch (25 mm) or less in diameter with patching
46 mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt,
47 and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place
48 patching mortar before bonding agent has dried. Compact patching mortar and finish to
49 match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- 50
- 51 E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and
52 patching mortar.
- 53
- 54 F. Repair materials and installation not specified above may be used, subject to Architect's
55 approval.
- 56

3.15 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.
- B. Testing and Inspecting: Engage a qualified testing and inspecting agency to perform tests and inspections and to submit reports.
- C. Inspections:
1. Steel reinforcement placement.
 2. Anchor bolts.
 3. Verification of use of required design mixture.
 4. Concrete placement, including conveying and depositing.
 5. Curing procedures and maintenance of curing temperature.
- D. Concrete Tests: Testing of composite samples of fresh concrete obtained according to ASTM C 172 shall be performed according to the following requirements:
1. Testing Frequency: Obtain one composite sample for each day's pour of each concrete mixture exceeding 5 cu. yd. (4 cu. m), but less than 25 cu. yd. (19 cu. m), plus one set for each additional 50 cu. yd. (38 cu. m) or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. (76 cu. m) or fraction thereof of each concrete mixture placed each day.
 - a. When frequency of testing will provide fewer than five compressive-strength tests for each concrete mixture, testing shall be conducted from at least five randomly selected batches or from each batch if fewer than five are used.
 3. Slump: ASTM C 143/C 143M; one test at point of placement for each composite sample, but not less than one test for each day's pour of each concrete mixture. Perform additional tests when concrete consistency appears to change.
 4. Air Content: ASTM C 231, pressure method, for normal-weight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 5. Concrete Temperature: ASTM C 1064/C 1064M; one test hourly when air temperature is 40 deg F (4.4 deg C) and below and when 80 deg F (27 deg C) and above, and one test for each composite sample.
 6. Unit Weight: ASTM C 567, fresh unit weight of structural lightweight concrete; one test for each composite sample, but not less than one test for each day's pour of each concrete mixture.
 7. Compression Test Specimens: ASTM C 31/C 31M.
 - a. Cast and laboratory cure two sets of two standard cylinder specimens for each composite sample.
 - b. Cast and field cure two sets of two standard cylinder specimens for each composite sample.
 8. Compressive-Strength Tests: ASTM C 39/C 39M; test one set of two laboratory-cured specimens at 7 days and one set of two specimens at 28 days.
 - a. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
 - b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.
 9. When strength of field-cured cylinders is less than 85 percent of companion laboratory-cured cylinders, Contractor shall evaluate operations and provide corrective procedures for protecting and curing in-place concrete.
 10. Strength of each concrete mixture will be satisfactory if every average of any three consecutive compressive-strength tests equals or exceeds specified compressive strength and no compressive-strength test value falls below specified compressive strength by more than 500 psi (3.4 MPa).

11. Test results shall be reported in writing to Architect, concrete manufacturer, and Contractor within 48 hours of testing. Reports of compressive-strength tests shall contain Project identification name and number, date of concrete placement, name of concrete testing and inspecting agency, location of concrete batch in Work, design compressive strength at 28 days, concrete mixture proportions and materials, compressive breaking strength, and type of break for both 7- and 28-day tests.
12. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.
13. Additional Tests: Testing and inspecting agency shall make additional tests of concrete when test results indicate that slump, air entrainment, compressive strengths, or other requirements have not been met, as directed by Architect. Testing and inspecting agency may conduct tests to determine adequacy of concrete by cored cylinders complying with ASTM C 42/C 42M or by other methods as directed by Architect.
14. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
15. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 03300

SECTION 03541 - HYDRAULIC CEMENT UNDERLAYMENT

PART 1 GENERAL

1.1 SUMMARY

- A. Section Includes: This section specifies hydraulic cement based self-leveling liquid compound for filling, patching, smoothing and leveling interior substrates. Coordinate locations on architectural and structural drawings.
- B. Related Requirements:
 - 1. Section 09650 – Resilient Flooring.

1.2 REFERENCES

- A. Definitions:
 - 1. Friable: Substrate material easily crumbled or pulverized.
- B. Reference Standards:
 - 1. ASTM International (ASTM).
 - a. **ASTM C109/C109M** Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2 in. or [50 mm] Cube Specimens).
 - b. **ASTM C136/C136M** Standard Test Method for Sieve Analysis of Fine and Coarse Aggregates.
 - c. **ASTM C191** Standard Test Method for Time of Setting of Hydraulic Cement by Vicat Needle.
 - d. **ASTM C348** Standard Test Method for Flexural Strength of Hydraulic-Cement Mortars.
 - e. **ASTM C1583/C1583M** Standard Test Method for Tensile Strength of Concrete Surfaces and the Bond Strength or Tensile Strength of Concrete Repair and Overlay Materials by Direct Tension (Pull-off Method).
 - f. **ASTM D4060 Standard Test Method for Abrasion Resistance of Organic Coatings by the Taber Abraser.**
 - g. **ASTM E84** Standard Test Method for Surface Burning Characteristics of Building Materials.

1.3 SUBMITTALS

- A. Product Data: Manufacturer's standard specifications and descriptive literature, including:
 - 1. Product characteristics.
 - 2. Performance criteria.
 - 3. Safety Data Sheets (SDS).
- B. Manufacturer's written instructions, including:
 - 1. Delivery, storage and handling recommendations.
 - 2. Preparation and application recommendations.
- C. Test Reports: Certified test reports showing compliance with specified performance characteristics and physical properties.
- D. Certificates: Product certificates signed by manufacturer certifying materials comply with specified performance characteristics and criteria and physical requirements.
- E. Manufacturer's Field Reports: Submit manufacturer's field reports within 3 days of each manufacturer representative's site visit and inspection.
- F. Installer's Experience: Submit verification of evidence of work similar to the work of this section.
- G. Warranty: Fully executed, issued in Owner's name, and registered with manufacturer, including:
 - 1. Manufacturer's 10 year warranty, from date of substantial completion, covering defects in materials.

1 1.4 QUALITY ASSURANCE

- 2 A. Installer: Experienced in performing work similar to work of this section.

3 1.5 DELIVERY, STORAGE & HANDLING

- 4 A. Deliver materials in accordance with manufacturer's written instructions.
- 5 1. Deliver materials in manufacturer's original, unopened, undamaged containers with
- 6 identification labels intact and product name and manufacturer clearly visible and sized to suit
- 7 project.
- 8 B. Store materials protected from exposure to harmful environmental conditions, clean, dry,
- 9 frost-free and at recommended temperature and humidity levels.
- 10 1. Do not store or apply materials at temperatures lower than 41 degrees F.

11 1.6 EXISTING CONDITIONS

- 12 A. Apply self-leveling underlayment only when:
- 13 1. Substrate temperature is greater than 41 degrees F.
- 14 2. Grinding has been completed.
- 15 3. Primer has been applied.
- 16 4. Cracks have been properly treated and repaired.

17 1.7 WARRANTY

- 18 A. Manufacturer's Warranty: Manufacturer's standard comprehensive project warranty document
- 19 executed by authorized company official.
- 20 B. Project Warranty: Submit, for Owner's acceptance, manufacturer's standard comprehensive
- 21 warranty document executed by authorized company official.
- 22 1. Project warranty is in addition to and not intended to limit other rights Owner may have under
- 23 Contract Conditions.

24 **PART 2 PRODUCTS**

25 2.1 MANUFACTURER

- 26 A. Schönox HPS North America, Inc.; 511 Wilhite Street, Florence, AL 35630; Phone: (855) 391-2649,
- 27 (256) 246-0345; Fax: (256) 246-0346; Email: info@hpsubfloors.com; Website: http://hpsubfloors.com.
- 28 1. Schonox ZM.
- 29 2. Schonox SL for featheredge where required.
- 30 3. See accessories for additional products required.

31 2.2 PERFORMANCE REQUIREMENTS

- 32 A. Compressive Strength: To ASTM C109, 5800 psi at 28 days for ZM and 3700 psi for SL
- 33 B. Flexural Strength: To ASTM C348, 1300 psi at 28 days for ZM and SL.
- 34 C. Tensile Strength: To ASTM C1583, 400 psi after 3 days.:
- 35 1. Initial Set: approximately 60 minutes at 70 degrees F.
- 36 2. Final Set: approximately 70 minutes at 70 degrees F and 20 minutes for SL.
- 37 3. Foot-traffic Ready: 2hours minimum.
- 38 D. Covering Time: 24 to 48 hours minimum with up to ¼ to 3/8 inch layer thickness.
- 39 E. Fire Burning Characteristics to ASTM E84:
- 40 1. Flame spread: 0.
- 41 2. Smoke developed: 0.
- 42 F. VOC: 0 g/l to SCAQMD Rule 1113.

2.3 DESCRIPTION

- A. Hydraulic cement based self-leveling compound for filling, smoothing, and leveling interior substrates.

2.4 MATERIALS

- A. Underlayment system: Interior use hydraulic cement based self-leveling, low VOC, underlayment [capable of permitting feathered edges on sloped substrates].
 - 1. Coverage: 200 square feet per 10 lbs bag when applied as true featheredge 60 – 70 square feet per 55 lbs bag at 1/8 inch thickness in depth.
 - 2. Layer thickness without aggregates 1/6 to 3/8 inches.
 - 3. Layer thickness with aggregates: 1/6 to 1 inches.
 - 4. Acceptable Material: HPS North America, Inc., Schönox ZM and Schönox SL
- B. Primer: In accordance with manufacturer's written recommendations and to SCAQMD Rule 1113.

2.5 ACCESSORIES

- A. Reinforcing Mat: Multiaxial glass fiber fabric.
 - 1. Acceptable material: HPS North America, Inc., Schönox Renotex.
- B. Repair Compound: In accordance with manufacturer's written recommendations.
 - 1. Acceptable Material: HPS North America, Inc., Schönox Repair Compound.
- C. Residual Moisture Mitigation: Moisture suppressor in accordance with manufacturer's written recommendations.
 - 1. Ensure moisture suppressor meets requirements of SCAQMD Rule 1113.
- D. Sand: Fine sand aggregate to ASTM C136/C136M.
- E. Crack Repair: Schonox PGH, prep and use crack repair compound at all identified joints.

PART 3 EXECUTION

3.1 INSTALLER

- A. Use only installers who have training and experience of work similar to the work of this section.

3.2 EXAMINATION

- A. Verification of Conditions: Verify that conditions of substrate previously installed under other Sections or Contracts are acceptable for underlayment application in accordance with manufacturer's written recommendations.
 - 1. Ensure substrate is smooth, sound, clean and free of contaminants which may hinder adhesion.
 - 2. Visually inspect substrate in presence of Consultant.
 - 3. Inform Consultant of unacceptable conditions immediately upon discovery.
 - 4. Proceed with installation only after unacceptable conditions have been remedied and after receipt of written approval to proceed from Consultant.
 - 5. Starting application of hydraulic cement underlayment implies substrate conditions are acceptable for Work of this Section.

3.3 PREPARATION

- A. Mechanically remove friable substrate materials and repair areas to smooth finish using repair compound and methods in accordance with manufacturer's written recommendations.
- B. Mitigate moisture using residual moisture suppressor and methods in accordance with manufacturer's written recommendations.

3.4 MIXING

- A. Mix each 55 lbs bag with 6.6 to 6.8 quarts of water.

1. Mix in accordance with manufacturer's written recommendations.
 - a. Do not over water.
2. Mix thoroughly for 3 minutes minimum using heavy duty drill mixer.
 - a. Add aggregates in accordance with manufacturer's written recommendations.
 - b. Mix thoroughly for 3 minutes minimum using heavy duty drill mixer.
 - c. Use mixture within 15 minutes of mixing.

3.5 APPLICATION

- A. Prime substrate in accordance with manufacturer's written recommendations.
- B. Pour self-leveling underlayment onto substrate and spread using smoothing trowel.
- C. Prime first layer only after it has reached final set and only when second layer is required.
 1. Use primer and methods in accordance with manufacturer's written recommendations.
 2. Pour second layer over primed first layer and spread using smoothing trowel.
 3. Ensure second layer does not exceed thickness of first layer.
- D. Ensure surfaces are even and level using pin leveler or spike roller.
- E. Prep and fill all identified cracks with PGH compound.

3.6 FIELD QUALITY CONTROL

- A. Manufacturer's Services:
 1. Have manufacturer review work involved in handling, application, protection, and cleaning of hydraulic cement underlayment and submit written reports in acceptable format to verify compliance of Work with Contract conditions.
 2. Manufacturer's Field Services: Provide manufacturer's field services consisting of product use recommendations and periodic site visits for product installation review in accordance with manufacturer's instructions.
 3. Schedule site visits to review work at stages listed:
 - a. After delivery and storage of hydraulic cement underlayment, and when preparatory work on which Work of this Section depends is complete, but before application begins.
 - b. During progress of work.
 - c. Upon completion of Work, after cleaning is carried out.

3.7 CLEANING

- A. Immediately clean tools in water.
 1. Leave work area clean at end of each day.
- B. Upon completion, remove surplus materials, rubbish, tools and equipment.

3.8 PROTECTION

- A. Protect applied hydraulic cement underlayment from damage during construction.
 1. Place temporary wood planking over finished hydraulic cement underlayment work at traffic areas.
- B. Repair or replace adjacent materials damaged by application of hydraulic cement underlayment.

END OF SECTION 03541

1 **SECTION 04200 - UNIT MASONRY**

2
3 **PART 1 - GENERAL**

4
5 1.1 RELATED DOCUMENTS

- 6
7 A. Drawings and general provisions of the Contract, including General and Supplementary
8 Conditions and Division 1 Specification Sections, apply to this Section.
9

10 1.2 SUMMARY

- 11
12 A. This Section includes the following:
13 1. Concrete unit masonry.
14 2. Reinforced unit masonry.
15 3. Mortar and Grout.
16 6. Steel reinforcing bars
17 7. Masonry joint reinforcement.
18 8. Miscellaneous masonry accessories.
19 9. Masonry waste disposal.
20
21 B. Related Sections: The following Sections contain requirements that relate to this Section:
22 1. Division 7 Section "Joint Sealants" for sealing expansion and lintel joints.
23
24 C. Products installed but not furnished under this Section include the following:
25 1. Wood nailers and blocking built into unit masonry specified in Division 6 Section
26 "Rough Carpentry."
27 2. Hollow metal frames in unit masonry openings specified in Division 8 Section
28 "Steel Doors and Frames."
29

30 1.3 PERFORMANCE REQUIREMENTS

- 31
32 A. Provide unit masonry developing the installed 28 day compressive strengths (f'm) below.
33 1. For Concrete Unit Masonry: f'm = 1500 psi, based on net area.
34

35 1.4 SUBMITTALS

- 36
37 A. General: Submit each item in this Article according to the Conditions of the Contract and
38 Division 1 Specification Sections.
39
40 B. Product data for each manufactured product specified.
41
42 C. Shop drawings for reinforcing, detailing fabrication, bending, and placement of unit
43 masonry reinforcing bars. Comply with ACI 315 "Details and Detailing of Concrete
44 Reinforcement". Include fabricated flashing for corner units, end-dams and other
45 applications.
46
47 D. Material certificates for the following, signed by manufacturer and Contractor, certifying
48 that each material complies with requirements.
49 1. Each different cement product required for mortar and grout, including name of
50 manufacturer, brand, type, and weight slips at time of delivery.
51 2. Each material and grade indicated for reinforcing bars.
52 3. Each type and size of joint reinforcement.
53 4. Each type and size of anchors, ties, and metal accessories.
54 5. Mix Designs: For each type of mortar and grout. Include description of type and
55 proportions of ingredients.

- a) Include test reports for mortar mixes required to comply with property specification. Test according to ASTM C 109/C 109M for compressive strength, ASTM C 1506 for water retention, and ASTM C 91 for air content.
 - b) Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
6. Statement of Compressive Strength of Masonry: For each combination of masonry unit type and mortar type, provide statement of average net-area compressive strength of masonry units, mortar type, and resulting net-area compressive strength of masonry determined according to Tables 1 and 2 in ACI 530.1/ASCE 6/TMS 602.

1.5 QUALITY ASSURANCE

- A. Contractor shall employ and pay a qualified professional engineer to provide a survey and inspection of foundations for compliance with dimensional tolerances.
- B. Fire-Resistance Ratings: Where indicated, provide materials and construction identical to those of assemblies with fire resistance ratings determined per ASTM E 119 by a testing and inspecting agency, by equivalent concrete masonry thickness, or by another means, as acceptable to authorities having jurisdiction.
- C. Single-Source Responsibility for Masonry Units: Obtain exposed masonry units of a uniform texture and color, or a uniform blend within the ranges accepted for these characteristics, from one source and by a single manufacturer for each different product required.
- D. Single-Source Responsibility for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from one manufacturer for each cementitious component and from one source or producer for each aggregate.
- E. Pre-installation Conference: Conduct conference at Project site, after the mock-up has been completed and to comply with requirements of Division 1 Section "Project Meetings."

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms, under cover, and in a dry location to prevent their deterioration or damage due to moisture, temperature changes, contaminants, corrosion, and other causes. If units become wet, do not install until they are in an air-dried condition.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.7 PROJECT CONDITIONS

- A. Protection of Masonry: During erection, cover tops of walls, projections, and sills with waterproof sheeting at end of each day's work. Cover partially completed masonry when construction is not in progress.
 1. Extend cover a minimum of 24 inches (600 mm) down both sides and hold cover securely in place.

- 1
2 B. Do not apply uniform roof loads for at least 12 hours and concentrated loads for at least 3
3 days after building masonry walls or columns.
4
5 C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be
6 left exposed or painted. Immediately remove grout, mortar, and soil that come in contact
7 with such masonry.
8 1. Protect base of walls from rain-splashed mud and mortar splatter by coverings
9 spread on ground and over wall surface.
10 2. Protect sills, ledges, and projections from mortar droppings.
11 3. Protect surfaces of window and door frames, as well as similar products with
12 painted and integral finishes, from mortar droppings.
13 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain
14 from splashing mortar and dirt on completed masonry.
15
16 D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated
17 with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry
18 damaged by frost or by freezing conditions. Comply with cold-weather construction
19 requirements contained in ACI 530.1/ASCE 6/TMS 602.
20 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature
21 is 40 deg F (4 deg C) and higher and will remain so until masonry has dried, but
22 not less than seven days after completing cleaning.
23
24 E. Hot-Weather Requirements: Comply with hot-weather construction requirements
25 contained in ACI 530.1/ASCE 6/TMS 602.

26 **PART 2 - PRODUCTS**

27 2.1 MASONRY UNITS, GENERAL

- 28
29 A. Defective Units: Referenced masonry unit standards may allow a certain percentage of
30 units to contain chips, cracks, or other defects exceeding limits stated in the standard. Do
31 not use units where such defects will be exposed in the completed Work.
32
33 B. Fire-Resistance Ratings: Where indicated, provide units that comply with requirements
34 for fire-resistance ratings indicated as determined by testing according to ASTM E 119, by
35 equivalent masonry thickness, or by other means, as acceptable to authorities having
36 jurisdiction.
37

38 2.2 MANUFACTURERS

- 39
40 A. Available Manufacturers: Subject to compliance with requirements, manufacturers
41 offering products that may be incorporated in the Work include, but are not limited to, the
42 following:
43 1. Concrete Masonry Units:
44 a. Block USA, Inc.
45 b. Midwest Brick & Block, Inc.
46 c. Miller Materials Co.
47 2. Portland Cement, Mortar Cement, Masonry Cement, and Lime:
48 a. Glen-Gery Corporation.
49 b. Lafarge Corporation.
50 c. Lehigh Portland Cement Co.
51 3. Joint Reinforcement, Ties, and Anchors:
52 a. Dur-O-Wal, Inc.
53 b. Heckman Building Products, Inc.
54 c. Hohmann & Barnard, Inc.

- d. Masonry Reinforcing Corp. of America.
- e. National Wire Products Industries.

2.2 CONCRETE MASONRY UNITS

- A. General: Provide shapes indicated and as follows for each form of concrete masonry unit required.
 - 1. Provide special shapes for lintels, corners, jambs, sash, control joints, headers, bonding, and other special conditions.
 - 2. Provide bullnose units for outside corners, unless otherwise indicated.
- B. Concrete Masonry Units: ASTM C 90 and as follows:
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi (14.8 MPa).
 - 2. Weight Classification: Normal weight.
 - 3. Aggregates: Do not use aggregates made from pumice, scoria, or tuff.
 - 4. Provide Type I, moisture-controlled units.
 - 5. Size: Manufactured to the actual dimensions minus 3/8 inch less than nominal units 8" x 8" x 16", except 8" x 12" x 16" w/ center score where shown the drawings.
 - 6. Exposed Faces: Manufacturer's standard color and texture, unless otherwise indicated.

2.3 CONCRETE AND MASONRY LINTELS

- A. General: Provide one of the following:
 - 1. Concrete Lintels: ASTM C 1623, matching CMUs in color, texture, and density classification; and with reinforcing bars indicated. Provide lintels with net-area compressive strength not less than CMU's.
 - 2. Masonry Lintels: Prefabricated or built-in-place masonry lintels made from bond beam CMUs with reinforcing bars placed as indicated and filled with coarse grout. Cure precast lintels before handling and installing. Temporarily support built-in-place lintels until cured.

2.4 MORTAR AND GROUT MATERIALS

- A. Portland Cement: ASTM C 150, Type I or II, except Type III may be used for cold-weather construction. Provide natural color or white cement as required to produce mortar color indicated.
- B. Masonry Cement: ASTM C 91.
 - 1. For pigmented mortars, use premixed, colored masonry cements of formulation required to produce color indicated, or if not indicated, as selected from manufacturer's standard formulations. Pigments shall not exceed 5 percent of masonry cement by weight for mineral oxides nor 1 percent for carbon black.
 - 2. For colored-aggregate mortars, use masonry cement of natural color or white as required to produce mortar color indicated.
 - 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. Brixment-in-Color; Essroc Materials, Inc.
 - b. Centurion Colorbond; Lafarge Corporation.
 - c. Lehigh Custom Color Masonry Cement; Lehigh Portland Cement Co.
 - d. Flamingo Color Masonry Cement; Riverton Corporation (The).
- C. Mortar Cement: ASTM C 1329.
- D. Hydrated Lime: ASTM C 207, Type S.

- E. Aggregate for Mortar: ASTM C 144; except for joints less than 1/4 inch (6.5 mm), use aggregate graded with 100 percent passing the No. 16 (1.18 mm) sieve.
1. White-Mortar Aggregates: Natural white sand or ground white stone.
 2. Colored-Mortar Aggregates: Natural-colored sand or ground marble, granite, or other sound stone, as required to match Architect's sample.

F. Aggregate for Grout: ASTM C 404.

G. Water: Potable.

2.5 REINFORCING STEEL

A. Steel Reinforcing Bars: Billet steel complying with ASTM A 615 (ASTM A 615M).

B. Deformed Reinforcing Wire: ASTM A 496, with ASTM A 153, Class B-2 zinc coating.

2.6 JOINT REINFORCEMENT

A. General: Hot-dip galvanized carbon-steel wire, coating class as follows:

1. ASTM A 153, Class B-2, for both interior and exterior walls.

B. Description: Welded-wire units prefabricated with deformed continuous side rods and plain cross rods into straight lengths of not less than 10 feet (3 m), with prefabricated corner and tee units, and complying with requirements indicated below:

1. Wire Diameter for Side Rods: 0.148 inch (3.8 mm).
2. Wire Diameter for Cross Rods: 0.148 inch (3.8 mm).

C. For single-wythe masonry, provide Truss type design masonry joint reinforcement with continuous diagonal cross rods spaced not more than 16 inches (407 mm) o.c.

2.7 TIES AND ANCHORS, GENERAL

A. General: Provide ties and anchors specified in subsequent articles that comply with requirements for metal and size of this Article, unless otherwise indicated.

B. Wire: As follows:

1. Hot-dip galvanized Carbon-Steel Wire: ASTM A 82; with ASTM A 153, Class B-2 coating.
2. Wire Diameter: 0.1875 inch (4.8 mm).

C. Steel Sheet: Galvanized Steel Sheet: ASTM A 366 (ASTM A 366M) (commercial quality) cold-rolled, carbon-steel sheet hot-dip galvanized after fabrication to comply with ASTM A 153, Class B-2 or B-3, as applicable, for sheet-metal ties and anchors in exterior walls not completely embedded in mortar and grout.

D. Thickness of Steel Sheet Galvanized After Fabrication: Uncoated thickness of steel sheet for hot-dip galvanizing after fabrication; 0.0747 inch (1.9 mm).

E. Steel Plates and Bars: ASTM A 36 (ASTM A 36M), hot-dip galvanized to comply with ASTM A 153, Class B-1, B-2, or B-3, as applicable to size and form indicated.

2.8 BENT WIRE TIES

A. Individual units prefabricated from bent wire to comply with requirements indicated below:

1. Tie Shape for Hollow Masonry Units Laid with Cells Vertical: Rectangular with closed ends and not less than 4 inches (100 mm) wide.

2. Tie Shape for Solid Masonry Unit Construction and for Hollow Masonry Units with Cells Horizontal: Z-shaped ties with ends bent 90 degrees to provide hooks not less than 2 inches (50 mm) long.

2.9 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded Neoprene filler strips complying with ASTM D 1056, Type 2, Class A, Grade 1; compressible up to 35 percent; of width and thickness indicated.
- B. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints with loops for holding reinforcing bars in center of cells; 0.142-inch, hot-dip galv. after fabrication.

2.10 MASONRY CLEANERS

- A. Acidic Cleaner: Manufacturer's standard-strength, general-purpose cleaner designed for removing mortar/grout stains, efflorescence, and other new construction stains from new masonry surfaces of type indicated below without discoloring or damaging masonry surfaces; expressly approved for intended use by manufacturer of masonry units being cleaned.
1. Available Products: Subject to compliance with requirements, products that may be used to clean unit masonry surfaces include, but are not limited to, the following:
- a. Diedrich Technologies, Inc.
 - b. EaCO Chem., Inc.
 - c. Sure Klean Vana Trol; ProSoCo, Inc.

2.11 MORTAR AND GROUT MIXES

- A. General: Do not use admixtures, including pigments, air-entraining agents, accelerators, retarders, water-repellent agents, antifreeze compounds, or other admixtures, unless otherwise indicated.
1. Do not use calcium chloride in mortar or grout.
2. Add cold-weather admixture (if used) at the same rate for all mortar, regardless of weather conditions, in order to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification, for types of mortar indicated below:
1. Limit cementitious materials in mortar to Portland cement and lime.
2. Limit cementitious materials in mortar for exterior use to Portland cement and lime.
3. For masonry below grade, in contact with earth, and where indicated, use type indicated below:
- a. Type: S.
4. For reinforced masonry and where indicated, use type indicated below:
- a. Type: N.
5. For exterior, above-grade, load-bearing and non-load-bearing walls and parapet walls; for interior load-bearing walls; for interior non-load-bearing partitions, and for other applications where another type is not indicated, use type indicated below:
- a. Type: N.
- C. Pigmented Mortar: Select and proportion pigments with other ingredients to produce color required.
1. Limit pigments to the following percentages of cement content by weight.
- D. Grout for Unit Masonry: Comply with ASTM C 476. Use grout of consistency indicated or, if not otherwise indicated, of consistency (fine or coarse) at time of placement that will completely fill spaces intended to receive grout.

1. Use fine grout in grout spaces less than 2 inches (50 mm) in horizontal dimension, unless otherwise indicated.
2. Use coarse grout in grout spaces 2 inches (50 mm) or more in least horizontal dimension, unless otherwise indicated.
3. Specified 28-day compressive strength not less than 2500 psi (17.5 MPa) with a slump of 8 to 11 inches (203 to 279 mm as measured according to ASTM C143/C143M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of unit masonry. Do not proceed with installation until unsatisfactory conditions have been corrected.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of unit masonry.
- B. Examine rough-in and built-in construction to verify actual locations of piping connections prior to installation.

3.2 INSTALLATION, GENERAL

- A. Thickness: Build single-wythe walls to the actual thickness of the masonry units, using units of thickness indicated.
- B. Build chases and recesses to accommodate items specified in this and other Sections of the Specifications.
- C. Leave openings for equipment to be installed before completion of masonry. After installing equipment, complete masonry to match construction immediately adjacent to the opening.
- D. Cut masonry units with motor-driven saws to provide clean, sharp, un-chipped edges. Cut units as required to provide continuous pattern and to fit adjoining construction. Use full-size units without cutting, where possible. Allow units cut with water-cooled saws to dry before placing, unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.
- E. Mix units for exposed unit masonry from several pallets or cubes as they are placed to produce uniform blend of colors and textures.

3.3 CONSTRUCTION TOLERANCES

- A. Variation from Plumb: For vertical lines and surfaces of columns, walls, and arises, do not exceed 1/4 inch in 10 feet (6 mm in 3 m), nor 3/8 inch in 20 feet (10 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For external corners, expansion joints, control joints, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For vertical alignment of head joints, do not exceed plus or minus 1/4 inch in 10 feet (6 mm in 3 m), nor 1/2 inch (12 mm) maximum.
- B. Variation from Level: For bed joints and lines of exposed lintels, sills, parapets, horizontal grooves, and other conspicuous lines, do not exceed 1/4 inch in 20 feet (6 mm in 6 m), nor 1/2 inch in 40 feet (12 mm in 12 m) or more. For top surface of bearing walls, do not

exceed 1/8 inch (3 mm) in 10 feet (3 m), nor 1/16 inch (1.5 mm) within width of a single unit.

- C. Variation of Linear Building Line: For position shown in plan and related portion of columns, walls, and partitions, do not exceed 1/2 inch in 20 feet (12 mm in 6 m), nor 3/4 inch in 40 feet (19 mm in 12 m) or more.
- D. Variation in Mortar-Joint Thickness: Do not vary from bed-joint thickness indicated by more than plus or minus 1/8 inch (3 mm), with a maximum thickness limited to 1/2 inch (12 mm). Do not vary bed-joint thickness from bed-joint thickness of adjacent course by more than 1/8 inch (3 mm). Do not vary from head-joint thickness indicated by more than plus or minus 1/8 inch (3 mm).

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint widths and for accurate locating of openings, movement-type joints, returns, and offsets. Avoid the use of less-than-half-size units at corners, jambs, and where possible at other locations.
- B. Lay walls to comply with specified construction tolerances, with courses accurately spaced and coordinated with other construction.
- C. Bond Pattern for Exposed Masonry: Lay exposed masonry in the following bond pattern; do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
 - 1. One-half running bond with vertical joint in each course centered on units in courses above and below.
- D. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 2 inches (50 mm). Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch (100-mm) horizontal face dimensions at corners or jambs.
- E. Stopping and Resuming Work: In each course, rack back 1/2-unit length for one-half running bond or 1/3-unit length for one-third running bond; do not tooth. Clean exposed surfaces of set masonry, wet clay masonry units lightly if required, and remove loose masonry units and mortar prior to laying fresh masonry.
- F. Built-in Work: As construction progresses, build-in items specified under this and other Sections of the Specifications. Fill in solidly with masonry around built-in items.
- G. Fill space between hollow metal frames and masonry solidly with mortar, unless otherwise indicated.
 - 1. At exterior frames, insert extruded polystyrene board insulation around perimeter of frame in thickness indicated, but not less than 3/4 inch (19 mm) to act as a thermal break between frame and masonry.
- H. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath in the joint below and rod mortar or grout into core.
- I. Fill cores in hollow concrete masonry units with grout 24 inches (600 mm) under bearing plates, beams, lintels, posts, and similar items, unless otherwise indicated.

1 3.5 MORTAR BEDDING AND JOINTING

- 2
- 3 A. Lay hollow concrete masonry units as follows:
- 4 1. With full mortar coverage on horizontal and vertical face shells.
- 5 2. Bed webs in mortar in starting course on footings and in all courses where
- 6 adjacent to cells or cavities to be filled with grout.
- 7 3. For starting course on footings where cells are not grouted, spread out full mortar
- 8 bed, including areas under cells.
- 9 4. Maintain joint widths indicated, except for minor variations required to maintain
- 10 bond alignment. If not indicated, lay walls with 3/8-inch (10-mm) joints.
- 11
- 12 B. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than
- 13 joint thickness, except flush struck at back-up masonry to receive fluid-applied air barrier.
- 14

15 3.6 HORIZONTAL-JOINT REINFORCEMENT

- 16
- 17 A. General: Provide continuous horizontal-joint reinforcement as indicated. Install entire
- 18 length of longitudinal side rods in mortar with a minimum cover of 5/8 inch (16 mm) on
- 19 exterior side of walls, 1/2 inch (13 mm) elsewhere. Lap reinforcing a minimum of 6 inches
- 20 (150 mm).
- 21 1. Space reinforcement not more than 16 inches (406 mm) o.c.
- 22 2. Space reinforcement not more than 8 inches (203 mm) o.c. in foundation walls
- 23 and parapet walls.
- 24 3. Provide reinforcement in mortar joint 1 block course above and below wall
- 25 openings and extending 12 inches (305 mm) beyond opening.
- 26 a. Reinforcement above is in addition to continuous reinforcement.
- 27
- 28 B. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise
- 29 indicated.
- 30
- 31 C. Provide continuity at corners and wall intersections by using prefabricated "L" and "T"
- 32 sections. Cut and bend reinforcement units as directed by manufacturer for continuity at
- 33 returns, offsets, column fireproofing, pipe enclosures, and other special conditions.
- 34

35 3.7 ANCHORING MASONRY TO STRUCTURAL MEMBERS

- 36
- 37 A. Anchor masonry to structural members where masonry abuts or faces structural
- 38 members to comply with the following:
- 39 1. Provide an open space not less than 1 inch (25 mm) in width between masonry
- 40 and structural member, unless otherwise indicated. Keep open space free of
- 41 mortar or other rigid materials.
- 42

43 3.8 LINTELS

- 44
- 45 A. Provide masonry lintels where shown and where openings of more than 12 inches (305
- 46 mm) for brick size units and 24 inches (610 mm) for block size units are shown without
- 47 structural steel or other supporting lintels.
- 48
- 49 B. Provide minimum bearing of 8 inches (200 mm) at each jamb, unless otherwise indicated.
- 50

51 3.9 INSTALLATION OF REINFORCED UNIT MASONRY

- 52
- 53 A. Temporary Formwork and Shores: Construct formwork and shores to support reinforced
- 54 masonry elements during construction.
- 55 1. Construct formwork to conform to shape, line, and dimensions shown. Make
- 56 sufficiently tight to prevent leakage of mortar and grout. Brace, tie, and support

- forms to maintain position and shape during construction and curing of reinforced masonry.
 2. Do not remove forms and shores until reinforced masonry members have hardened sufficiently to carry their own weight and other temporary loads that may be placed on them during construction.
- B. Grouting: Do not place grout until entire height of masonry to be grouted has attained sufficient strength to resist grout pressure.
1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for placement, including minimum grout space and maximum pour height.
 2. Fully grout masonry walls as described for grout requirements and shown on the architectural drawings for locations to improve acoustical control between rooms.

3.10 FIELD QUALITY CONTROL

- A. The Owner will engage and pay for the services of an independent testing agency to perform the following testing for field quality control. Payment for these services will be made from the Inspection and Testing Allowance, as authorized by Change Orders. Retesting of materials failing to meet specified requirements shall be done at Contractor's expense.
- B. Testing Frequency: Tests and Evaluations listed in this Article will be performed during construction for each 5000 sq. ft. (460 sq. m) of wall area or portion thereof.
- C. Mortar composition and properties will be evaluated per ASTM C 780.
- D. Grout will be sampled and tested for compressive strength per ASTM C 1019.

3.11 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or if units do not match adjoining units. Install new units to match adjoining units; install in fresh mortar or grout, pointed to eliminate evidence of replacement.
- B. Pointing: During the tooling of joints, enlarge voids and holes, except weep holes, and completely fill with mortar. Point-up joints, including corners, openings, and adjacent construction, to provide a neat, uniform appearance. Prepare joints for application of sealants.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears prior to tooling joints.
- D. Final Cleaning: After mortar is thoroughly set and cured, clean exposed masonry as follows:
1. Remove large mortar particles by hand with wooden paddles and nonmetallic scrape hoes or chisels.
 2. Test cleaning methods on sample wall panel; leave one-half of panel uncleaned for comparison purposes. Obtain Architect's approval of sample cleaning before proceeding with cleaning of masonry.
 3. Protect adjacent stone and non-masonry surfaces from contact with cleaner by covering them with liquid strippable masking agent, polyethylene film, or waterproof masking tape.
 4. Wet wall surfaces with water prior to application of cleaners; remove cleaners promptly by rinsing thoroughly with clear water.
 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2 applicable to type of stain present on exposed surfaces.

- 1
2 E. Protection: Provide final protection and maintain conditions that ensure unit masonry is
3 without damage and deterioration at time of Substantial Completion.
4

5 3.12 MASONRY WASTE DISPOSAL
6

- 7 A. Salvageable materials: Undamaged, excess masonry materials are Contractor's property
8 and shall be removed from the Project site for his use.
9
10 B. Excess Masonry Waste: Remove excess, clean masonry waste that cannot be used as
11 fill, as described above and other masonry waste and legally dispose of off Owner's
12 property.
13
14
15
16

END OF SECTION 04200

SECTION 05400 - COLD-FORMED METAL FRAMING

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. Load-bearing wall framing.
2. Exterior load-bearing wall framing.
3. Exterior load-bearing roof framing.

B. Related Requirements:

1. Section 09250 "Gypsum Board Assemblies" for interior non-load-bearing, metal-stud-framed, shaft-wall assemblies.

1.3 PREINSTALLATION MEETINGS

- A. Pre-installation Conference: Conduct conference at Project site.

1.4 ACTION SUBMITTALS

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

B. Shop Drawings:

1. Include layout, spacing, sizes, thicknesses, and types of cold-formed steel framing; fabrication; and fastening and anchorage details, including mechanical fasteners.
2. Indicate reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, installation procedures and attachment to adjoining work.

1.5 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

- B. Product Test Reports: For each listed product, for tests performed by manufacturer and witnessed by a qualified testing agency.

1. Steel sheet.
2. Expansion anchors.
3. Power-actuated anchors.
4. Mechanical fasteners.
5. Vertical deflection clips.
6. Miscellaneous structural clips and accessories.

- C. Research Reports: For non-standard cold-formed steel framing, from ICC-ES.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM E 329 for testing indicated.

- B. Product Tests: Mill certificates or data from a qualified independent testing agency indicating steel sheet complies with requirements, including base-metal thickness, yield strength, tensile strength, total elongation, chemical requirements, and metallic-coating thickness.

- C. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 2. AWS D1.3/D1. 3M, "Structural Welding Code - Sheet Steel."
- D. Comply with AISI S230 "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed steel framing from corrosion, moisture staining, deformation, and other damage during delivery, storage, and handling.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. AllSteel & Gypsum Products, Inc.
 - 2. Consolidated Fabricators Corp.; Building Products Division.
 - 3. ClarkDietrich Building Systems.
 - 4. Nuconsteel; a Nucor Company.
 - 5. Steel Construction Systems.
 - 6. Steel Network, Inc. (The).
 - 7. United Metal Products, Inc.

2.2 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed steel framing capable of withstanding design loads within limits and under conditions indicated.
 - 1. Design Loads: As indicated.
 - 2. Deflection Limits: Design framing systems to withstand design loads without deflections greater than the following:
 - a. Exterior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height.
 - b. Interior Load-Bearing Wall Framing: Horizontal deflection of 1/240 of the wall height under a horizontal load of 5 lbf/sq. ft. (239 Pa).
 - c. Exterior Non-Load-Bearing Framing: Horizontal deflection of 1/240 of the wall height.
 - d. Roof Framing: Vertical deflection of 1/180 of the span for live loads and 1/240 for total loads of the span.
 - 3. Design framing systems to provide for movement of framing members located outside the insulated building envelope without damage or overstressing, sheathing failure, connection failure, undue strain on fasteners and anchors, or other detrimental effects when subject to a maximum ambient temperature change of 120 deg F (67 deg C).
 - 4. Design framing system to maintain clearances at openings, to allow for construction tolerances, and to accommodate live load deflection of primary building structure as follows:
 - a. Upward and downward movement of 1/2 inch (13 mm).
 - 5. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.
- B. Cold-Formed Steel Framing Design Standards:
 - 1. Floor and Roof Systems: AISI S210.
 - 2. Wall Studs: AISI S211.

3. Headers: AISI S212.
 4. Lateral Design: AISI S213.
- C. AISI Specifications and Standards: Unless more stringent requirements are indicated, comply with AISI S100 and AISI S200.
 - D. Fire-Resistance Ratings: Comply with ASTM E 119; testing by a qualified testing agency. Identify products with appropriate markings of applicable testing agency.
 1. Indicate design designations from UL's "Fire Resistance Directory" or from the listings of another qualified testing agency.
- ## 2.3 COLD-FORMED STEEL FRAMING, GENERAL
- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of pre-consumer recycled content not less than 25 percent.
 - B. Steel Sheet: ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of grade and coating weight as follows:
 1. Grade: As required by structural performance.
 2. Coating: G60 (Z180), A60 (ZF180), AZ50 (AZ150).
 - C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 1. Grade: 33 (230), Class 1.
 2. Coating: G60 (Z180).
- ## 2.4 LOAD-BEARING WALL FRAMING
- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0538inch (1.37 mm).
 2. Flange Width: 1-5/8 inches (41 mm).
 - B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with straight flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0538inch (1.37 mm).
 2. Flange Width: 1-1/4 inches (32 mm).
 - C. Steel Box or Back-to-Back Headers: Manufacturer's standard C-shapes used to form header beams, of web depths indicated, unpunched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0538inch (1.37 mm).
 2. Flange Width: 1-5/8 inches (41 mm).
- ## 2.5 EXTERIOR LOAD-BEARING WALL FRAMING
- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0538inch (1.37 mm).
 2. Flange Width: 1-5/8 inches (41 mm).
 - B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with un-stiffened flanges, and as follows:
 1. Minimum Base-Metal Thickness: 0.0538inch (1.37 mm).
 2. Flange Width: 1-1/4 inches (32 mm).

- C. Vertical Deflection Clips: Manufacturer's standard head clips, capable of accommodating upward and downward vertical displacement of primary structure through positive mechanical attachment to stud web.
1. Manufacturers: Subject to compliance with requirements, available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:
 - a. AllSteel & Gypsum Products, Inc.
 - b. ClarkDietrich Building Systems.
 - c. Steel Network, Inc. (The).
- D. Single Deflection Track: Manufacturer's single, deep-leg, U-shaped steel track; unpunched, with unstiffened flanges, of web depth to contain studs while allowing free vertical movement, with flanges designed to support horizontal loads and transfer them to the primary structure, and as follows:
1. Minimum Base-Metal Thickness: 0.0538inch (1.37 mm)
 2. Flange Width: 1 inch (25 mm) plus the design gap for one-story structures.

2.6 EXTERIOR LOAD-BEARING ROOF FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428inch (1.09 mm).
 2. Flange Width: 1-5/8 inches (41 mm).
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with un-stiffened flanges, and as follows:
1. Minimum Base-Metal Thickness: 0.0428inch (1.09 mm).
 2. Flange Width: 1-1/4 inches (32 mm).

2.7 FRAMING ACCESSORIES

- A. Fabricate steel-framing accessories from steel sheet, ASTM A 1003/A 1003M, Structural Grade, Type H, metallic coated, of same grade and coating weight used for framing members.
- B. Provide accessories of manufacturer's standard thickness and configuration, unless otherwise indicated, as follows:
1. Supplementary framing.
 2. Bracing, bridging, and solid blocking.
 3. Web stiffeners.
 4. Anchor clips.
 5. End clips.
 6. Foundation clips.
 7. Gusset plates.
 8. Stud kickers and knee braces.
 9. Joist hangers and end closures.
 10. Hole reinforcing plates.
 11. Backer plates.

2.8 ANCHORS, CLIPS, AND FASTENERS

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

- B. Anchor Bolts: ASTM F 1554, Grade 36, threaded carbon-steel headless, hooked bolts and carbon-steel nuts; and flat, hardened-steel washers; zinc coated by hot-dip process according to ASTM A 153/A 153M, Class C.
- C. Expansion Anchors: Fabricated from corrosion-resistant materials, with allowable load or strength design capacities calculated according to ICC-ES AC193 and ACI 318 greater than or equal to the design load, as determined by testing per ASTM E 488 conducted by a qualified testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with allowable load capacities calculated according to ICC-ES AC70, greater than or equal to the design load, as determined by testing per ASTM E 1190 conducted by a qualified testing agency.
- E. Mechanical Fasteners: ASTM C 1513, corrosion-resistant-coated, self-drilling, self-tapping, steel drill screws.
 - 1. Head Type: Low-profile head beneath sheathing, manufacturer's standard elsewhere.
- F. Welding Electrodes: Comply with AWS standards.

2.9 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: ASTM A 780.
- B. Cement Grout: Portland cement, ASTM C 150, Type I; and clean, natural sand, ASTM C 404. Mix at ratio of 1 part cement to 2-1/2 parts sand, by volume, with minimum water required for placement and hydration.
- C. Nonmetallic, Non-shrink Grout: Premixed, nonmetallic, noncorrosive, non-staining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107/C 1107M, with fluid consistency and 30-minute working time.
- D. Shims: Load bearing, high-density multimonomer plastic, and non-leaching; or of cold-formed steel of same grade and coating as framing members supported by shims.
- E. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch (6.4 mm) thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.10 FABRICATION

- A. Fabricate cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened, according to referenced AISI's specifications and standards, manufacturer's written instructions, and requirements in this Section.
 - 1. Fabricate framing assemblies using jigs or templates.
 - 2. Cut framing members by sawing or shearing; do not torch cut.
 - 3. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, pneumatic pin fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by no fewer than three exposed screw threads.
 - 4. Fasten other materials to cold-formed steel framing by welding, bolting, pneumatic pin fastening, or screw fastening, according to Shop Drawings.

- B. Reinforce, stiffen, and brace framing assemblies to withstand handling, delivery, and erection stresses. Lift fabricated assemblies to prevent damage or permanent distortion.
- C. Fabrication Tolerances: Fabricate assemblies level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed steel framing assembly to a maximum out-of-square tolerance of 1/8 inch (3 mm).

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting substrates and abutting structural framing for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of load-bearing wall bottom track and the top of foundation wall or slab at locations with a gap larger than 1/4 inch (6 mm) to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets at the underside of wall bottom track or rim track and at the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed steel framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed steel framing according to AISI S200 and to manufacturer's written instructions unless more stringent requirements are indicated.
- C. Install shop- or field-fabricated, cold-formed framing and securely anchor to supporting structure.
 - 1. Screw, bolt, or weld wall panels at horizontal and vertical junctures to produce flush, even, true-to-line joints with maximum variation in plane and true position between fabricated panels not exceeding 1/16 inch (1.6 mm).
- D. Install cold-formed steel framing and accessories plumb, square, and true to line, and with connections securely fastened.
 - 1. Cut framing members by sawing or shearing; do not torch cut.
 - 2. Fasten cold-formed steel framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3/D1.3M requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, and complying with requirements for spacing, edge distances, and screw penetration.
- E. Install framing members in one-piece lengths unless splice connections are indicated for track or tension members.

- F. Install temporary bracing and supports to secure framing and support loads comparable in intensity to those for which structure was designed. Maintain braces and supports in place, undisturbed, until entire integrated supporting structure has been completed and permanent connections to framing are secured.
- G. Do not bridge building expansion joints with cold-formed steel framing. Independently frame both sides of joints.
- H. Install insulation, specified in Section 07210 "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's approved or standard punched openings.
- J. Erection Tolerances: Install cold-formed steel framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet (1:960) and as follows:
 - 1. Space individual framing members no more than plus or minus 1/8 inch (3 mm) from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 LOAD-BEARING WALL INSTALLATION

- A. Install continuous top and bottom tracks sized to match studs. Align tracks accurately and securely anchor at corners and ends, and at 24 inch spacing.
- B. Squarely seat studs against top and bottom tracks with gap not exceeding of 1/8 inch (3 mm) between the end of wall framing member and the web of track. Fasten both flanges of studs to top and bottom tracks. Space studs as follows:
 - 1. Stud Spacing: 16 inches (406 mm).
- C. Set studs plumb, except as needed for diagonal bracing or required for non-plumb walls or warped surfaces and similar configurations.
- D. Align studs vertically where floor framing interrupts wall-framing continuity. Where studs cannot be aligned, continuously reinforce track to transfer loads.
- E. Align floor and roof framing over studs according to AISI S200, Section C1. Where framing cannot be aligned, continuously reinforce track to transfer loads.
- F. Anchor studs abutting structural columns or walls, including masonry walls, to supporting structure as indicated.
- G. Install headers over wall openings wider than stud spacing. Locate headers above openings as indicated. Fabricate headers of compound shapes indicated or required to transfer load to supporting studs, complete with clip-angle connectors, web stiffeners, or gusset plates.
 - 1. Frame wall openings with not less than a double stud at each jamb of frame as indicated on Shop Drawings. Fasten jamb members together to uniformly distribute loads.
 - 2. Install runner tracks and jack studs above and below wall openings. Anchor tracks to jamb studs with clip angles or by welding, and space jack studs same as full-height wall studs.
- H. Install supplementary framing, blocking, and bracing in stud framing indicated to support fixtures, equipment, services, casework, heavy trim, furnishings, and similar work requiring attachment to framing.

1. If type of supplementary support is not indicated, comply with stud manufacturer's written recommendations and industry standards in each case, considering weight or load resulting from item supported.

I. Install horizontal bridging in stud system, spaced vertically 48 inches (1220 mm). Fasten at each stud intersection.

1. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs with a minimum of two screws into each flange of the clip angle for framing members up to 6 inches (150 mm) deep.

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

3.5 ROOF FRAMING INSTALLATION

A. Install perimeter roof framing track sized to match joists. Align and securely anchor or fasten track to supporting structure at corners, ends, and spacings indicated.

B. Install joists bearing on supporting frame, level, straight, and plumb; adjust to final position, brace, and reinforce. Fasten joists to both flanges of joist track.

1. Install joists over supporting frame with a minimum end bearing of 1-1/2 inches (38 mm).
2. Reinforce ends and bearing points of joists with web stiffeners, end clips, joist hangers, steel clip angles, or steel-stud sections.

C. Space joists not more than 2 inches (51 mm) from abutting walls, and as follows:

1. As indicated on Drawings.

D. Frame openings with built-up joist headers, consisting of joist and joist track or another combination of connected joists if indicated.

E. Install joist reinforcement at interior supports with single, short length of joist section located directly over interior support, with lapped joists of equal length to joist reinforcement.

1. Install web stiffeners to transfer axial loads of walls above.

F. Install bridging at intervals indicated. Fasten bridging at each joist intersection as follows:

1. Joist-Track Solid Bridging: Joist-track solid blocking of width and thickness indicated, secured to joist webs.
2. Combination Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and joist-track solid blocking of width and thickness indicated. Fasten flat straps to bottom flange of joists and secure solid blocking to joist webs.

G. Secure joists to load-bearing interior walls to prevent lateral movement of bottom flange.

H. Install miscellaneous joist framing and connections, including web stiffeners, closure pieces, clip angles, continuous angles, hold-down angles, anchors, and fasteners, to provide a complete and stable joist-framing assembly.

3.6 FIELD QUALITY CONTROL

A. Testing: Owner will engage a qualified independent testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Field and shop welds will be subject to testing and inspecting.

- C. Testing agency will report test results promptly and in writing to Contractor and Architect.
- D. Remove and replace work where test results indicate that it does not comply with specified requirements.
- E. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

3.7 REPAIRS AND PROTECTION

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

END OF SECTION 054000

SECTION 05500 - METAL FABRICATIONS

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. This Section includes the following metal fabrications:
 - 1. Rough hardware
 - 2. Loose bearing and leveling plates
 - 3. Loose steel lintels / angles
 - 4. Elevator sub sill angle.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 5 Section "Structural Steel" for structural steel framing system components.

1.3 PERFORMANCE REQUIREMENTS

- A. Control of Corrosion: Prevent galvanic action and other forms of corrosion by insulating metals and other materials from direct contact with incompatible materials.

1.4 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Shop drawings detailing fabrication and erection of each metal fabrication indicated. Include plans, elevations, sections, and details of metal fabrications and their connections. Show anchorage and accessory items. Provide templates for anchors and bolts specified for installation under other Sections.
- C. Samples of materials and finished products as may be requested by Architect.
- D. Welder certificates signed by Contractor certifying that welders comply with requirements specified under the "Quality Assurance" Article.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include a list of completed projects with project names, addresses, architects and owner's names, and other information specified.

1.5 QUALITY ASSURANCE

- A. Fabricator Qualifications: Firm experienced in producing metal fabrications similar to those indicated for this Project with a record of successful in-service performance, and with sufficient production capacity to produce required units without delaying the Work.
- B. Welding Standards: Comply with applicable provisions of AWS D1.1 "Structural Welding Code--Steel," AWS D1.2 "Structural Welding Code--Aluminum," and AWS D1.3 "Structural Welding Code--Sheet Steel."
- C. Certify that each welder has satisfactorily passed AWS qualification tests for welding processes involved and, if pertinent, has undergone recertification.

1.6 PROJECT CONDITIONS

- A. Field Measurements: Check actual locations of walls and other construction to which metal fabrications must fit by accurate field measurements before fabrication. Show recorded measurements on final shop drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.
- B. Where field measurements cannot be made without delaying the Work, guarantee dimensions and proceed with fabricating products without field measurements. Coordinate construction to ensure that actual dimensions correspond to guaranteed dimensions. Allow for trimming and fitting.

PART 2 - PRODUCTS

2.1 FERROUS METALS

- A. Metal Surfaces, General: For metal fabrications exposed to view in the completed Work, provide materials selected for their surface flatness, smoothness, and freedom from surface blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.
- B. Steel Plates, Shapes, and Bars: ASTM A36/A36M.
- C. Steel Tubing and Pipe: Product type (manufacturing method) and as follows:
 - 1. Cold-Formed Steel Tubing: ASTM A500.
 - 2. Hot-Formed Steel Tubing: ASTM A501.
 - 3. For all exterior installations and where indicated, provide tubing with hot-dip galvanized coating per ASTM A53.
- D. Gray-Iron Castings: ASTM A48, Class 30.
- E. Malleable-Iron Castings: ASTM A47, Grade 32510 (ASTM A 47M, Grade 22010).
- F. Cast-in-Place Anchors in Concrete: Anchors of type indicated below, fabricated from corrosion-resistant materials capable of sustaining, without failure, the load imposed within a safety factor of 4, as determined by testing per ASTM E488, conducted by a qualified independent testing agency.
- G. Threaded or wedge type; galvanized ferrous castings, either ASTM A47 (ASTM A47M) malleable iron or ASTM A27/A27M cast steel. Provide bolts, washers, and shims as required, hot-dip galvanized per ASTM A153.
- H. Welding Rods and Bare Electrodes: Select according to AWS specifications for the metal alloy to be welded.

2.2 PAINT

- A. Shop Primer for Ferrous Metal: Fast-curing, lead- and chromate-free, universal modified-alkyd primer complying with performance requirements of FS TT-P-664, selected for good resistance to normal atmospheric corrosion, compatibility with finish paint systems, and capability to provide a sound foundation for field-applied topcoats despite prolonged exposure.
- B. Galvanizing Repair Paint: High-zinc-dust-content paint for reglazing welds in galvanized steel, with dry film containing not less than 94 percent zinc dust by weight, and complying with DOD-P-21035 or SSPC-Paint20.

- C. Bituminous Paint: Cold-applied asphalt mastic complying with SSPC-Paint12, except containing no asbestos fibers.

2.3 FASTENERS

- A. General: Provide plated fasteners complying with ASTM B633, Class Fe/Zn 25 for electrodeposited zinc coating, for exterior use or where built into exterior walls. Select fasteners for the type, grade, and class required.
- B. Bolts and Nuts: Regular hexagon-head bolts, ASTM A307, Grade A (ASTM F568, Property Class 4.6), with hex nuts, ASTM A563 (ASTM A563M), and, where indicated, flat washers.
- C. Machine Screws: ANSI B18.6.3. Lag Bolts: ANSI B18.2.1 (ANSI B18.2.3.8M).
- D. Plain Washers: Round, carbon steel, ANSI B18.22.1 (ANSI B18.22M). Lock Washers: Helical, spring type, carbon steel, ANSI B18.21.1.
- E. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to 6 times the load imposed when installed in unit masonry and equal to 4 times the load imposed when installed in concrete as determined by testing per ASTM E488 conducted by a qualified independent testing agency.
1. Material: Carbon steel, zinc-plated, comply with ASTM B633, Class Fe/Zn 5.
- F. Toggle Bolts: FS FF-B-588, tumble-wing type, class and style as required.

2.4 GROUT

- A. Non-shrink, Nonmetallic Grout: Factory-packaged, non-staining, non-corrosive, nongaseous grout complying with ASTM C1107. Provide grout specifically recommended by manufacturer for interior and exterior applications.
- B. Subject to compliance with requirements, products that may be incorporated in the Work include, but are not limited to, the following:
1. B-6 Construction Grout; W. R. Bonsal Co.
 2. Euco N-S Grout; Euclid Chemical Co.
 3. Five Star Grout; Five Star Products.
 4. Crystex; L & M Construction Chemicals, Inc.
 5. Masterflow 928 and 713; Master Builders Technologies, Inc.
 6. Sealtight 588 Grout; W. R. Meadows, Inc.
 7. SonogROUT 14; Sonneborn Building Products--ChemRex, Inc.

2.5 FABRICATION, GENERAL

- A. Form metal fabrications from materials of size, thickness, and shapes indicated but not less than that needed to comply with performance requirements indicated. Work to dimensions indicated or accepted on shop drawings, using proven details of fabrication and support. Use type of materials indicated or specified for various components of each metal fabrication.
- B. Form exposed work true to line and level with accurate angles and surfaces and straight sharp edges.
- C. Allow for thermal movement resulting from the following maximum change (range) in ambient temperature in the design, fabrication, and installation of installed metal assemblies to prevent buckling, opening up of joints, and overstressing of welds and

fasteners. Base design calculations on actual surface temperatures of metals due to both solar heat gain and nighttime sky heat loss.

- D. Temperature Change (Range): 100 degF (55.5 degC).
- E. Shear and punch metals cleanly and accurately. Remove burrs.
- F. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise indicated. Form bent-metal corners to smallest radius possible without causing grain separation or otherwise impairing work. Remove sharp or rough areas on exposed traffic surfaces.
- G. 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. Remove welding flux immediately.
 - 3. At exposed connections, finish exposed welds and surfaces smooth and blended so that no roughness shows after finishing, and contour of welded surface matches those adjacent.
- H. Form exposed connections with hairline joints, flush and smooth, using concealed fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated, Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- I. Provide for anchorage of type indicated; coordinate with supporting structure. Fabricate and space anchoring devices to secure metal fabrications rigidly in place and to support indicated loads.
- J. Shop Assembly: Preassemble items in shop to greatest extent possible to minimize field splicing and assembly. Disassemble units only as necessary for shipping and handling limitations. Use connections that maintain structural value of joined pieces. Clearly mark units for reassembly and coordinated installation.
- K. Cut, reinforce, drill, and tap metal fabrications as indicated to receive finish hardware, screws, and similar items.
- L. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide weep holes where water may accumulate.

2.6 ROUGH HARDWARE

- A. Furnish 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 or other structures. Straight bolts and other stock rough hardware items are specified in Division 6 Sections.
- B. Fabricate items to sizes, shapes, and dimensions required. Furnish malleable-iron washers for heads and nuts that bear on wood structural connections, and furnish steel washers elsewhere.

2.7 LOOSE BEARING AND LEVELING PLATES

- A. Provide loose bearing and leveling plates for steel items bearing on masonry or concrete construction, made flat, free from warps or twists, and of the required thickness and bearing area. Drill plates to receive anchor bolts and for grouting as required. Galvanize after fabrication.

1 **2.8 LOOSE STEEL LINTELS/ ANGLES**

- 2
- 3 A. Fabricate loose structural steel lintels from steel angles and shapes of size indicated for
- 4 openings and recesses in masonry walls and partitions at locations indicated.
- 5
- 6 B. Weld adjoining members together to form a single unit where indicated.
- 7
- 8 C. Size loose lintels for equal bearing of 1 inch per foot (85 mm per meter) of clear span but not
- 9 less than 8 inches (200 mm) bearing at each side of openings, unless otherwise indicated.
- 10
- 11 D. Galvanize loose steel lintels located in exterior walls.
- 12

13 **2.9 ELEVATOR SUB SILL ANGLES**

- 14
- 15 A. Fabricate loose structural steel angles 4 X 4 shape of size indicated for openings and
- 16 verified by elevator manufacturer.
- 17
- 18 B. Anchor members where indicated to structural slab as indicated on drawings. Coordinate
- 19 final location with elevator manufacturer.
- 20

21 **2.10 FABRICATION, GENERAL**

- 22
- 23 A. Form exposed work true to line and level with accurate angles and surfaces and straight
- 24 sharp edges.
- 25
- 26 B. Shear and punch metals cleanly and accurately.
- 27
- 28 C. Remove sharp or rough areas on exposed surfaces.
- 29
- 30 D. Ease exposed edges to a radius of approximately 1/32 inch (1 mm), unless otherwise
- 31 indicated. Form bent-metal corners to smallest radius possible without causing grain
- 32 separation or otherwise impairing work.
- 33
- 34 E. Weld corners and seams continuously to comply with the following:
- 35 1. Use materials and methods that minimize distortion and develop strength and
- 36 corrosion resistance of base metals.
- 37 2. Obtain fusion without undercut or overlap. Remove welding flux immediately.
- 38 3. At exposed connections, finish exposed welds and surfaces smooth and blended
- 39 so that no roughness shows after finishing, and welded surface matches
- 40 contours of adjoining surfaces.
- 41
- 42 F. Form exposed connections with hairline joints, flush and smooth, using concealed
- 43 fasteners wherever possible. Use exposed fasteners of type indicated or, if not indicated,
- 44 Phillips flat-head (countersunk) screws or bolts. Locate joints where least conspicuous.
- 45
- 46 G. Shop Assembly: Preassemble in shop to greatest extent possible to minimize field
- 47 splicing and assembly. Use connections that maintain structural value of joined pieces.
- 48 Clearly mark units for field assembly and coordinated installation.
- 49
- 50 H. Fabricate joints that will be exposed to weather in a manner to exclude water, or provide
- 51 weep holes where water may accumulate.
- 52

53 **2.11 FINISHES, GENERAL**

- 54
- 55 A. Comply with NAAMM "Metal Finishes Manual" for recommendations relative to applying
- 56 and designing finishes.
- 57

- B. Finish metal fabrications after assembly.

2.12 STEEL AND IRON FINISHES

- A. Galvanizing: For those items indicated for galvanizing, apply zinc coating by the hot-dip process complying with the following requirements:
1. ASTM A153 for galvanizing iron and steel hardware.
 2. ASTM A123 for galvanizing both fabricated and unfabricated iron and steel products made of uncoated rolled, pressed, and forged shapes, plates, bars, and strip 0.0299 inch (0.76 mm) thick or thicker.
- B. Preparation for Shop Priming: Prepare uncoated ferrous metal surfaces to comply with minimum requirements indicated below for SSPC surface preparation specifications and environmental exposure conditions of installed metal fabrications:
1. Exteriors (SSPC Zone 1B): SSPC-SP6 "Commercial Blast Cleaning."
 2. Interiors (SSPC Zone 1A): SSPC-SP3 "Power Tool Cleaning."
- C. Apply shop primer to uncoated surfaces of metal fabrications, except those with galvanized finishes or to be embedded in concrete, sprayed-on fireproofing, or masonry, unless otherwise indicated. Comply with requirements of SSPC-PA1 "Paint Application Specification No. 1" for shop painting.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Coordinate and furnish anchorages, setting drawings, diagrams, templates, instructions, and directions for installing anchorages, including concrete inserts, sleeves, anchor bolts, and miscellaneous items having integral anchors that are to be embedded in concrete or masonry construction. Coordinate delivery of such items to Project site.
- B. Set sleeves in concrete with tops flush with finish surface elevations. Protect sleeves from water and concrete entry.

3.2 INSTALLATION, GENERAL

- A. Fastening to In-Place Construction: Provide anchorage devices and fasteners where necessary for securing miscellaneous metal fabrications to in-place construction. Include threaded fasteners for concrete and masonry inserts, toggle bolts, through-bolts, lag bolts, wood screws, and other connectors as required.
- B. Cutting, Fitting, and Placement: Perform cutting, drilling, and fitting required for installing miscellaneous metal fabrications. Set metal fabrication accurately in location, alignment, and elevation; with edges and surfaces level, plumb, true, and free of rack; and measured from established lines and levels.
- C. Provide temporary bracing or anchors in formwork for items that are to be built into concrete masonry or similar construction.
- D. 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 the surfaces of exterior units that have been hot-dip galvanized after fabrication and are intended for bolted or screwed field connections.
- E. 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 that no roughness shows after finishing, and contour of welded surface matches those adjacent.

- F. Corrosion Protection: Coat concealed surfaces of aluminum that will come into contact with grout, concrete, masonry, wood, or dissimilar metals with a heavy coat of bituminous paint.

3.3 INSTALLING MISCELLANEOUS FRAMING AND SUPPORT

- 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. Shelf Angle Installation Tolerances:
1. Vertical lines of alignment (plumb):
 - a. Locate toe of angle by surveying face of veneer prior to veneer installation.
 - b. Use full depth shims to adjust toe of angle horizontally outward when angle is more than 1" behind the face of brick.
 - c. Saw cut off toe of relief angle to adjust toe of angle horizontally where steel is more than 3/4" behind the face of brick.
 2. Horizontal lines of alignment (elevation): Locate shelf angles so top of horizontal leg of angle is at the bottom of the brick course of the course directly above the angle.
 3. Tolerances:
 - a. Vertical : Do not vary from plumb more than:
 - 1) 1/8" in 10 feet.
 - 2) 1/4" in 20 feet.
 - 3) 1/2" maximum.
 - b. Horizontal: Do not vary from elevation more than:
 - 1) 1/8" in 10 feet.
 - 2) 1/4" in 20 feet.
 - 3) 1/2" maximum.
 - c. Offset: Do not exceed 1/8" offset between angles at butt joints.
 4. Apply three coats of cold galvanizing repair paint to repair galvanizing at sawn edges.

3.4 SETTING LOOSE PLATES

- A. Clean concrete and masonry bearing surfaces of bond-reducing materials, and roughen to improve bond to surfaces. Clean bottom surface of bearing plates.
- B. Set loose leveling and bearing plates on wedges or other adjustable devices. After the bearing members have been positioned and plumbed, tighten the anchor bolts. Do not remove wedges or shims, but if protruding, cut off flush with the edge of the bearing plate before packing with grout.
- C. Use non-shrink, metallic grout in concealed locations where not exposed to moisture; use non-shrink, nonmetallic grout in exposed locations, unless otherwise indicated.
- D. Pack grout solidly between bearing surfaces and plates to ensure that no voids remain.

3.5 ADJUSTING AND CLEANING

- A. Touchup Painting: Immediately after erection, clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with same material as used for shop painting to comply with SSPC-PA 1 requirements for touching up shop-painted surfaces.

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- B. Apply by brush or spray to provide a 2.0-mil (0.05-mm) minimum dry film thickness.
- C. Touchup Painting: Cleaning and touchup painting of field welds, bolted connections, and abraded areas of the shop paint on miscellaneous metal is specified in Division 9 Section "Painting."
- D. For galvanized surfaces, clean welds, bolted connections, and abraded areas, and apply galvanizing repair paint to comply with ASTM A780.

END OF SECTION 05500

1 **SECTION 06100 - ROUGH CARPENTRY**

2
3 **PART 1 - GENERAL**

4
5 **1.1 RELATED DOCUMENTS**

- 6
7 A. Drawings and general provisions of the Contract, including General and Supplementary
8 Conditions and Division 1 Specification Sections, apply to this Section.
9

10 **1.2 SUMMARY**

- 11
12 A. This Section includes the following:
13 1. Wood furring, grounds, nailers and blocking.
14 2. Plywood sheathing and backing. (exterior and interior grade)
15 3. Roof Sheathing. (APA-rated and Fire-rated).
16

17 **1.3 DEFINITIONS**

- 18
19 A. Rough Carpentry: Carpentry work not specified in other Sections and not exposed, unless
20 otherwise specified.
21

22 **1.4 SUBMITTALS**

- 23
24 A. General: Submit each item in this Article according to the Conditions of the Contract and
25 Division 1 Specification Sections.
26
27 B. Product Data for the following products:
28 1. Exterior grade plywood.
29 2. Construction adhesives.
30 3. Roof Sheathing
31
32 C. Wood treatment data as follows, including chemical treatment manufacturer's instructions for
33 handling, storing, installing, and finishing treated materials:
34 1. For waterborne-treated products, include statement that moisture content of treated
35 materials was reduced to levels indicated before shipment to Project site.
36 2. For fire-retardant-treated wood products, include certification by treating plant that treated
37 materials comply with specified standard and other requirements as well as data relative
38 to bending strength, stiffness, and fastener-holding capacities of treated materials.
39
40 D. Material test reports from a qualified independent testing agency indicating and interpreting test
41 results relative to compliance of fire-retardant-treated wood products with requirements indicated.
42

43 **1.5 QUALITY ASSURANCE**

- 44
45 A. Testing Agency Qualifications: To qualify for approval, an independent testing agency must
46 demonstrate to Architect's satisfaction, based on evaluation of agency-submitted criteria
47 conforming to ASTM E 699, that it has the experience and capability to satisfactorily conduct the
48 testing indicated without delaying the Work.
49
50 B. Single-Source Responsibility for Fire-Retardant-Treated Wood: Obtain each type of fire-
51 retardant-treated wood product from one source and by a single producer.
52
53
54

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Keep materials under cover and dry. Protect from weather and contact with damp or wet surfaces. Stack lumber, plywood, and other panels. Provide for air circulation within and around stacks and under temporary coverings.
 - 1. For lumber and plywood pressure treated with waterborne chemicals, place spacers between each bundle to provide air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following or pre-bid approved equal manufacturer:
 - 1. Exterior Wood-Preservative-Treated Materials:
 - a. Chemical Specialties, Inc.
 - b. Continental Wood Preservers, Inc.
 - c. Hickson Corp.
 - d. Hoover Treated Wood Products, Inc.
 - 2. Fire-Retardant-Treated Materials, Interior Type A:
 - a. Chemical Specialties, Inc.
 - b. Continental Wood Preservers, Inc.
 - c. Hickson Corp.
 - d. Hoover Treated Wood Products, Inc.
 - 3. Fire-Retardant-Treated Materials, Exterior Type:
 - a. American Wood Treaters, Inc.
 - b. Hoover Treated Wood Products, Inc.
 - c. Or approved equal.

2.2 LUMBER, GENERAL

- A. Lumber Standards: Comply with DOC PS 20, "American Softwood Lumber Standard," and with applicable grading rules of inspection agencies certified by ALSC's Board of Review.
- B. Grade Stamps: Provide lumber with each piece factory marked with grade stamp of inspection agency evidencing compliance with grading rule requirements and identifying grading agency, grade, species, moisture content at time of surfacing, and mill.
 - 1. For exposed lumber, furnish pieces with grade stamps applied to ends or back of each piece, or omit grade stamps and provide grade-compliance certificates issued by inspection agency.

2.3 WOOD-PRESERVATIVE-TREATED MATERIALS

- A. General: Where lumber or plywood is indicated as exterior grade, preservative treated or is specified to be treated, comply with applicable requirements of AWPA C2 (lumber) and AWPA C9 (plywood). Mark each treated item with the Quality Mark Requirements of an inspection agency approved by ALSC's Board of Review.
 - 1. Do not use chemicals containing chromium or arsenic.
 - 2. For exposed items indicated to receive stained finish, use chemical formulations that do not bleed through, contain colorants, or otherwise adversely affect finishes.
- B. Pressure treat aboveground items with waterborne preservatives to a minimum retention of 0.25 lb/cu. ft. (4.0 kg/cu. m). After treatment, kiln-dry lumber and plywood to a maximum moisture content of 19 and 15 percent, respectively. Treat indicated items and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, wall backing, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
 2. Wood sills, sleepers, blocking, furring, stripping, and similar concealed members in contact with masonry or concrete.
 3. Wood framing members less than 18 inches (460 mm) above grade.
 4. Wood floor plates installed over concrete slabs directly in contact with earth.
- C. Complete fabrication of treated items before treatment, where possible. If cut after treatment, apply field treatment complying with AWPA M4 to cut surfaces. Inspect each piece of lumber or plywood after drying and discard damaged or defective pieces.
- 2.4 FIRE-RETARDANT-TREATED MATERIALS**
- A. General: Where fire-retardant-treated wood is indicated, comply with applicable requirements of AWPA C20 (lumber) and AWPA C27 (plywood). Identify fire-retardant-treated wood with appropriate classification marking of UL; U.S. Testing; Timber Products Inspection, Inc.; or another testing and inspecting agency acceptable to authorities having jurisdiction.
1. Research or Evaluation Reports: Provide fire-retardant-treated wood acceptable to authorities with jurisdiction and for which a current model code research or evaluation report exists that evidences compliance of fire-retardant-treated wood for application indicated.
- B. Interior Type A: For interior locations, use chemical formulation that produces treated lumber and plywood with the following properties under conditions present after installation:
1. Bending strength, stiffness, and fastener-holding capacities are not reduced below values published by manufacturer of chemical formulation under elevated temperature and humidity conditions simulating installed conditions, tested by a qualified independent agency.
 2. No form of degradation occurs due to acid hydrolysis or other causes related to treatment.
 3. Contact with treated wood does not promote corrosion of metal fasteners.
- C. Inspect each piece of treated lumber/plywood after drying, discard damaged or defective pieces.
- 2.5 BOARDS**
- A. Concealed Boards: Where boards will be concealed by other work, provide lumber with 19 percent maximum moisture content.
- 2.6 MISCELLANEOUS LUMBER**
- A. General: Provide lumber for support or attachment of other construction, including support bases, cant strips, bucks, nailers, blocking, furring, grounds, stripping, and similar members.
- B. Fabricate miscellaneous lumber from dimension lumber of sizes indicated and into shapes shown.
- C. Moisture Content: 19 percent maximum for lumber items not specified to receive wood preservative treatment.
- D. Grade: For dimension lumber sizes, provide No. 3 or Standard grade lumber per ALSC's NGRs of any species. For board-size lumber, provide No. 3 Common grade per NELMA, NLGA, or WWPA; No. 2 grade per SPIB; or Standard grade per NLGA, WCLIB or WWPA of any species.
- 2.7 CONCEALED, PERFORMANCE-RATED STRUCTURAL-USE ROOF PANELS**
- A. General: Where structural-use panels are indicated for the following concealed types of

- applications, provide APA-performance-rated panels complying with requirements designated under each application for grade, span rating, fire-rated, exposure durability classification, and edge detail (where applicable).
1. Thickness: Provide panels meeting requirements specified, not less than 23/32" thickness. For roof panels use minimum 3/4 inch thickness with H-clip or tongue-and-groove joints. Exposure Durability Classification: Exterior; FM90 and Class B roof assembly.
 2. Span Ratings: Provide panels with span ratings required to meet "Code Plus" provisions of APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial."

2.8 STRUCTURAL-USE PANELS FOR BACKING

- A. Plywood Backing Panels: For mounting electrical or telephone equipment, provide fire-retardant-treated plywood panels with grade, C-D Plugged Exposure 1, in thickness indicated or, if not otherwise indicated, not less than 15/32 inch (11.9 mm) thick (where applicable).

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

- A. Discard units of material with defects that impair quality of rough carpentry and that are too small to use with minimum number of joints or optimum joint arrangement.
- B. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted.
- C. Fit rough carpentry to other construction; scribe and cope as required for accurate fit. Correlate location of furring, nailers, blocking, grounds, and similar supports to allow attachment of other construction.
- D. Apply field treatment complying with AWPAs M4 to cut surfaces of preservative-treated lumber and plywood.
- E. Securely attach rough carpentry work to substrate by anchoring per "Recommended Nailing Schedule" of framing standard and AFPA's "National Design Specifications for Wood Construction."
- F. Use common wire nails, unless otherwise indicated. Use finishing nails for finish work. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood; pre-drill as required.
- G. Use hot-dip galvanized or stainless-steel nails where rough carpentry is exposed to weather, in ground contact, or in area of high relative humidity.
- H. Countersink nail heads on exposed carpentry work and fill holes with wood filler.

3.2 WOOD GROUNDS, NAILERS, BLOCKING, AND SLEEPERS

- A. Install wood grounds, nailers, blocking, and sleepers where shown and where required for screeding or attaching other work. Form to shapes shown and cut as required for true line and level of attached work. Coordinate locations with other work involved.
 1. Provide continuous wood blocking for ALL cabinets and equipment requiring attachment to walls, partitions, and ceilings, including but not limited to, hardware (wall stops, magnetic hold-opens, etc.), cabinets and shelving units mounted/attached to partitions, marker boards, tack boards, mechanical and electrical equipment, etc. where applicable.

- B. Attach to substrates to support applied loading. Recess bolts and nuts flush with surfaces, unless otherwise indicated. Build into masonry during installation of masonry work.
- C. Provide all fire-treated/ moisture-treated blocking for roof attachment as indicated on the drawings.

3.3 INSTALLATION OF STRUCTURAL-USE PANELS

- A. General: Comply with applicable recommendations contained in APA Form No. E30, "APA Design/Construction Guide: Residential & Commercial," for types of structural-use panels and applications indicated.
 - 1. Back and edge prime: seal all edges of all exterior construction plywood sheathing with primer/sealer to protect panels from water and humidity during installation.
- B. Fastening Methods: Fasten panels as indicated below:
 - 1. Sheathing: Nail or staple to framing.
 - a. Space panels 1/8 inch (3 mm) at edges and ends.
 - 2. Plywood Backing Panels: Nail or screw to supports.
 - 3. As indicated on the drawings and recommended by manufacturer.
- C. Moisture Protection: Cover roof sheathing w/ roofing felt to protect against moisture prior to roofing application.

END OF SECTION 06100

SECTION 07145 - SPRAY-APPLIED WATERPROOFING MEMBRANE

PART 1 GENERAL

1.01 SUMMARY

- A. Section includes:

Fluid-applied waterproofing membrane system specifically designed for co-spray-application, all applicable sealants, elastomeric flashings and protection board needed to prevent water penetration and methane penetration at locations applied. Fluid-applied waterproofing and/or methane barrier membrane indicated on the drawings, including surface preparation of concrete surfaces, sealing of form ties, cracks, joints and applications.
- B. Related work:
 - 1. Documents affecting work of this Section include, but are not necessarily limited to, General Conditions, Supplementary Conditions, and Sections in Division 1 of these Specifications.

1.02 SUBMITTALS

- A. Comply with provisions of Section 01300.
- B. Product data:
 - 1. Materials list of items to be provided under this Section;
 - 2. Manufacturer's specifications and other data needed to prove compliance with the specified requirements;
 - 3. Shop Drawings or catalog illustrations in sufficient detail to show installation and interface of the work of this Section with the work of adjacent trades;
 - 4. Manufacturer's current recommended installation procedures which, when reviewed by Architect, will become the basis for accepting or rejecting actual installation procedures used on the Work.

1.03 QUALITY ASSURANCE

- A. Use skilled workmen thoroughly trained and experienced in the necessary crafts and completely familiar with the specified requirements and methods needed for proper performance of the work of this Section.
- B. Applicator qualifications:
 - 1. Applicator shall have at written approval from the manufacturer as recommended for the installation of the spray-applied waterproofing.
 - 2. Applicator shall designate a single individual as project foreman who shall be on site at all times during installation.

1.04 DELIVERY, STORAGE AND HANDLING

- A. Deliver materials to job site in manufacturer's unopened containers with all labels intact and legible at time of use.

- B. Maintain the products in accord with manufacturer's recommendations with proper precautions to ensure fitness of material when installed.
- C. Protect waterproofing materials from freezing prior to application. Store material above 50°F.
- D. Store membrane and protection board off the ground. Provide cover on top and all sides.
- E. Comply with pertinent provisions of Section 01600.

1.05 SUBSTRATE CONDITIONS

- A. General:
 - 1. Provide concrete or masonry backfilled wall surfaces that are broom clean, dry, sound and free of voids, bugholes, rockpockets, honeycombs, protrusions, excessive roughness, foreign matter, frost, ice and other contaminants which may inhibit application or performance of the waterproofing and methane membrane system.
 - 2. Using suitable abrasive methods, remove residue of form release, curing compound, chemical retarders and other surface treatments, laitance, mortar smear, sawcutting residue, mill scale, rust, loose material and other contaminants from concrete and masonry backfilled wall surfaces to receive the work of this Section.
- B. Concrete: Where work of this Section will be applied to concrete, provide surfaces that are smooth. Bug holes and voids shall not exceed 1/8' depth. Fill all bug holes and voids that exceed 1/8" with approved trowel mortar and fill other concrete defects as deemed necessary by the membrane manufacturer.
- C. Penetration:
 - 1. Rigidly install pipe, vents and other surface protrusions, properly flash them, and Stainless Steel Band them to provide a waterproofing and methane barrier.
 - 2. Do not use corrugated pipe for any penetrations, use solid rigid pipe only.
- D. Joints and Seams: Configuration shall be consistent with this Section and with all other requirements of the Contract Documents and per manufacturer's details and application instructions.

1.06 WARRANTY

- A. Deliver to the Architect signed copies of the following written warranties against defective materials and workmanship for a period of ten years following date of completion. Warrant that installed waterproofing / methane membrane system shall be free of defects including adhesive failure, cohesive failure, methane failure and waterproofing failure.
 - 1. Manufacturer's ten year standard warranty covering materials;
 - 2. Applicator's two year standard warranty covering workmanship.

PART 2 PRODUCTS

2.01 GENERAL

- A. Fluid-Applied Waterproofing Membrane: Fluid-applied waterproofing and methane barrier membrane manufactured by Tremco (basis of design), an environmentally responsible, single

component, polymer-modified asphalt material. Membrane meets and/or exceeds the performance requirements as noted on the current product literature data sheet.

TYPICAL PHYSICAL PROPERTIES/Property Test Method/Requirement Typical Values

Adhesion to Concrete ASTM C794; 1 pli per ASTM C836

Exceeds Elongation D412 800%

Crack Bridging Ability ASTM C1305 Pass (*Tested at recommended application thickness of 60 dry mils)

Water Vapor Transmission E96, wet cup 0.0251 g/h*m₂

Water Vapor Permeance E96, wet cup 0.09 perms 5.47 X 10⁻⁹ g/Pa*S*m²

Water Vapor Permeability E96, wet cup 0.0054 perm inch, 50% R.H.

Hardness, Type 00 ASTM D2240 as modified in section Passes 5.5 of ASTM C836; 50 minimum

Stability (80° F/26.7° C) 6 months Minimum 1 year

Vertical Hold 60 mils Minimum 100 wet mils

Solids 60%,Density 8.3 lbs/gal

Approved by the City of Los Angeles as a waterproofing and methane barrier membrane

2.02 ACCESSORIES

- A. Joint backing: Closed-cell, polyethylene rod as recommended by membrane manufacturer.
- B. Joint Treatment:
 - 1. Acceptable product(s):
 - a. Dymeric 240FC; Tremco Inc.
 - b. Dymonic 100; Tremco Inc.
 - c. Or prior approved equal
 - 2. Base Material: Approved Base Material for below slab on grade, below slab, and blindside wall conditions upon approval by the manufacturer.
- C. Protection Board:
 - 1. Acceptable product(s): Provide an approved protection board Tremco 2450, composed of an extruded, hollow-core polypropylene/polyethylene copolymer with a standard thickness of .08 inch (2.2mm). Sheet size 39 in. x 44 in.

PART 3 EXECUTION

3.01 SURFACE CONDITIONS

- A. Coordinate as required with other trades to assure proper and adequate provision in the work of those trades for interface with the work of this Section.
- B. Applicator shall examine the areas and conditions under which work of this Section will be performed.
 - 1. Verify conformance with manufacturer's requirements;
 - 2. Report unsatisfactory conditions in writing to the General Contractor and/or Architect;
 - 3. Do not proceed until unsatisfactory conditions are corrected.

3.02 PREPARATION

- A. Surface preparation and detailing procedures to be in accordance with waterproofing membrane system manufacturer's instructions and recommendations except where more stringent requirements are indicated.
- B. On poured concrete walls, remove wall ties on outside and inside of wall. On poured concrete walls, tie holes and other voids, honeycomb, rock pockets, etc. shall be patched with a non-shrinking grout. Refer to manufacturer's detail drawings for repair and/or waterproofing of any cracks or non-moving control joints and/or other common waterproofing situations. Dymeric 240FC is recommended wherever trowel grade flashing materials are needed or shown in detail drawings.
- C. Rout, clean, prepare and detail surface cracks in accord with manufacturer's instructions; install backer rod where required.
- D. Install 1/4" diameter backer rod into corner of all horizontal-to-vertical junctures subject to movement and cover with 1" detail cant of approved sealant.
- E. Install detail coats, joint and crack treatments, and liquid flashings in accordance with manufacturer's instructions.
- F. Allow detail applications to cure in accordance with manufacturer's instructions prior to general application of membrane.
- G. Prepare all under slab and below slab on grade to meet manufacturer requirements.

3.03 APPLICATION

- A. General: Install waterproofing system in accordance with manufacturer's recommendations and instructions as applies to the Work except where more stringent requirements are indicated.
 - 1. Membrane shall have a minimum 90 mil wet film thickness producing a 60 mil dry film sprayed at 18 square feet per gallon.
 - 2. Grid surfaces to assure proper coverage rates and verify membrane wet mil film thickness with gauges as work progresses.
- B. Verify proper condition of substrate using method recommended by membrane system manufacturer; perform adhesion checks prior to general application of membrane system using field adhesion test method recommended by manufacturer.
- C. Mask off adjoining surfaces not to receive membrane system.
- D. Overlap existing work by 4" with new work. Do not co-spray the membrane between the seams.
- E. Spray apply the membrane uniformly and allow it to cure in accord with manufacturer's instructions.
- F. Install the protection board over the cured membrane in accordance with manufacturer's instructions.

3.04 PROTECTION AND CLEAN-UP

- A. Promptly remove material of membrane system material from adjacent surfaces which will be exposed in the completed work.
- B. Prohibit traffic over completed work and protect against work overhead until fully cured.

END OF SECTION

SECTION 07210 - BUILDING INSULATION

1 PART - 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. This Section includes the following:
 - 1. Concealed building insulation.
 - 2. Under slab and perimeter foundation walls.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 7 Section "Modified Bituminous Sheet Roofing" for insulation specified as part of roofing construction.
 - 2. Division 9 Section indicated below for acoustical insulation installed as part of metal-framed wall and "Gypsum Board" partition assemblies.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of insulation product specified.
- C. Product test reports from and based on tests performed by a qualified independent testing agency evidencing compliance of insulation products with specified requirements including those for thermal resistance, fire-test-response characteristics, water-vapor transmission, water absorption, and other properties, based on comprehensive testing of current products.
- D. Research or evaluation reports of the model code organization acceptable to authorities having jurisdiction that shows compliance of insulations with building code in effect for Project.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Insulation Products: Obtain each type of building insulation from a single source with resources to provide products complying with requirements indicated, without delaying the Work.
- B. Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated on Drawings or specified elsewhere in this Section as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.
 - 1. Surface-Burning Characteristics: ASTM E 84.
 - 2. Fire-Resistance Ratings: ASTM E 119.
 - 3. Combustion Characteristics: ASTM E 136.

1.5 DELIVERY, STORAGE, AND HANDLING

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

2 PART - PRODUCTS

2.1 MANUFACTURERS

- A. Subject to compliance with requirements, provide insulation products by one of the following:
 - 1. Glass-Fiber Insulation (stud infill insulation):
 - a. CertainTeed Corporation.
 - b. Johns Manville
 - c. Knauf Fiber Glass GmbH.
 - d. Owens-Corning Fiberglas Corporation.
 - e. Schuller International, Inc.

2.2 INSULATING MATERIALS

- A. General: Provide insulating materials that comply with requirements and with referenced standards.
 - 1. Preformed Units: Sizes to fit applications indicated; selected from manufacturer's standard thicknesses, widths, and lengths.
- B. Faced Glass-Fiber Blanket Insulation: Thermal insulation combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665, Type III, Class A (blankets with reflective vapor-retarder membrane facing with flame spread of 25 or less, and smoke development of 50 or less); Category 1, foil-scrim vapor-retarder membrane on 1 face.
 - 1. Mineral-Fiber Type: Fibers manufactured from glass.
 - 2. Flanged Units: Provide blankets fabricated with facing incorporating 5-inch- (127-mm-) wide flanges along edges for attachment to framing members.
 - 3. Thickness: 3-1/2" R-15 HD and 6-1/4", R-19, unless otherwise noted on the drawings.
- D. Thermafiber Safing: 4.0 pcf, 18 inch thickness, width and length to suit.
- E. Extruded polystyrene board insulation: Thermal insulation with closed cell and integral high density skin to comply with Type IV, 1.6 lbs./cu. ft min. density. Equal to Foamular 250. R-5 per inch. Minimum of 2 inches thick at foundations to the greatest limits of that shown on the drawings or to the limits of frost as identified by local building code.
- F. Insulating Foam: Provide expandable insulating foam for use in "hard to insulate spaces" around/between stud cavities and intersections with door and window frames, corner and header conditions where multi-stud construction prevents complete fill with blanket insulation, and in enclosed structural members within wall cavities as required by the drawings.
 - 1. Use Hilti CF-128 Insulating Foam or approved equal.

2.3 AUXILIARY INSULATING MATERIALS

- A. Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.
- B. Foil Tape: Type recommended by insulation manufacturer to seal all joints and repair damage to integral vapor barrier, complying with requirements for fire performance characteristics in all faced insulation blankets.

3 PART - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions, with Installer present, for compliance with requirements of

Sections in which substrates and related work are specified and to determine if other conditions affecting performance of insulation are satisfactory. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Clean substrates of substances harmful to insulations, including removing projections capable of puncturing vapor retarders or that interfere with insulation attachment.

3.3 INSTALLATION, GENERAL

- A. Comply with manufacturer's written instructions applicable to products and application indicated.
- B. Install insulation that is undamaged, dry, unsoiled, and has not been exposed to ice and snow.
- C. Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.
- D. Apply single layer of insulation to produce thickness indicated, unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF GENERAL BUILDING INSULATION

- A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.
- B. Seal joints between closed-cell (non-breathing) insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.
- C. Set vapor-retarder-faced units with vapor retarder to warm side of construction, unless otherwise indicated. Do not obstruct ventilation spaces, except for firestopping.
 - 1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.
- D. Install mineral-fiber blankets in cavities formed by framing members according to the following requirements:
 - 1. Use blanket widths and lengths that fill cavities formed by framing members. Where more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends.
 - 2. Place blankets in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.
 - 3. Provide foam insulation at small voids, intersections in studs, at structural framing, and at other locations where impractical to insulate with blanket type insulation.

3.5 PROTECTION

- A. General: Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

END OF SECTION 07210

SECTION 07240 - EXTERIOR INSULATION AND FINISH SYSTEMS

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. This Section includes the following:
 - 1. Applications for new exterior wall construction with door and window systems. **Match existing color, texture and finish and as otherwise shown on the drawings.**
- B. Related Sections: The following Sections contain requirements that relate to this Section
 - 1. Division 4 Section "Unit Masonry" for system wall substrate where located on drawings.
 - 2. Division 5 Section "Cold-Formed Metal Framing" for system wall substrate where located on drawings.
 - 3. Division 7 Section "Joint Sealants" for requirements specified by reference in this Section for sealing joints in system with elastomeric joint sealants.
 - 4. Section 7 Section "Flashing and Sheet Metal" for requirements with flashings and trim.

1.3 DEFINITIONS

- A. Exterior insulation and finish systems refer to exterior assemblies composed of an inner layer of board insulation and an outer layer composed of a glass-fiber-mesh-reinforced base coat applied directly to board insulation and a textured protective finish coat. These assemblies are applied to supporting masonry and exterior grade sheathing over metal framing substrates of construction.
- B. System manufacturer refers to the manufacturer of exterior insulation and finish systems.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide systems that comply with the following performance requirements:
 - 1. Bond Integrity: Free from bond failure within system components or between system and supporting wall construction, resulting from exposure to fire, wind loads, weather, or other in-service conditions.
 - 2. Weather-tightness: Resistant to water penetration from exterior into system and assemblies behind it or through them into interior of building that results in deterioration of thermal-insulating effectiveness or other degradation of system and assemblies behind system.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product data for each component of exterior insulation and finish systems required to match, patch and repair existing system.

- 1 C. Samples for verification in the form of 24-inch square panels for finish, color and texture
2 required to match existing installation. Prepare samples using same tools and techniques
3 intended for actual work. **EIFS Contractor shall visit site, review, and match finish, color,**
4 **texture and pattern required for each repair/refinish area prior to sample submittal.**
5
6 D. Installer certificates signed by manufacturer certifying that Installers comply with
7 requirements under the "Quality Assurance" Article.
8
9 E. Qualification data for firms and persons specified in the "Quality Assurance" Article to
10 demonstrate their capabilities and experience. Include lists of completed projects with
11 project names, names and address of architects and owners.
12
13 F. Sealant compatibility and adhesion test reports from sealant manufacturer indicating that
14 materials forming joint substrates and joint sealant backings have been tested for
15 compatibility and adhesion with joint sealants; include joint sealant manufacturers'
16 interpretation of test results relative to sealant performance and recommendations for
17 primers and substrate preparation needed to obtain adhesion.
18

19 **1.6 QUALITY ASSURANCE**

- 20
21 A. Installer Qualifications: Engage an experienced Installer minimum of 5 years who has
22 completed systems similar in material, design, and extent to that indicated for this Project
23 and with a record of successful in-service performance.
24
25 B. Manufacturer Qualifications: Firm experienced in manufacturing systems similar to those
26 indicated for this Project and that have a record of successful in-service performance.
27
28 C. Single-Source Responsibility: Obtain materials for system from one source and by a single
29 manufacturer or by manufacturers approved by the system manufacturer as compatible with
30 other system components.
31

32 **1.7 DELIVERY, STORAGE, AND HANDLING**

- 33
34 A. Deliver products in original, unopened packages with manufacturer's labels identifying
35 products legible and intact.
36
37 B. Store materials inside and under cover; keep them dry and protected from the weather,
38 direct sunlight, surface contamination, aging, corrosion, damaging temperatures, damage
39 from construction traffic, and other causes.
40

41 **1.8 PROJECT CONDITIONS**

- 42
43 A. Environmental Conditions: Do not install system when ambient outdoor air and substrate
44 temperatures are 40 deg F (4 deg C) and falling unless temporary protection and heat are
45 provided to maintain ambient temperatures above 40 deg F (4 deg C) during installation of
46 wet materials and until they have dried thoroughly and become weather resistant, but for not
47 less than 24 hours after installation.
48

49 **1.9 COORDINATION AND SCHEDULING**

- 50
51 A. Coordinate installation of system with related units of Work specified in other Sections.
52

53 **PART 2 - PRODUCTS**

1 **2.1 MANUFACTURERS**

- 2 A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering
3 systems that may be incorporated in the Work include, but are not limited to, the following:
4 1. **Basis of Design:** STO Industries; StoTherm ci Essence with continuous air/moisture
5 barrier.
6 2. Dryvit Systems, Inc.
7 3. Senergy, Inc.

8
9 **2.2 MATERIALS**

- 10 A. Compatibility: Provide adhesive, board insulation, reinforcing fabrics, base and finish coat
11 materials, sealants, and accessories that are compatible with one another and will match
12 existing systems as approved for use by the system manufacturer.
13
14 B. Colors and Textures of Finish Coat: Comply with the following requirements:
15 1. Verify through inspection and match colors and textures of existing installation, preparing
16 sample boards for review and approval of Architect, prior to commencing any work.
17
18 C. StoGuard: continuous waterproof air barrier.
19 1. StoGuard RapidSeal over masonry, under window framing prior to applied air barrier.
20
21 D. Adhesive for Application of Insulation: System manufacturer's standard formulation
22 designed for indicated use, compatible with substrate, and complying with the following
23 requirements:
24 1. Job-mixed formulation of Portland cement complying with ASTM C 150, Type I, and
25 polymer-based adhesive specified for base coat.
26
27 E. Molded Polystyrene Board Insulation: Rigid cellular thermal insulation formed by the
28 expansion of polystyrene resin beads or granules in a closed mold, complying with
29 ASTM C 578 for Type I, approved by system manufacturer for material qualities including
30 corner squareness, other dimensional tolerances, and the following:
31 1. Age insulation in block form prior to cutting and shipping by air drying for not less than
32 6 weeks or by another method approved by system manufacturer that produces
33 equivalent results.
34 2. Provide insulation in boards not more than 24 by 48 inches (610 by 1219 mm) and in
35 thickness required to suit existing condition.
36
37 F. Reinforcing Fabric: Balanced, alkali-resistant open-weave glass-fiber fabric treated for
38 compatibility with other system materials, made from continuous multi-end strands with
39 tensile strength of not less than 145 lb (645 N) and 150 lb (667 N) in warp and fill directions
40 per ASTM D 5035, complying with ASTM D 578 and the following requirements for minimum
41 weight:
42 1. Standard Reinforcing Fabric: 4.0 oz./sq. yd. (136 g/sq. m).
43
44 G. Base Coat Materials: System manufacturer's standard mixture, complying with the following
45 requirements for material composition and method of combining materials:
46 1. Job-combined formulation of manufacturer's standard polymer emulsion adhesive and
47 manufacturer's standard dry mix containing Portland cement.
48
49 H. Finish Coat Materials: System manufacturer's standard mixture complying with the following
50 requirements for material composition and method of combining materials:
51 1. Factory-mixed Sto Essence ready-mixed, acrylic- based DPR Finish.
52
53 I. Water: Clean and potable.
54

- J. Trim Accessories: Type as required to suit existing conditions and to comply with system manufacturer's requirements, manufactured from vinyl plastic and complying with ASTM C 1063.
1. Casing Bead: Prefabricated 1-piece type for attachment behind insulation, of depth required to suit thickness of coating and thickness of insulation as well, with face leg perforated for bonding to coating.
 2. Drip Screed: Prefabricated 1-piece type for attachment behind insulation, of depth required to suit thickness of coating and thickness of insulation as well, with face leg perforated for bonding to coating and extended to form a drip.

2.3 ELASTOMERIC SEALANTS

- A. Sealant Products: Provide system manufacturer's recommended chemically curing, elastomeric sealant that is compatible with joint fillers, joint substrates, and other related materials and complies with requirements of Division 7 Section "Joint Sealants" for products corresponding to description indicated below.
- B. Sealant Color: Match finish coat color of existing system. If conflict arises, notify Architect.

2.4 MIXING

- A. General: Comply with system manufacturer's requirements for combining and mixing materials. Do not introduce admixtures, water, or other materials except as approved by system manufacturer. Mix materials in clean containers. Use materials within time period specified by system manufacturer or discard.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine existing conditions, substrates, with Installer present, to determine if they are in satisfactory condition for installation of system. Do not proceed with installation of system until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Protect contiguous work from moisture deterioration and soiling resulting from application of systems. Provide temporary covering and other protection needed to prevent spattering of exterior finish coatings on other work.
- B. Protect system, substrates, and wall construction behind them from inclement weather during installation. Prevent infiltration of moisture behind system and deterioration of substrates.
- C. Prepare and clean substrates to comply with system manufacturer's requirements to obtain optimum bond between substrate and adhesive for insulation.
 1. Apply primer-sealer over substrates where required by system manufacturer for improving adhesion or for protecting substrates from premature degradation.

3.3 INSTALLATION

- A. Comply with manufacturer's current published instructions for installation of system as

1 applicable to each type of existing substrate that occurs.

- 2
- 3 B. Apply moisture barrier to masonry and exterior grade sheathing over metal substrates, 2
- 4 coats minimum, as recommended by manufacturer.
- 5
- 6 C. Apply trim accessories at perimeter of system, at expansion joints, and elsewhere to match
- 7 integrity of system. Use drip screed at bottom edge of system. Use casing beads at other
- 8 locations.
- 9
- 10 D. Adhesively attach insulation to comply with the following requirements:
- 11 1. Allow adhered insulation to remain undisturbed for period prescribed by system
- 12 manufacturer, but not less than 24 hours, prior to beginning rasping and sanding
- 13 insulation or application of base coat and reinforcing fabric.
- 14 2. Interlock ends at internal and external corners.
- 15 3. Abut boards tightly at joints within and between each course to produce flush,
- 16 continuously even surfaces without gaps or raised edges between insulation boards. If
- 17 gaps occur, fill with insulation cut to fit gaps exactly; insert without use of adhesive.
- 18 4. Cut insulation to fit openings, corners, and projections precisely and to produce edges
- 19 and shapes conforming to details required to match existing installation.
- 20 5. Rasp or sand flush entire surface of insulation to remove irregularities projecting more
- 21 than 1/32 inch (0.8 mm) from surface of insulation and to remove yellowed areas due
- 22 to sun exposure; do not create depressions deeper than 1/16 inch (1.6 mm).
- 23 6. Cut grooves, rabbets, and other features in outside face of insulation with high-speed
- 24 router and bit configured to produce grooves, rabbets, and other features that conform
- 25 accurately to profiles and locations indicated. Do not reduce insulation thickness at
- 26 features to less than 3/4 inch (19 mm)
- 27 7. Form joints for sealant application by leaving gaps between adjoining insulation edges
- 28 as well as between insulation edges and dissimilar adjoining surfaces. Make gaps
- 29 wide enough to produce joint widths indicated after encapsulation of joint substrates
- 30 with base coat, reinforcing fabric, and finish coat.
- 31 8. Treat exposed edges of insulation board, including those forming substrates of sealed
- 32 joints within system or between system and other work, by encapsulating with base
- 33 coat, reinforcing fabric, and finish coat, unless otherwise indicated.
- 34 9. Treat edges of insulation board at trim accessories by extending base coat, reinforcing
- 35 fabric, and finish coat over face leg of accessories.
- 36
- 37 E. Apply base coat to exposed surfaces of insulation in minimum thickness specified by system
- 38 manufacturer.
- 39
- 40 F. Embed reinforcing fabric of type indicated below in wet base coat to produce wrinkle-free
- 41 installation with fabric continuous or lapped at corners and lapped or otherwise treated at
- 42 joints to comply with system manufacturer's requirements. Completely embed fabric, applying
- 43 additional base coat material if necessary, so that reinforcing fabric pattern is not visible.
- 44
- 45 G. Additional Reinforcing Fabric: Apply strip reinforcing fabric around openings extending 4
- 46 inches (100 mm) beyond perimeter. Apply additional 8 by 16 inch (200 by 400 mm) strip
- 47 reinforcing fabric diagonally at corners of openings (re-entrant corners). Apply 8-inch-
- 48 (200-mm-) wide strip reinforcing at both inside and outside corners unless base layer of
- 49 fabric is lapped at least 4 inches (100 mm) on each side of corner
- 50 1. At decorative grooves (false joints), apply strip reinforcing at least 8 inches (200 mm) wide.
- 51 2. Embed strip reinforcing fabric in base coat before applying first layer of reinforcing fabric.
- 52
- 53 H. Double Base Coat Application: Where required to match existing application, apply a second
- 54 base coat in same manner as first application, except without reinforcing fabric. Do not apply

1 until first base coat has cured.

- 2
- 3 I. Apply finish coat over dry base coat in thickness required by system manufacturer to produce a
- 4 uniform finish of texture and color matching approved sample.
- 5 1. Embed aggregate in finish coat following system manufacturer's recommendations to
- 6 produce a uniform applied aggregate finish of color and texture matching existing
- 7 installation and approved sample.
- 8

9 **3.4 INSTALLATION OF JOINT SEALANTS**

- 10
- 11 A. Prepare joints and apply sealants, of type and at locations to maintain the integrity of the
- 12 existing system, to comply with applicable requirements of Division 7 Section "Joint Sealants"
- 13 and with EIMA "Joint Sealant Specifications for Exterior Insulation and Finish Systems (EIFS).
- 14 1. Clean surfaces to receive sealants to comply with indicated requirements and system
- 15 manufacturer's recommendations.
- 16 2. Apply primer recommended by sealant manufacturer for surfaces to be sealed.
- 17 3. Install sealant backing to control depth and configuration of sealant joint and to prevent
- 18 sealant from adhering to back of joint.
- 19 4. Apply masking tape to protect areas adjacent to sealant joints. Remove tape immediately
- 20 after tooling joints without disturbing joint seal.
- 21 5. Recess sealant sufficiently from surface of system so that an additional sealant
- 22 application, including backing rod, can be installed without protruding beyond the system
- 23 surface.
- 24 6. Apply joint sealants after base coat has cured but before applying finish coat.
- 25

26 **3.5 CLEANING AND PROTECTION**

- 27
- 28 A. Remove temporary covering and protection of other work. Promptly remove coating
- 29 materials from window and door frames and other surfaces outside areas indicated to
- 30 receive system coatings.
- 31
- 32 B. Provide final protection and maintain conditions in a manner acceptable to Installer and
- 33 system manufacturer that ensures system's being without damage or deterioration at time of
- 34 Substantial Completion.
- 35

36 **END OF SECTION 07240**

37

SECTION 07552 - MODIFIED BITUMINOUS SHEET ROOFING

1.1 SECTION INCLUDES

- A. APP-Modified Bituminous Roof Systems.
- B. Roof Insulation.
- C. Roof Flashings.
- D. Existing Roof Repair/interface with new roofing, shall be warranty compatible with all existing roofing system components and attachment conditions.

1.2 RELATED SECTIONS

- A. Section 06100 - Rough Carpentry: fire-treated roof sheathing.
- B. Section 07600 - Sheet Metal Flashing and Trim.

1.3 DESCRIPTION

- A. Furnish and install weather and watertight modified bitumen roof complete, in place, as shown on the drawings, specified herein, and needed for a complete and proper installation.

1.4 REFERENCES

- A. American Society for Testing and Materials, Philadelphia, PA
- B. Factory Mutual Engineering Research Corp.
- C. National Roofing Contractors Association, Rosemont, IL
- D. Underwriters Laboratories, Northbrook, IL

1.5 SUBMITTALS

- A. Submit under provisions of Section 01300.
- B. Product Data: Manufacturer's data sheets on each product to be used, including:
 - 1. **Manufacturer's published specifications, base flashing details, and installation** instructions for the specified system.
 - 2. Submit Material Safety Data Sheets on all roofing materials to be used.
- C. Shop Drawings: Provide plan, section, elevation and perspective drawings as necessary to depict all flashing and project conditions on the project, including but not limited to the following:
 - 1. Roof system and base flashing configuration.
 - 2. Penetration details.
 - 3. Termination details.
 - 4. Cover board details.
 - 5. Fastening patterns.
 - 6. Tapered insulation and wood nailer design for roof slopes greater than 2/12.
- D. Verification Samples: For each finish product specified, two samples, minimum size 6 inches (150 mm) square, representing actual product, and color.
- E. Manufacturer's Certificates: Certify products meet or exceed specified requirements.
- F. Closeout Submittals: Provide an executed copy of the manufacturer's warranty outlining its terms, conditions, and exclusions from coverage.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: All primary products specified in this section shall be supplied by a single manufacturer with a minimum of 10 years experience.
- B. Installer Qualifications: A single installer, approved by the roof system manufacturer, with a minimum of 3 years documented experience in installing products of the same type and scope as specified.
- C. Organize a pre-installation conference held approximately two weeks prior to commencing Work specified. Representatives of the Owner, Architect, roofing contractor, installer, roof consultant and roofing systems manufacturer must be present.
 - 1. Review installation procedures, materials to be used, submittals, schedules, and all related work required under this section. Finalize schedule and confirm availability of materials, equipment, installer's personnel, and facilities needed to complete work as planned.
 - 2. Review anticipated weather conditions and procedures for coping with unfavorable conditions, and maintaining the water tightness of the roof system.
 - 3. Tour roofing areas, inspect and discuss condition of substrate, roof drains, penetrations, curbs, and any work performed by other trades.
 - 4. Review structural loading limitations of deck and inspect deck for acceptability as roof substrate.
 - 5. Review inspection and quality control procedures to be used.
- D. Roofing systems manufacturer shall provide qualified company personnel to attend pre-construction and in-progress meetings, and to perform periodic job site visits as necessary. Manufacturer shall also provide field inspectors to perform regular in-progress and final quality assurance inspections. Provide copies of the manufacturer's field auditor inspection report to the Architect, roof consultant and Owner.
- E. Exterior Fire-Test Exposure ASTM E 108, Class B for application and roof slopes indicated, as determined by testing identical membrane roofing materials by a qualified testing agency. Materials shall be identified with appropriate markings of applicable testing agency.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Store products in manufacturer's unopened packaging until ready for installation.
- B. Store pail goods in their original undamaged containers in a clean, dry location within their specified temperature range.
- C. Store roll goods on end on pallets in a clean, dry, protected area. Do not double stack modified bitumen products.
- D. Store and dispose of hazardous materials, and materials contaminated by hazardous materials, in accordance with requirements of local authorities having jurisdiction.

1.8 SCHEDULING

- A. Work is to be performed on a daily basis with each section completed before progressing to the next day's work unless specifically directed otherwise by the Owner's Representative.
- B. Completion of work will be defined as the installation of all specified roof preparation, insulation, membrane, flashings, counterflashings, sheet metal, fasteners and caulking.

1.9 WARRANTY

- A. Provide manufacturer's roof system guaranty with single source coverage and no monetary limitation (NDL) where the manufacturer agrees to repair or replace

components in the roofing system, which cause a leak due to a failure in materials or workmanship.

1. Duration: Ten years from the date of substantial completion.

- B. Contractor (Installer) shall warrant all materials and workmanship for a period of Two years from the date of acceptance of the completed work by the Owner. The Contractor shall make good any defects in materials or workmanship that may develop during the two-year period by repairing or replacing such defects at his own expense without cost to the Owner. Contractor shall use the form provided at the end of this section.

PART 2 PRODUCTS

2.1 GENERAL

A. All materials used on this project shall be compatible with the existing conditions and with each other.

B. No product shall contain any asbestos or asbestos-related products.

2.2 ACCEPTABLE MANUFACTURERS

A. Basis-of-Design: Products manufactured or accepted by:

1. Derbigum Americas Inc. or Pre-bid approved equal.

2.3 MATERIALS

A. Modified Bitumen Roof Membrane

1. Two-ply APP-modified bitumen membrane reinforcement; bottom ply shall be unsurfaced, top ply shall have a granular surface and be fire rated.

a. Granule-Surfaced Roofing Membrane Cap Sheet: ASTM D 6222, Grade G, 180 mil Type II, APP-modified asphalt sheet (mid-reinforced with polyester fabric); granular surfaced; fire rated (FR) suitable for application method specified. Granule color shall match existing roof color from the Manufacturer's standard color offerings.

B. Two-Ply Base Flashings

1. Deribase and Derbicolor GP by Derbigum Americas Inc.

C. Roofing Adhesive

1. Adhesive for Horizontal Application

a. Permastic by Derbigum Americas Inc.

2. Adhesive for Sloped and Vertical Applications

a. Perflash by Derbigum Americas Inc.

D. Asphalt Roof Cement

1. Complying with ASTM D 4586, asphalt roof cement (asbestos free) or roofing membrane Manufacturer supplied modified asphalt roof cement (asbestos free) as required.

E. Reinforcing Fabric

1. Shall comply with ASTM D 1668-1.

F. Asphalt Primer

1. Complying with ASTM D 41. Asphalt primer shall not be thinned.

G. Fasteners

1. Corrosion-resistant, self-tapping, self-drilling #12 screw with #3 phillips head, with a withdraw resistance of a minimum of 100 psi. Fasteners shall be carbon steel with corrosion-resistant coating.

2. Galvalume coated steel plate, supplied by fastener Manufacturer.

- H. Bead-Applied Polyurethane Adhesive
1. Dual component polyurethane adhesive, used to attach roof insulation board to substrates. OlyBond 500 by OMG or Weather-Title Surface Treatment and one Step Foamable Adhesive by Millennium Adhesive Products, Inc.
- I. Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Class 1, Grade 2 felt or glass-fiber mat facer on both major surfaces.
1. Provide insulation package with minimum R Value of 25.00.
 - a. First layer with minimum thickness 2.3" – Mechanically Fastened.
 - b. Second layer 2.3" - Dimensions: 48 inch by 48 inch – Bead-Applied two-component urethane Adhesive.
- J. Tapered Insulation: Provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48) Dimensions: 48 inch by 48 inch (1219 mm by 1219 mm).
1. Tapered Insulation – Bead-Applied two component urethane Adhesive.
- K. Provide preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated.
- L. Cover Board: Securock: Fiber reinforced cementitious roof board.
1. Thickness: 1/2 inch (13mm).
 2. Dimensions: 48 inch by 48 inch (1219 mm by 1219 mm)
 3. Bead-Applied Polyurethane Adhesive.
- M. Perlite Tapered Edge Strip.
- N. Pitch Pan Filler
1. Sealant: Two component polyurethane pourable sealant as approved by the Owner Representative and Manufacturer.
 2. Primer: Polyurethane primer as approved by the pourable sealant Manufacturer.
 3. Grout: Quick-set, non-shrink, cementitious grout as approved by the Owner Representative and Manufacturer.
- O. Related Material
1. Lead flashing for roof drains shall be 27" x 27" and be minimum 4 pound lead.
 2. Pipe or vent jackets shall be minimum 3 pound lead with cap designed for use on flat roof construction.
 3. Wood Curbs and Nailers: Douglas fir 2" by size as noted or as required by existing conditions.
 4. Flashing securement devices shall be of adequate design to achieve substantial and positive anchorage.
 - a. Anchor bars for flashing securement to concrete or masonry substrates shall be 1/8" x 1" flat aluminum bar with 8" hole spacing
 - b. Fasteners for securing anchor bars to concrete or masonry substrates shall be zinc alloy with stainless steel pin.
 - c. Nails for flashing securement to wood substrates shall be stainless steel or zinc-coated type with 1" metal caps.
 5. Sealant for sealing flashing edges at set-on metal accessories shall be Sonolastic NP-1 or approved equal.

2.4 OTHER MATERIALS

- A. All other materials not specifically described but required for a complete and proper installation of the work in this section shall be as selected by the Contractor, approved by the Manufacturer, and subject to the approval of the Owner.

PART 3 EXECUTION

3.1 EXAMINATION

- A. Examine substrate, areas, and conditions for compliance requirements affecting performance of installation of new roofing and strip-in roofing to existing roof system.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.
- C. Clean surfaces thoroughly prior to installation.
- D. Surfaces scheduled to receive insulation shall be free of any standing water, frost, snow, or loose debris.
- E. Deck areas for re-roof/repair.
 - 1. Remove existing roof system, base flashings, and sheet metal flashing.
 - 2. Mechanically attach base layer of polyisocyanurate roof insulation to metal deck using appropriate fasteners. Penetrate the load bearing portion of the metal deck one inch.
 - 3. Using low rise foam adhesive or hot asphalt, adhere subsequent layer of roof insulation, tapered insulation where designated, crickets or saddles, and cover board.
 - 4. Using cold adhesive, adhere field ply modified bitumen membrane to cover board and adhere cap sheet membrane to field modified bitumen sheet.
 - 5. Install base flashing system as specified.
 - 6. Prior to installing the roof insulation, add appropriate height of wood nailers to accommodate new height of roof system
- F. All nailers shall be installed prior to installing insulation. Provide nailers on slopes greater than 2/12 installed in strict conformance with manufacturers recommendations

3.2 INSULATION INSTALLATION

- A. Do not apply roof insulation until all other Work which requires foot equipment traffic on the roof has been completed.
- B. Securely attach Insulation to the roof deck using the required fastener density and pattern. A minimum FM 1-90 attachment is required.
- C. Do not install wet, damaged or warped insulation boards.
- D. Install insulation boards with staggered board joints in one direction
- E. Install insulation boards snug. Gaps between board joints must be less than 1/4 inch (6 mm). Fill all gaps in excess of 1/4 inch (6 mm) with insulation material of the same type.
- F. Wood Nailers: Install minimum 3-1/2 inch (89 mm) wide nailers at all locations indicated on the Drawings. Nailers must be of equal thickness as the insulation with a minimum 1 inch (25 mm) and securely fastened to the deck.
- G. Install cant strips at the transition between roof deck and wall/curb surfaces in all membrane flashing applications. Where necessary to accommodate differential movement between the wall and roof deck, vertical wood nailers, of sufficient height to provide a minimum 8 inch (203mm) base flashing height, may be mechanically fastened to the insulation stops in accordance with NRCA recommendations and the Drawings.
- H. Miter and fill the edges of the insulation boards at ridges, valleys and other changes in plane to prevent open joints or irregular surfaces. Avoid breaking or crushing of the insulation at the corners.
- I. Do not install any more insulation than will be completely waterproofed each day.
 - 1. Bottom Layer 2.3" Polyisocyanurate Roof Insulation.

- a. Fasten insulation with screw and plate type fasteners. Minimum spacing shall be as listed below:
 - Field: 1 per every 4.0 square feet
 - Perimeters: 1 per every 2.0 square feet
 - Corners: 1 per every 1.0 square foot
 2. Second Layer 2.3" Polyisocyanurate Roof Insulation, tapered Polyisocyanurate Roof Insulation sloped a minimum of ¼-inch per 12 inches unless otherwise required to obtain drainage slope and Securock Cover Board, 48 inch by 48 inch (1219 mm by 1219 mm).
 - a. Install bead-applied insulation with slope direction as indicated on the approved shop drawings. Install adhesive over the previously installed insulation in beads as follows:
 - Field: Install beads at a spacing of 12" o.c.
 - Perimeters: Install beads at a spacing of 6" o.c.
 - Corners: Install beads at a spacing of 4" o.c.
- 3.3 BASE/TOP PLY INSTALLATION
- A. Apply approved base and top sheets over insulation or deck surfaces using methods approved by the manufacturer for the specified roof system.
- 3.4 MEMBRANE INSTALLATION
- A. Apply roof system in strict accordance with manufacturer's published recommendations.
- B. Unroll membranes and allow them to relax prior to application. Application of sheet materials directly from the factory roll may increase the incidence of wrinkling during or subsequent to application.
- C. Starting at the low point of the roof area, unroll membrane into position with 3 inch (76mm) side laps and end laps staggered a minimum of 12 inches (305mm).
- D. APP-Modified Bituminous Membrane Application:
1. Plan Work and foot traffic so adhesive is not tracked across the top of the finished base ply membrane.
 2. Starting at the low point of the roof area, rolls of modified cap sheet shall be unrolled into position with 3 inch (76mm) side laps and end laps staggered a minimum of 12 inches (305mm).
 3. Pull the end of each sheet straight back onto itself so that the sheet is folded approximately in half, maintaining alignment of the individual sheets and uniformity of the side laps.
 4. Apply adhesive uniformly over the previously marked area with a 1/4 inch notched squeegee at the minimum rate of 1-1/2 to 2 gallons per 100 SF, keeping the adhesive from the side and end lap areas of adjacent rolls.
 5. Roll the sheet into the adhesive commencing with the first roll in the gang, maintaining alignment of the roll and uniformity of the side laps. Broom the membrane as necessary to insure embedment of the membrane into the adhesive.
 6. Repeat the procedure on the opposite end of the rolls of the membrane. Side and end laps must be left clean and free of adhesive.
- E. Side and End Laps:
1. Hot Air Weld side and end laps of the modified bituminous membrane using hot air welding equipment.
 2. Roll with a 20 pound steel roller while the bitumen is still warm. Edge of the lap must be left untooled, with a continuous bead of bitumen visible at the seam.

3.5 MEMBRANE BASE FLASHING

- A. Priming: Prime all metal surfaces with asphalt primer and allow them to dry prior to application of the flashing membrane.
1. Install the first base flashing ply after completing the field base ply.
 2. At the conclusion of the field top ply, install the second ply of base flashing membrane. This will result in "lacing" of the field and base flashing membranes.
 - a. Stripping Plies:
 1. At metal flanges, install a stripping ply over the field base ply, extending a minimum of 4 inches (102 mm) beyond the flange of the metal.
 2. Set the metal flange over the stripping ply in a bed of flashing cement and mechanically anchor.
 3. Apply top ply over the primed metal flange.
 4. Where the edge of stripping plies meets the metal detail (i.e., outside edge of perimeter metal or against vent pipes), apply a bead of flashing cement to provide a continuous seal and fill in any gaps that may allow standing water at this point.
- B. Seal the top edges of all modified bitumen base flashings with asphalt flashing cement and reinforcing fabric to provide protection until metal counter flashing is installed.
- C. Curb and Corner Flashings:
1. All inside and outside corners require a boot to provide weather protection at the lap joint. Boot must be a minimum 2 inch (51mm) radius beyond all intersecting surfaces, and have a minimum of 1/4 inch (6mm) follow of modified bitumen beyond all edges.
 2. Install boots at the inside and outside corners (underneath) prior to installing the flashing membrane.
- D. Mechanically fasten the top of all modified bitumen vertical base flashing membranes. Install fasteners appropriate to the substrate 8 inches (203 mm) on center.
- E. Metal Counter Flashing: All vertical base flashings must be covered by metal counter flashing to form a continuous water shedding surface over the top of membrane flashing. Extend metal counter flashing a minimum of 3 inches (76 mm) over the top of the membrane flashing.
- F. Metal Face Securement: Install Hook strips (cleats) on all metal extending over roof edges (coping metal, gravel stop/eave strip, perimeter curb metal, etc.) in accordance with recommendations in the NRCA Roofing and Waterproofing Manual. Appropriate provision must be made in accessory metal to allow for expansion and contraction of the metal sections without interrupting the integrity of the waterproofing assembly.
- G. Roof Drains: Set 30-by-30-inch square lead flashing in bed of roofing-manufacturer-approved asphaltic adhesive on completed roofing membrane. Prime surface of lead flashing. Cover metal flashing with roofing membrane cap-sheet stripping and extend a minimum of 4 inches beyond edge of metal flashing onto field of roofing membrane. Clamp roofing membrane, metal flashing, and stripping into roof-drain clamping ring
1. Install new drain bolts for all clamping rings.
- I. Pitch Pans
1. Pitch pans shall have a minimum depth of 4" and have a minimum clearance of 2" from penetration on all sides.
 2. Prime interior of pitch pan and penetration with polyurethane primer.
 3. Fill lower portion of pitch pan with grout and allow to dry. Fill to 2" with an acceptable pourable sealer.

3.6 INSPECTION AND QUALITY CONTROL

- A. The roofing system manufacturer shall provide a qualified, trained auditor to perform a final inspection to insure the roof system has been installed properly and according to the manufacturer's recommendations and guaranty requirements. Upon completion of the inspection, copies of the inspection report will be provided to the Architect, roof consultant and Contractor. Any corrective action deemed necessary to comply with the manufacturer's specifications must be completed prior to final close-out.

3.7 PROTECTION AND CLEANING

- A. Protect new roof system during remainder of construction period. Plan work so traffic over new roof system is kept to a minimum. Where traffic must continue over new roof system, provide protection for the finished roof.
- B. Provide protection for masonry and other building surfaces against damage of staining from roofing operations. Any surfaces damaged or stained as a result of roofing operations shall be cleaned, repaired or replaced as necessary by the roofing contractor.
- C. Contractor is responsible for cleanup and damage to any property and equipment as a result of a leak during roof construction.
- D. Job site shall be maintained in a clean, orderly fashion, and free of debris. Store materials and equipment so operations of building are not interrupted.
- E. Touch-up, repair or replace damaged products before Substantial Completion.

3.8 ROOFING INSTALLER'S WARRANTY

- A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project
1. Owner: <Insert name of Owner>.
 2. Address: <Insert address>.
 3. Building Name/Type: <Insert information>.
 4. Address: <Insert address>.
 5. Area of Work: <Insert information>.
 6. Acceptance Date: <Insert date>.
 7. Warranty Period: <Insert time>.
 8. Expiration Date: <Insert date>.
- B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period.
- C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.
- D. This Warranty is made subject to the following terms and conditions:
1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
 - a. lightning;
 - b. peak gust wind speed exceeding 115 mph;
 - c. fire;
 - d. failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;

- e. faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
 - f. vapor condensation on bottom of roofing; and
 - g. activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.
2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.
 3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faults or defects of work.
 4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
 5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.
 6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.
 7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this **<Insert day>** day of **<Insert month>**, **<Insert year>**.

1. Authorized Signature: **<Insert signature>**.
2. Name: **<Insert name>**.
3. Title: **<Insert title>**

END OF SECTION 07552

SECTION 07600 - FLASHING AND SHEET METAL

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Metal counter and cap flashing, gravel stops, gutters, downspouts and splash pan to match existing Burgundy color.
 - 2. Exposed metal trim.
 - 3. Miscellaneous sheet metal accessories.
- B. Furnish and install roof related sheet metal work per the drawings and specifications, including all clips, sealant, fasteners, and joining to make weather and watertight.
- C. Roofing accessories installed integral with roofing membrane are specified in roofing system, as roofing work.

1.3 QUALITY ASSURANCE

- A. Standards: Comply with all pertinent standards specified in the contract documents, including those listed below. If the building code references a specific edition or revision of an individual standard, then comply with that edition or revision. Otherwise, comply with the latest published edition or revision available on the date the Contractor submits its price proposal to the Owner.
 - 1. *ANSI/SPRI ES-1*.
 - 2. *Architectural Sheet Metal Manual*, Sheet Metal and Air Conditioning Contractors National Association (SMACNA)
 - 3. *The NRCA Roofing and Waterproofing Manual* National Roofing Contractors Association
 - 4. Manufacturer's published specifications, product data sheets, application instructions, and technical bulletins.
 - 5. *Annual Book of ASTM Standards*, ASTM International
 - 6. Sealant, Waterproofing & Restoration Institute (SWR Institute) written recommendations and technical bulletins.
- B. Qualifications of Installers: Use adequate number of skilled workers who are thoroughly trained and experienced in the necessary crafts, and who are completely familiar with the specified requirements and methods needed for proper performance of the work in this section.

1.4 SUBMITTALS

- A. Product data, Flashing, Sheet Metal, and Accessories: Submit manufacturer's technical product data, installation instructions and general recommendations for each specified sheet material and fabricated product in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Shop drawings showing layout, profiles, joining and anchorage details, including major counter-flashing, trim/fascia units, gutters and downspouts. Provide layouts at 1/4-inch scale and details at 3-inch scale. Show type and gauge of metal used. Gauges of sheet metal specified in this section are minimum requirements. Submit product information or material list noting fasteners, sealants, sealant primers, sealant tapes, and other required accessories.

- C. Samples: Provide color samples, minimum of 3 for each color, on metal to match type and gage of sheet metal components to be finished.

1.5 PROJECT CONDITIONS

- A. Coordinate work of this section with interfacing and adjoining work for proper sequencing of each installation. Ensure best possible weather resistance and durability of work and protection of materials and finishes.
- B. Use all means to protect the materials of this section before, during, and after installation and to protect the work and materials of all other trades. Roof surfaces shall be protected from damage at all times.
- C. Deliver only new materials to the job site. Materials to be stored in such a manner as to be protected from wind displacement, rain, snow, or inclement weather. When storing materials on the roof, do not overstress the deck.
- D. In the event of damage, immediately make all repairs and replacements to the approval of the Owner and at no additional cost to the Owner.
- E. Follow the Manufacturer's recommendations for storage.

1.6 SCHEDULING

- A. All new sheet metal work shall be closely coordinated with the installation of the new roofing system.
- B. Sheet metal shall be installed directly after roofing work such that roofing terminations shall not be left unprotected by metal.

1.7 WARRANTY

- A. All new materials and workmanship provided under this section of the specifications shall be guaranteed in writing by the Contractor for two years.
- B. The Contractor shall maintain all roof related sheet metal in a watertight condition without cost to the Owner during the Contractor's warranty period.

PART 2 - PRODUCTS

2.1 SHEET METAL COUNTERFLASHING AND "UNEXPOSED" FLASHING MATERIALS

- A. Zinc-Coated Steel: Commercial quality with 0.20 percent copper, ASTM A 526 except ASTM A 527 for lock-forming, C90 hot-dip galvanized; 22 gage minimum.
- B. Aluminum Flashings: 0.040" gage minimum. Shape flashing as shown on the drawings.

2.2 "EXPOSED" SHEET METAL FLASHING, GRAVEL STOPS, COPING, AND TRIM MATERIALS (INCLUDING GUTTERS AND DOWNSPOUTS)

- A. Coil-Coated Galvanized Steel Sheet: Zinc-coated, commercial-quality steel sheet conforming to ASTM A 755, G 90 (ASTM A 755M, Z 275) coating designation, coil coated with high-performance fluoropolymer coating as specified in "Coil-Coated Galvanized Steel Sheet Finish" Article; not less than 0.0336 inch (0.85 mm) thick (22 gauge), unless otherwise indicated, provide Kynar 500", color shall match: Burgundy at existing school coping and trim.

- 1 B. Aluminum Sheet: Commercial-quality aluminum sheet, 0.040 inch thickness minimum, coil coated
2 with high-performance fluoropolymer coating as specified in "Coil-Coated Aluminum Sheet Finish"
3 Article; provide Kynar 500", color shall match: Burgundy at existing school coping and trim.
4
- 5 C. Miscellaneous Materials and Accessories:
6 1. Solder: For steel, provide 50-50 tin/lead solder (ASTM B32), with rosin flux.
7 2. Fasteners: Same metal as flashing/sheet metal or other non-corrosive metal recommended
8 by sheet manufacturer. Match finish of fasteners with that of material being fastened.
9 3. Bituminous Coating: SSPC - Paint 12, solvent-type bituminous mastic, nominally free of
10 sulfur, compounded for 15-mil dry film thickness per coat.
11 4. Mastic Sealant: Polyisobutylene; non-hardening, non-skinning, non- drying, non-migrating
12 sealant.
13 5. Elastomeric Sealant: Generic type recommended by manufacturer of metal and fabricator of
14 components being sealed and complying with requirements for joint sealants as specified in
15 Division 7 Section "Joint Sealers."
16 6. Epoxy Seam Sealer: 2-part non-corrosive metal seam cementing compound, recommended
17 by metal manufacturer for nonmoving joints including riveted joints.
18 7. Adhesives: Type recommended by flashing sheet manufacturer for waterproof/weather-
19 resistant seaming and adhesive application of flashing sheet.
20 8. Paper Slip Sheet: 5-lb. rosin-sized building paper.
21 9. Metal Accessories: Provide sheet metal clips, straps, anchoring devices, and similar
22 accessory units as required for installation of work, matching or compatible with material
23 being installed, non-corrosive, size and gage required for performance.
24 10. Elastic Flashing Filler: Closed-cell polyethylene or other soft closed-cell material
25 recommended by elastic flashing manufacturer as filler under flashing loops to ensure
26 movement with minimum stress on flashing sheet.
27 11. Roofing Cement: ASTM D 2822, asphaltic.
28 12. Splash Pan: Refer SMACNA Fig. 1-36.
29

30 2.3 FABRICATED UNITS

- 31 A. General Metal Fabrication: Shop-fabricate to greatest extent possible. Comply with details shown
32 on the drawings and with applicable requirements of SMACNA "Architectural Sheet Metal Manual"
33 and other recognized industry practices. Fabricate for waterproof and weather-resistant
34 performance, with expansion provisions for running work, sufficient to permanently prevent
35 leakage, damage, or deterioration of the work. Form work to fit substrates. Comply with material
36 manufacturer instructions and recommendations for forming material. Form exposed sheet metal
37 work without excessive oil-canning and tool marks, true to line and level, with exposed edges
38 folded back to form hems.
39
- 40 B. Seams: Fabricate nonmoving seams in sheet metal with flat-lock seams with back-up sheet,
41 edges to be seamed, form seams, and solder.
42
- 43 C. Expansion Provisions: Where lapped or bayonet-type expansion provisions in work cannot be
44 used or would not be sufficiently water/weatherproof, form expansion joints of intermeshing
45 hooked flanges, not less than 1 inch deep, filled with mastic sealant (concealed within joints).
46
- 47 D. Sealant Joints: Where movable, non-expansion type joints are required for proper performance of
48 work, form metal to provide for proper installation of elastomeric sealant, in compliance with
49 SMACNA standards.
50
- 51 E. Separations: Provide for separation of metal from non-compatible metal or corrosive substrates
52 by coating concealed surfaces at locations of contact, with bituminous coating or other permanent
53 separation as recommended by manufacturer/fabricator.
54

55 2.4 FINISHES

- 1 A. Fluoropolymer Coating/Use with Composite Metal Panels: Manufacturer's standard two-coat,
2 thermo-cured, full-strength durable coating system, over galvanized steel or aluminum substrate,
3 consisting of 70 percent "Kynar 500" coating consisting of a primer (minimum 0.8 mils dry film)
4 and polyvinylidene fluoride color coat (minimum 0.8 mils dry film), total system thickness 1.6 mils,
5 to provide color retention when tested in accordance with ASTM D 523 and a 20 year finish
6 warrant.
7 1. Provide coating that has been field tested under normal range of weathering conditions
8 for a minimum of 20 years without significant peel, blister, flake, chip, crack, or check in
9 finish; without chalking in excess of No. 8 in accordance with ASTM D 659 and without
10 fading in excess of 5 NBS units.

11 **PART 3 - EXECUTION**

12 **3.1 INSTALLATION REQUIREMENTS**

- 13
14
15
16 A. General: Except as otherwise indicated, comply with manufacturer's installation instructions and
17 recommendations and with SMACNA "Architectural Sheet Metal Manual." Anchor units of work
18 securely in place by methods indicated, providing for thermal expansion of metal units; conceal
19 fasteners where possible, and set units true to line and level as indicated. Install work with laps,
20 joints, and seams that will be permanently watertight and weatherproof.
21
22 B. Bed flanges of work in a thick coat of bituminous roofing cement where required for waterproof
23 performance.
24
25 C. Install counter-flashing in reglets, either by snap-in seal arrangement or by welding in place for
26 anchorage and filling reglet with mastic or elastomeric sealant, as indicated and depending on
27 degree of sealant exposure.
28
29 D. Install new metal gutters and downspouts and repair/replace portions of metal gutters and
30 downspouts as shown on the drawings. Match metal gauge, metal type, size, and shape of
31 existing metal downspouts. Contractor shall visit the site prior to bidding to insure proper material,
32 gauge, size, shape and finish for downspouts are included in bid.
33

34 **3.2 CLEANING AND PROTECTION**

- 35
36 A. Clean exposed metal surfaces, removing substances that might cause corrosion of metal or
37 deterioration of finishes.
38
39 B. Protection: Advise Contractor of required procedures for protection of flashings and sheet metal
40 work during construction to ensure that work will be without damage other than natural weathering
41 at Substantial Completion.
42
43
44

45 **END OF SECTION 07600**

SECTION 07920 - JOINT SEALANTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes joint sealants for the following locations:
 - 1. Interior joints in vertical surfaces and horizontal non-traffic surfaces as indicated below:
 - a. Control and expansion joints on exposed interior surfaces of exterior walls.
 - b. Perimeter joints of exterior openings where indicated on the drawings.
 - c. All joints between different materials.
 - d. Other joints as indicated on the drawings.
 - 2. Interior joints in horizontal traffic surfaces as indicated below:
 - a. Control and expansion joints in cast-in-place concrete slabs.
 - b. Other joints as indicated on the drawings.
 - c. All joints between different materials.

1.3 SYSTEM PERFORMANCE REQUIREMENTS

- A. Provide elastomeric joint sealants, produced and installed to establish and to maintain watertight and airtight continuous seals without causing staining or deterioration of joint substrates.
- B. Provide joint sealants for interior applications, produced and installed to establish and maintain continuous seals that are water resistant and cause no staining or deterioration of joint substrates.

1.4 SUBMITTALS

- A. General: Submit the following in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data from manufacturers for each joint sealant product required.
 - 1. Certification by joint sealant manufacturer: Sealants plus the primers and cleaners required for sealant installation comply with local regulations controlling use of volatile organic compounds.
- C. Samples for initial selection purposes in form of manufacturer's standard bead samples, consisting of strips of actual products showing full range of colors available, for each product exposed to view.
- D. Certificates from manufacturers of joint sealants attesting that their products comply with specification requirements and are suitable for the use indicated.
- E. Compatibility and adhesion test reports from elastomeric sealant manufacturer indicating that materials forming joint substrates and joint sealant backings have been tested for compatibility and adhesion with joint sealants. Include sealant manufacturer's interpretation of test results relative to sealant performance and recommendations for primers and substrate preparation needed to obtain adhesion.

1.5 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed joint sealant applications similar in material, design, and extent to that indicated for Project that have resulted in construction with a record of successful in-service performance.
- B. Single Source Responsibility for Joint Sealant Materials: Obtain joint sealant materials from a single manufacturer for each different product required.

1.6 DELIVERY, STORAGE, AND HANDLING

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

1.7 PROJECT CONDITIONS

- A. Environmental Conditions: Do not proceed with installation of joint sealants under the following conditions:
 - 1. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer.
 - 2. When ambient and substrate temperature conditions are outside the limits permitted by joint sealant manufacturer or below 40 deg F (4.4 deg C).
 - 3. When joint substrates are wet.
- B. Joint Width Conditions: Do not proceed with installation of joint sealants where joint widths are less than allowed by joint sealant manufacturer for application indicated.
- C. Joint Substrate Conditions: Do not proceed with installation of joint sealants until contaminants capable of interfering with their adhesion are removed from joint substrates.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

- A. Compatibility: Provide joint sealants, joint fillers, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by sealant manufacturer based on testing and field experience.
- B. Colors: Provide color of exposed joint sealants to comply with the following:
 - 1. Provide selections made by Architect from manufacturer's full range of standard colors for products of type indicated.

2.2 ELASTOMERIC JOINT SEALANTS

- A. Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing elastomeric sealants that comply with ASTM C 920 and other requirements indicated on each Elastomeric Joint Sealant Data Sheet at end of this Section, including those requirements referencing ASTM C 920 classifications for Type, Grade, Class, and Uses.
 - 1. Additional Movement Capability: Where additional movement capability is specified in Elastomeric Joint Sealant Data Sheet, provide products with the capability, when tested for adhesion and cohesion under maximum cyclic movement per ASTM C 719, to withstand the

specified percentage change in the joint width existing at time of installation and remain in compliance with other requirements of ASTM C 920 for Uses indicated.

2.3 JOINT SEALANT BACKING

- A. General: Provide sealant backings of material and type that are non-staining; are compatible with joint substrates, sealants, primers and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.
- B. Plastic Foam Joint Fillers: Preformed, compressible, resilient, non-staining, non-waxing, non-extruding strips of flexible plastic foam of material indicated below and of size, shape, and density to control sealant depth and otherwise contribute to producing optimum sealant performance:
 - 1. Proprietary, reticulated, closed-cell polymeric foam, non-out-gassing, with a density of 2.5 pcf, tensile strength of 35 psi per ASTM D 1623, and water absorption less than 0.02 gms/cc per ASTM C 1083.
- C. Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint filler materials or joint surfaces at back of joint where such adhesion would result in sealant failure. Provide self-adhesive tape where applicable.

2.4 MISCELLANEOUS MATERIALS

- A. Primer: Material recommended by joint sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealant-substrate tests and field tests.
- B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming in any way joint substrates and adjacent nonporous surfaces, and formulated to promote optimum adhesion of sealants with joint substrates.
- C. Masking Tape: Non-staining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint sealant performance. Do not proceed with installation of joint sealants until unsatisfactory conditions have been corrected at no cost to project by the responsible contractor.

3.2 PREPARATION

- A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with recommendations of joint sealant manufacturer and the following requirements:
 - 1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.
 - 2. Clean concrete and similar porous joint substrate surfaces by brushing, grinding, blast

- cleaning, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining from above cleaning operations by vacuuming or blowing out joints with oil-free compressed air.
 3. Remove laitance and form release agents from concrete.
 4. Clean metal and other nonporous surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
- B. Joint Priming: Prime joint substrates where indicated or where recommended by joint sealant manufacturer based on preconstruction joint sealant-substrate tests or prior experience. Apply primer to comply with joint sealant manufacturer's recommendations. Confine primers to areas of joint sealant bond; do not allow spillage or migration onto adjoining surfaces.
- C. Masking Tape: Use masking tape where required to prevent contact of sealant with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

- A. General: Comply with joint sealant manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.
- B. Sealant Installation Standard: Comply with recommendations of ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.
- C. Installation of Sealant Backings: Install sealant backings to comply with the following requirements:
1. Install joint fillers of type indicated to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
 - a. Do not leave gaps between ends of joint fillers.
 - b. Do not stretch, twist, puncture, or tear joint fillers.
 - c. Remove absorbent joint fillers that have become wet prior to sealant application and replace with dry material.
 2. Install bond breaker tape between sealants where backer rods are not used between sealants and joint fillers or back of joints.
- D. Installation of Sealants: Install sealants by proven techniques that result in sealants directly contacting and fully wetting joint substrates, completely filling recesses provided for each joint configuration, and providing uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability. Install sealants at the same time sealant backings are installed.
- E. Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of configuration indicated, to eliminate air pockets, and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents that discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.
1. Provide concave joint configuration per Figure 5A in ASTM C 1193, unless otherwise noted.
 2. Use masking tape to protect adjacent surfaces of recessed tooled joints.

1 **3.4 CLEANING**

- 2
- 3 A. Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods
- 4 and with cleaning materials approved by manufacturers of joint sealants and of products in which
- 5 joints occur.
- 6

7 **3.5 PROTECTION**

- 8
- 9 A. Protect joint sealants during and after curing period from contact with contaminating substances
- 10 or from damage resulting from construction operations or other causes so that they are without
- 11 deterioration or damage at time of Substantial Completion. If, despite such protection, damage or
- 12 deterioration occurs, cut out and remove damaged or deteriorated joint sealants immediately so
- 13 that and installations with repaired areas are indistinguishable from original work.
- 14

15 **SEALANT SCHEDULE**

- 16
- 17 A. **Interior joints in field-painted vertical and overhead surfaces, at perimeter of all hollow**
- 18 **metal frames; in gypsum drywall, concrete, and concrete masonry; and all other interior**
- 19 **joints not indicated otherwise.**
- 20 A. Base Polymer: Acrylic-Emulsion/Silicone, mildew-resistant, complying with ASTM C 834
- 21 (and ASTM C 920)
- 22 B. Type: S (single component).
- 23 C. Grade: NS (nonsag).
- 24 D. Class: 25
- 25 E. Additional Movement Capability: 5 percent movement in extension, 5 percent in compression.
- 26 F. Use[s] Related to Exposure: NT (nontraffic).
- 27 G. Uses Related to Joint Substrates: M, G, A, and, as applicable to joint substrates indicated.
- 28 H. Use O Joint Substrates: Coated glass, color anodized aluminum, aluminum coated with a
- 29 high-performance coating, galvanized steel, brick, ceramic tile, and wood.
- 30 I. Products:
- 31 1. Sonneborn "Sonolac"
- 32 2. Pecora "AC-20 + Silicone"
- 33 3. Tremco "Acrylic Latex 834"
- 34 4. Dow Corning Corp. "Performance Plus Silicone Sealant"
- 35
- 36 B. **Exterior and interior joints in horizontal surfaces of concrete; between metal and**
- 37 **concrete, mortar, and masonry.**
- 38 A. One-Part, Pourable, Urethane Sealant for Use T
- 39 B. Type: S
- 40 C. Grade: P
- 41 D. Class: 25
- 42 E. Additional Movement Capability: 25% movement in extension & 25% in compression.
- 43 F. Uses Related to Joint Substrates: M, G, A, & as applicable to joint substrates
- 44 indicated.
- 45 G. Use O Joint Substrates: Color anodized aluminum, aluminum coated
- 46 with a high-performance coating, galvanized steel, brick, ceramic tile, and wood.
- 47 H. Products:
- 48 1. Mameco "Vulkem 45"
- 49 2. Pecora "NR-201 Urexpan"
- 50 3. Sonneborn "Sonolastic SL 1"
- 51 4. Tremco Inc. "THC-901"
- 52

53 **END OF SECTION 07920**

SECTION 08110 - STEEL DOORS AND FRAMES

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. This Section includes steel doors and frames.
 - 1. Fire rated and non-fire rated doors and frames.
 - 2. Fire rated and non-fire rated borrowed lite interior door and window frames.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Section "Unit Masonry" for building anchors into and grouting frames in masonry construction.
 - 2. Division 8 Section "Door Hardware" for door hardware and gasketing.
 - 3. Division 8 Section "Glass and Glazing" for glass in steel doors and sidelights.
 - 4. Division 9 Section "Gypsum Board Assemblies" for spot grouting frames in partitions.
 - 5. Division 9 Section "Painting" for field painting primed doors and frames.

1.3 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of door and frame specified, including details of construction, materials, dimensions, hardware preparation, core, label compliance, profiles, and finishes.
- C. Shop Drawings showing fabrication and installation of steel doors and frames. Include details of each frame type, elevations of door design types, conditions at openings, details of construction, location and installation requirements of door and frame hardware and reinforcements, and details of joints and connections. Show anchorage and accessory items.
- D. Door Schedule: Submit schedule of doors and frames using same reference numbers for details and openings as those on Contract Drawings.
 - 1. Indicate coordination of glazing frames and stops with glass and glazing requirements.

1.4 QUALITY ASSURANCE

- A. Provide doors and frames complying with ANSI/SDI 100 "Recommended Specifications for Standard Steel Doors and Frames" and as specified.
- B. Fire-Rated Door Assemblies: Units that comply with NFPA 80, are identical to door and frame assemblies tested for fire-test-response characteristics per ASTM E 152, and are labeled and listed by UL, Warnock Hersey, or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Borrowed Light Fire-Rated Frame Assemblies: Assemblies complying with NFPA 80 that are listed and labeled by testing agency acceptable to authorities having jurisdiction for fire protective ratings indicated. Provide testing according to NFPA 257 or UL 9. Label each individual glazed lite.

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver doors and frames cardboard-wrapped or crated to provide protection during transit and job storage. Provide additional protection to prevent damage to finish of factory-finished doors and frames.
- B. Inspect doors and frames on delivery for damage. Minor damages may be repaired provided refinished items match new work and are acceptable to Architect; otherwise, remove and replace damaged items as directed.
- C. Store doors and frames at building site under cover. Place units on minimum 4-inch- (100-mm-) high wood blocking. Avoid using non-vented plastic or canvas shelters that could create a humidity chamber. If cardboard wrappers on doors become wet, remove cartons immediately. Provide minimum 1/4-inch (6-mm) spaces between stacked doors to promote air circulation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Door and Frame Manufacturers: Subject to compliance with requirements, provide steel door and frame products by one of the following:
 - 1. Amweld Building Products, Inc.
 - 2. Ceco Door Products.
 - 3. Curries Co.
 - 4. Mesker Door, Inc.
 - 5. Steelcraft.
- B. Interior Doors, Basis-of-Design: Provide steel doors, in wood grain finish where indicated, by Steelcraft, or pre-approved equal. All doors shall be wood appearance: **Steelcraft "Grain-Tech, Oak"**, unless otherwise noted or pre-approved by Owner. Contractor to verify prior to ordering.

2.2 MATERIALS

- A. Hot-Rolled Steel Sheets and Strip: Commercial-quality carbon steel, pickled and oiled, complying with ASTM A 569 (ASTM A 569M).
- B. Cold-Rolled Steel Sheets: Carbon steel complying with ASTM A 366 (ASTM A 366M), commercial quality, or ASTM A 620 (ASTM A 620M), drawing quality, special killed.
- C. Supports and Anchors: Fabricated from not less than 0.0478-inch- (1.2-mm-) thick steel sheet; 0.0516-inch- (1.3-mm-) thick galvanized steel where used with galvanized steel frames.
- D. Inserts, Bolts, and Fasteners: Manufacturer's standard units. Where items are to be built into exterior walls, hot-dip galvanize complying with ASTM A 153, Class C or D as applicable.

2.3 DOORS

- A. Steel Doors: Provide 1-3/4-inch- (44-mm-) thick doors of materials and ANSI/SDI 100 grades and models specified below, or as indicated on Drawings or schedules:
 - 1. Interior Doors: Grade II, heavy-duty, Model 1, full flush design, minimum 18 ga. (0.0478-inch- 1.2-mm-) thick cold-rolled steel sheet faces.

2.4 FRAMES

- A. Provide metal frames for doors, transoms, sidelights, borrowed lights, and other openings, according to ANSI/SDI 100, and of types and styles as shown on Drawings and schedules. Conceal fastenings, unless otherwise indicated. Fabricate frames of minimum 16 ga. (0.0598-

inch- 1.5-mm-) thick cold-rolled steel sheet.

1. Fabricate frames with mitered or coped and continuously welded corners.
2. Fabricate frames for interior openings over 48 inches (1220 mm) wide from 0.0598-inch- (1.5-mm-) thick steel sheet.
3. Exterior frames: 14 gauge, hot-dip galvanized.

B. Door Silencers: Except on weather stripped or fire rated frames, drill stops to receive 3 silencers on strike jambs of single-door frames and 2 silencers on heads of double-door frames.

C. Plaster Guards: Provide minimum 0.0179-inch- (0.45-mm-) thick steel plaster guards or mortar boxes at back of hardware cutouts where mortar or other materials might obstruct hardware operation and to close off interior of openings.

D. Grout: When required in masonry construction, as specified in Division 4 Section "Unit Masonry."

2.5 FABRICATION

A. Fabricate steel door and frame units to be rigid, neat in appearance, and free from defects, warp, or buckle. Where practical, fit and assemble units in manufacturer's plant. Clearly identify work that cannot be permanently factory assembled before shipment, to assure proper assembly at Project site. Comply with ANSI/SDI 100 requirements.

1. Internal Construction: One of the following manufacturer's standard core materials according to SDI standards:
 - a. Unitized steel grid.
 - b. Vertical steel stiffeners.
 - c. Rigid mineral fiber with internal sound deadener on inside of face sheets.
2. Clearances: Not more than 1/8 inch (3.2 mm) at jambs and heads, except not more than 1/4 inch (6.4 mm) between non-fire-rated pairs of doors. Not more than 3/4 inch (19 mm) at bottom. Fire Doors: Provide clearances according to NFPA 80.

B. Fabricate exposed faces of doors and panels, including stiles and rails of non-flush units, from only cold-rolled steel sheet.

C. Tolerances: Comply with SDI 117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Fabricate concealed stiffeners, reinforcement, edge channels, louvers, and moldings from either cold- or hot-rolled steel sheet.

E. Hardware Preparation: Prepare doors and frames to receive mortised and concealed hardware according to final door hardware schedule and templates provided by hardware supplier. Comply with applicable requirements of SDI 107 and ANSI A115 Series specifications for door and frame preparation for hardware.

1. For concealed overhead door closers, provide space, cutouts, reinforcing, and provisions for fastening in top rail of doors or head of frames, as applicable.

F. Reinforce doors and frames to receive surface-applied hardware. Drilling and tapping for surface-applied hardware may be done at Project site.

G. Locate hardware as indicated on Shop Drawings or, if not indicated, according to the Door and Hardware Institute's (DHI) "Recommended Locations for Architectural Hardware for Standard Steel Doors and Frames."

H. Glazing Stops: Minimum 0.0359-inch- (0.9-mm-) thick steel.

1. Provide non-removable stops on secure side of interior doors for glass and other panels.
2. Provide screw-applied, removable, glazing beads on inside of glass, louvers, and other panels in doors.

2.6 FINISHES, GENERAL

- A. Comply with NAAMM's "Metal Finishes Manual" relative to applying and designating finishes.
- B. Factory Priming for Field-Painted Finish: Where field painting after installation is indicated, apply air-dried primer specified below immediately after cleaning and pretreatment.
 - 1. Shop Primer: Zinc-dust, zinc-oxide primer paint complying with performance requirements of FS TT-P-641, Type II.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. General: Install steel doors, frames, and accessories according to Shop Drawings, manufacturer's data, and as specified.
- B. Placing Frames: Comply with provisions of SDI 105, unless otherwise indicated. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is completed, remove temporary braces and spreaders, leaving surfaces smooth and undamaged.
- C. Except for frames located in existing concrete, masonry, or gypsum board assembly construction, place frames before constructing enclosing walls and ceilings.
- D. In masonry construction, install at least 3 wall anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Acceptable anchors include masonry wire anchors and masonry T-shaped anchors.
- E. At existing concrete or masonry construction, install at least 3 completed opening anchors per jamb adjacent to hinge location on hinge jamb and at corresponding heights on strike jamb. Set frames and secure to adjacent construction with bolts and masonry anchorage devices. Bolt head shall be create a dimple in frame, install a metal compatible putty over bolt head in dimple, sand flush to frame, prior to final finishing.
- F. In metal-stud partitions, install at least 3 wall anchors per jamb at hinge and strike levels. In steel-stud partitions, attach wall anchors to studs with screws.
- G. Install fire-rated frames according to NFPA 80.
- H. Door Installation: Fit hollow-metal doors accurately in frames, within clearances specified in ANSI/SDI 100.
- I. Fire-Rated Doors: Install with clearances specified in NFPA 80.
- J. Smoke-Control Doors: Comply with NFPA 105.

3.2 ADJUSTING AND CLEANING

- A. Prime Coat Touchup: Immediately after erection, sand smooth any rusted or damaged areas of prime coat and apply touchup of compatible air-drying primer.
- B. Protection Removal: Immediately before final inspection, remove protective wrappings from doors and frames.
- C. Replace damaged doors that cannot be repaired or not acceptable to the Owner.

END OF SECTION 08110

SECTION 08120 - MONUMENTAL FLUSH DOORS

PART 1- GENERAL

1.1 SECTION INCLUDES

- A. Monumental aluminum flush insulated doors and aluminum frames. Match existing Burgundy finish.
- B. Factory glazing: 1/4" tempered with screw-applied stops finish to match door..

1.2 RELATED SECTIONS

- A. Section 07920 – Joint Sealants
- B. Section 08710 - Door Hardware.

1.3 REFERENCES

- A. ASTM B 209 - Aluminum and Aluminum-Alloy Sheet and Plate.
- B. ASTM B 221 - Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes.
- C. ASTM D 6670-01 - Standard Practice for Full-Scale Chamber Determination of Volatile Organic Emissions from Indoor Materials/Products.
- D. ASTM E 84 - Surface Burning Characteristics of Building Materials.
- E. ASTM E 283 - Determining the Rate of Air Leakage through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
- F. ASTM E 330 - Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.
- G. ASTM E 331 - Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Uniform Static Air Pressure Difference.
- H. ASTM E 1886 - Standard Test Method for Performance of Exterior Windows, Curtain Walls, Doors, and Storm Shutters Impacted by Missile(s) and Exposed to Cyclic Pressure Differentials.

1.4 PERFORMANCE REQUIREMENTS

- A. General: Provide door assemblies designed and fabricated to comply with specified performance requirements, as demonstrated by testing manufacturer's corresponding standard systems.
- B. Air Infiltration: For a single door, test specimen shall be tested in accordance with ASTM E 283 at a pressure differential of 6.27 psf. Door shall not exceed 0.01 cfm per square foot.
- C. Uniform Structural Load: For a single door, test specimen shall be tested in accordance with ASTM E 330. Plus or minus 240 pounds per square foot.
- D. Water Resistance: For a single door, test specimen shall be tested in accordance with ASTM E 331 at a pressure differential of 7.50 psf. No leakage.
- E. Indoor air quality testing per ASTM D 6670-01: GREENGUARD Environmental Institute Certified including GREENGUARD for Children and Schools Certification.
- F. Thermal Transmission, Exterior Doors, U-Value, NFRC 102-2010: Maximum of 0.47 BTU/hr x sf x degrees F.

1.5 SUBMITTALS

- A. Comply with Section 01300 - Submittals.
- B. Product Data: Submit manufacturer's product data, including description of materials, components, fabrication, finishes, glazing and installation.
- C. Shop Drawings: Submit manufacturer's shop drawings, including elevations, sections, and details, indicating dimensions, tolerances, materials, fabrication, doors, panels, framing, hardware schedule and finish.
- D. Manufacturer's Project References: Submit list of successfully completed projects including project name and location, name of architect, and type and quantity of doors manufactured.
- E. Maintenance Manual: Submit manufacturer's maintenance and cleaning instructions for doors, including maintenance and operating instructions for hardware.
- F. Warranty: Submit manufacturer's standard warranty.

1.6 QUALITY ASSURANCE

- A. Manufacturer's Qualifications:
 - 1. Continuously engaged in manufacturing of doors of similar type to that specified, with a minimum of 25 years successful experience.
 - 2. Door and frame components from same manufacturer.
 - 3. Evidence of a compliant documented quality management system.

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Delivery: Deliver materials to site in manufacturer's original, unopened containers and packaging, with labels clearly identifying opening door mark and manufacturer.
- B. Storage: Store materials in clean, dry area indoors in accordance with manufacturer's instructions.
- C. Handling: Protect materials and finish from damage during handling and installation.

1.8 WARRANTY

- A. Warrant doors, frames, and factory hardware against failure in materials and workmanship, including excessive deflection, faulty operation, defects in hardware installation, and deterioration of finish or construction in excess of normal weathering.
 - 1. Warranty Period: Ten years starting on date of Substantial Completion.
 - 2. Finish Period: Twenty years starting date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Basis-of-Design Product: The design for Monumental Flush Doors is based on Special-Lite Inc. Model: SL-16 monumental aluminum flush doors with aluminum frames with factory-glazed ¼" tempered glass or pre-bid approved equal. Door shall comply with the following dimensions:
 - 1. Door Opening Size: As indicated on the Drawings.
 - 2. Door Thickness: 1-3/4 inches.
 - 3. Material: Aluminum Alloy 6063-T6 tubular extrusions, 0.125-inch minimum wall thickness.
 - 4. Color: Custom color to match existing Burgundy.
 - 5. Corners: Interior corners are joined by concealed reinforcement brackets and deep penetration fillet weld.
 - a. True mortise and tenon joints.
 - b. Full-width 3/8-inch diameter galvanized steel tie rods secured with locking hex nuts.

- 1 B. Door Perimeter Tubular Framing:
- 2 1. Size and Type: As indicated on the Drawings.
- 3 2. Material: Aluminum extrusions made from prime-equivalent billet that is produced from
- 4 100% reprocessed 6063-T6 alloy recovered from industrial processes, 0.125-inch
- 5 minimum wall thickness tube. Insulation shall be a poured-in-place urethane core w/
- 6 minimum 5 lb/cubic foot density.
- 7 3. Color: Custom color to match existing Burgundy.
- 8 4. Perimeter Frame Members:
- 9 a. Box type with 4 enclosed sides.
- 10 b. Factory fabricated.
- 11 c. Open-back framing is not acceptable.
- 12 5. Applied Door Stops:
- 13 a. 0.625-inch high, with screws and weatherstripping.
- 14 b. Pressure gasketing for weathering seal.
- 15 c. Counterpunch fastener holes in door stop to preserve full-metal thickness under
- 16 fastener head.
- 17 6. Caulking: Caulk joints before assembling frame members.
- 18 7. Joints:
- 19 a. Secure joints with fasteners.
- 20 b. Provide hairline butt joint appearance.
- 21 8. Hardware:
- 22 a. Pre-machine and reinforce frame members for hardware in accordance with
- 23 manufacturer's standards and door hardware schedule.
- 24 b. Factory install door hardware.
- 25 9. Anchors:
- 26 a. Anchors appropriate for wall conditions to anchor framing to wall materials.
- 27 b. Door Jamb and Header Mounting Holes: Maximum of 24-inch centers.
- 28 c. Secure head and sill members of transom and similar conditions.

30 2.2 MATERIALS

- 31
- 32 A. Aluminum Members:
- 33 1. Extrusions: ASTM B 221.
- 34 2. Sheet and Plate: ASTM B 209.
- 35 3. Wall Thickness: 0.125 inch.
- 36 4. Alloy and Temper: As required by manufacturer for strength, corrosion resistance,
- 37 application of required finish, and control of color.
- 38 B. Steel Reinforcement: Complying with ASTM A 36 (ASTM A 36M) for structural shapes, plates,
- 39 and bars; ASTM A 611 for cold-rolled sheet and strip; or ASTM A 570 (ASTM A 570M) for hot-
- 40 rolled sheet and strip.
- 41
- 42 C. Fasteners:
- 43 1. Material: Aluminum, 18-8 stainless steel, or other noncorrosive metal.
- 44 2. Compatibility: Compatible with items to be fastened.
- 45 3. Exposed Fasteners: Oval Phillips head screws with finish matching items to be fastened.
- 46
- 47 D. "Brake Metal": Aluminum "brake metal" shall be 11 gauge aluminum sheet, finished to match
- 48 aluminum frame members, as shown on the drawings. Provide manufacturer's standard
- 49 connector components and clips to allow installation of "brake metal" to fill spaces between
- 50 aluminum frame to frame and frame to partition/floor/ceiling conditions.
- 51

52 2.3 FABRICATION

- 53
- 54 A. Sizes and Profiles: Required sizes for door and frame units and profile requirements shall be as
- 55 indicated on the Drawings.
- 56 B. Coordination of Fabrication: Field measure before fabrication and show recorded measurements
- 57 on shop drawings.

- C. Assembly:
 - 1. Complete cutting, fitting, forming, drilling, and grinding of metal before assembly.
 - 2. Remove burrs from cut edges.
- D. Welding: Welding of doors or frames is not acceptable.
- E. Fit: Maintain continuity of line and accurate relation of planes and angles. Secure attachments and support at mechanical joints with hairline fit at contacting members.
- F. Concealed Flashing: Manufacturer's standard corrosion-resistant, non-staining, non-bleeding flashing and end dams compatible with adjacent materials, and of type recommended by manufacturer.
- G. Weather Stripping: Manufacturer's standard replaceable weather stripping as follows:
 - 1. Compression Weather Stripping: Molded neoprene complying with ASTM D 2000 requirements or molded PVC complying with ASTM D 2287 requirements.

2.4 HARDWARE

- A. Pre-machine doors in accordance with templates from specified hardware manufacturers and hardware schedule.
- B. Factory install hardware. Coordinate with electrical contractor to conceal power supply and wiring where applicable with in the framing system.
- C. Hardware Schedule: As specified in Section 08710.
- D. Finish: As specified in Section 08710.

2.5 ALUMINUM FINISHES

- A. General: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.
- B. Finish designations prefixed by AA comply with the system established by the Aluminum Association for designating aluminum finishes.
- C. Kynar 500, two coat finishes; Match existing Burgundy.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas to receive doors. Notify Architect of conditions that would adversely affect installation or subsequent use. Do not proceed with installation until unsatisfactory conditions are corrected.

3.2 PREPARATION

- A. Ensure openings to receive frames are plumb, level, square, and in tolerance.

3.3 INSTALLATION

- A. Install doors and factory-glazing in accordance with manufacturer's instructions.
- B. Install doors plumb, level, square, true to line, and without warp or rack.
- C. Anchor frames securely in place.

- D. Separate aluminum from other metal surfaces with bituminous coatings or other means approved by Architect.
- E. Set thresholds in bed of mastic and back-seal.
- F. Install exterior doors to be weather-tight in closed position.
- G. Remove and replace damaged components that cannot be successfully repaired as determined by Architect

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Services: Manufacturer's representative shall provide technical assistance and guidance for installation of storefronts.
- B. Water Spray Test: After completing the installation of test areas indicated, test storefront system for water penetration according to AAMA 501.2 requirements.
- C. Repair or remove and replace Work that does not meet requirements or that is damaged by testing; replace to conform to specified requirements.

3.5 ADJUSTING

- A. Adjust doors, hinges, and locksets for smooth operation without binding.

3.6 CLEANING

- A. Clean doors promptly after installation in accordance with manufacturer's instructions.
- B. Do not use harsh cleaning materials or methods that would damage finish.

3.6 PROTECTION

- A. Protect installed doors and windows to ensure that, except for normal weathering, doors and windows will be without damage or deterioration at time of substantial completion.

END OF SECTION 08120

SECTION 08710 – DOOR HARDWARE

PART 1 - GENERAL

1.1 SUMMARY

- A. Intent: The intent of this Section is to provide finish hardware for the proper operation and control of all hollow metal and aluminum doors in the Project. Prior to bidding, notify the Architect of any doors that do not have hardware meeting this intention.
- B. This Section includes items known commercially as finish or door hardware that are required for swinging doors, except special types of unique hardware specified in the same sections as the doors and door frames on which they are installed. This Section includes, but is not necessarily limited to furnishing and installing complete, the following:
 - 1. Finish hardware for proper operation and control of all aluminum and hollow metal doors, including hinges, locks and latch sets, closers, panic devices, auto flushbolts, electric strikes, magnetic holders, removable mullions, cylinders, keys, miscellaneous stops, flat goods, weatherstripping and thresholds as required.
 - 2. Cylinder for access doors where specified.
- C. Related work in other sections:
 - 1. Hollow metal doors, frames and silencers: Section 08110.
 - 2. Aluminum doors: Relocate existing door, frame and hardware as indicated on the drawings.

1.2 DEFINITIONS

- A. "Finish Hardware" includes items known commercially as finish hardware which are required for swing, and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and door frame.

1.3 ACTION SUBMITTALS

- A. Product Data: Submit manufacturers technical product data for each hardware item. Include information necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finishes.
 - 1. Manufacturer shall submit written certification confirming closers compliance with U.L. 10C.
- B. Hardware Schedule: Submit a hardware schedule in a vertical format (horizontal format not acceptable), organized into sets, including the information below. Designations for door numbers and hardware sets in the schedule shall match those used in the Construction Documents for each opening.
 - 1. Hardware Schedule shall be coordinated with doors, frames, and related work to ensure proper size, thickness, hand function, and finish of door hardware.
 - 2. Catalog cuts of each type of exposed hardware unit, highlighted in color to indicate compliance with the Hardware Schedule.
 - 3. Type, style, function, size and finish of each hardware item.
 - 4. Name and manufacturer of each item.
 - 5. Fastenings and other pertinent information.
 - 6. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
 - 7. Mounting locations for hardware.
 - 8. Door and frame sizes and materials.
 - 9. Deviations from Specifications shall be noted in cover letter.
- C. Submittal Sequence: Submit schedule at earliest possible date particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples,

shop drawings of other work affected by finish hardware, and other information essential to the coordinated review of hardware schedule.

- D. Keying Schedule: Submit separate detailed schedule, at the same time as the Hardware Schedule, indicating keying for all locks and how Owner's instructions, on keying of locks has been fulfilled. Keying schedule must be approved before ordering any locks.
- E. Pinning Transcript: Submit detailed schedule indicating each lock cylinder and core.
- F. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

1.4 QUALITY ASSURANCE

- A. Manufacturer: Obtain each type of hardware (latch and lock sets, hinges, closers, etc.) from a single manufacturer, although several may be indicated as offering products complying with requirements.
- B. Product/Material Qualifications: Manufacturer's product numbers are indicated for convenience in identifying finish hardware items. Unless otherwise indicated, manufacturer's description for indicated product number constitutes minimum standards of quality, design, function and performance required for each item to be incorporated into the Project.
 - 1. It will be the responsibility of the Bidder to furnish with his Bid a list clarifying any deviations from these specifications written or implied, in order that a fair and proper evaluation be made. Those Bidders not submitting a list of deviations will be presumed to have Bid as specified.
- C. Supplier Qualifications: A recognized Architectural Finish Hardware Supplier, with warehousing facilities within 50 miles of the project location, who has been furnishing and installing hardware in the project's vicinity for a period of not less than 3 years. Supplier shall be or employ an experienced Architectural Hardware Consultant (AHC) who is certified by and member of the Door and Hardware Institute. The Architectural Hardware Consultant shall be available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Contractor.
 - 1. Supplier shall meet with the Owner to finalize keying requirements and obtain final instructions in writing.
 - 2. Hardware provider shall employ installers with not less than 3 years' experience in installing commercial door hardware. The installers shall also have attended the specified manufacturers training classes instructing them in the proper installation of their products.
 - 3. Installation of products in this section is to be provided by the door hardware supplier.
- D. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Pamphlets No. 80, No. 101 and of authorities having jurisdiction requirements. Provide only hardware which has been tested and listed by UL, FM or Warnock Hersey for types and sizes of doors required and complies with requirements of door and door frame labels.
 - 1. Where emergency exit devices are required on fire-rated doors, (with supplementary marking on doors' UL or FM labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL or FM label on exit devices indicating "Fire Exit Hardware".
- E. Standards: Comply with the requirements of the latest edition of the following standards, unless indicated otherwise:
 - 1. American National Standards Institute (ANSI) Publications:
 - a. A115 Series - Door and Frame Preparation.
 - b. A156 Series - Hardware.
 - 2. Builders Hardware Manufacturers Association (BHMA) Publications:
 - a. 1201 - Auxiliary Hardware.
 - b. 1301 - Materials and Finishes.
 - 3. Door and Hardware Institute (DHI) Publications:

- a. Keying - Procedures, Systems, and Nomenclature.
 - b. Abbreviations and Symbols.
 - c. Hardware for Labeled Fire Doors.
 - d. Recommended Locations for Builder's Hardware for Standard and Custom Steel Doors and Frames.
 - e. Wood Door Standards W1, W2, WDHS-2, WDHS-3.
 4. National Fire Protection Association (NFPA) Publications:
 - a. NFPA Pamphlet No. 80 - Standards for Fire Doors and Windows.
 5. International Building Code - current edition as adopted and amended by the authority having jurisdiction of the City of Duquesne, Missouri.
 6. Americans with Disabilities Act (ADA).
 - F. Keying Conference: Conduct conference in accordance with Section 01300. In addition to Owner, Construction Manager, and Architect, conference participants shall also include Installer's Architectural Hardware Consultant. Incorporate keying conference decisions into final keying schedule after reviewing door hardware keying system including, but not limited to, the following:
 1. Function of building, flow of traffic, purpose of each area, degree of security required, and plans for future expansion.
 2. Preliminary key system schematic diagram.
 3. Requirements for key control system.
 4. Address and method of delivery of keys and permanent cores.
 - G. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Section 01300 as follows:
 1. Architectural Finish Hardware supplier (AFHS) shall conduct the pre-installation conference at the site. An Owners representative must be present at this meeting to help instruct on special requirements and instructions. The AFHS shall instruct finish hardware installers on proper installation, adjustment and troubleshooting for each operable item of finish hardware specified. The AFHS and Owner shall observe the installation and adjustment of the first three locksets, closers and exit devices. Anyone installing door hardware must be present at this meeting. An attendee list and notes from this meeting shall be supplied to the Owner and Architect for their records.
- 1.5 DELIVERY, STORAGE AND HANDLING
- A. Package each hardware item in separate containers with all screws, wrenches, installation instructions and installation templates. Mark or tag each box with hardware heading and door number according to approved hardware schedule.
 - B. Packaging of door hardware is responsibility of supplier. As material is received by hardware supplier from various manufacturers, sort and repackage in containers clearly marked with appropriate hardware set number to match set numbers of approved hardware schedule. Two or more identical sets may be packed in same container.
 - C. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation. Provide a complete packing list showing items, door numbers and hardware headings with each shipment.
 - D. Store hardware in shipping cartons above ground and under cover to prevent damage.
 1. Provide secure lockup for door hardware delivered to the Project, but not yet installed. Control handling and installation of hardware items that are not immediately replaceable so that completion of the Work will not be delayed by hardware losses both before and after installation.
 - E. Deliver keys and permanent cores to Owner by registered mail or overnight package service.
 - F. Aluminum Door Hardware – Reuse existing hardware for relocated aluminum door as indicated on the drawings. Provide and install a new aluminum threshold to suit the new condition unless existing threshold is salvageable.

1.6 COORDINATION

- A. Templates: Obtain and distribute to the parties involved templates for doors, frames, and other work specified to be factory prepared for installing door hardware. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing door hardware to comply with indicated requirements.
- B. Security: Coordinate installation of door hardware, keying, and access control with Owner's security consultant.
- C. Electrical System Roughing-In: Coordinate layout and installation of electrified door hardware with connections to power supplies and building safety and security systems.
- D. Existing Openings: Where hardware components are scheduled for application to existing construction or where modifications to existing door hardware are required, field verify existing conditions and coordinate installation of door hardware to suit opening conditions and to provide proper door operation.

1.7 MAINTENANCE

- A. Maintenance Tools and Instructions: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of door hardware.

PART 2 - PRODUCTS

2.1 HARDWARE - GENERAL

- A. Provide the materials or products indicated by trade names, manufacturer's name, or catalog number.
- B. Provide manufacturer's standard products meeting the design intent of this Specifications, free of imperfections affecting appearance or serviceability.
 - 1. Base Metals: Produce hardware units of basic metal and forming method indicated using manufacturer's standard metal alloy, composition, temper, and hardness, but in no case of lesser (commercially recognized) quality than specified for applicable hardware units for finish designations indicated.
 - 2. Provide hardware complete with all fasteners, anchors, instructions, layout templates, and any specialized tools as required for satisfactory installation and adjustment.
 - 3. Hand of door: Drawings show direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of door movement as shown.
 - 4. Furnish screws for installation, with each hardware item. Provide Phillips flat-head screws except as otherwise indicated or approved. Finish screws exposed under any condition to match hardware finish or, if exposed in surfaces of other work, to match finish of such other work as closely as
 - 5. Finish all other hardware in accordance with the BHMA finish as follows, unless otherwise indicated in manufacturers' screws to secure hardware.
 - 6. Provide concealed fasteners for hardware units which are exposed when door is closed, except to extent 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, except where indicated otherwise or where it is not feasible to adequately reinforce the work. In such cases, provide sleeves for each thru-bolt or use sex bolt fasteners.
 - 7. Provide factory pinned cylinders and cores.
- C. Hardware is specified in the hardware schedule by set, type, and functions which have been selected as best meeting the application requirements. Acceptable products for each category are specified under PART 2 of this Specification.

2.2 SPECIAL REQUIREMENTS

A. Hinges:

1. Provide non-removable pins for all exterior doors and out-swinging corridor doors. Use nonrising pins for all other doors.
2. Pre-drill pilot holes for hinge fasteners at factory to suit hinge type.
3. Provide continuous hinges where specified.
4. Hinges shall be sized in accordance with the following:
 - a. Height: 4-1/2" inches.
 - b. Width: Sufficient to clear frame and trim when door swings 180 degrees.
 - c. Number of Hinges: Furnish 3 hinges per leaf to 7'-6" in height. Add one hinge for each additional 30 inches of height.

B. Panic Devices:

1. Except on fire-rated doors, or unless specified otherwise, provide panic devices with hex dogging device to hold latch bolt open on doors with closers.
2. Classrooms and student spaces with panics are to have the ability to lock from the inside via a key or thumbturn. Lock condition must be readily distinguishable from the classroom side via indicator on the panic.

C. Locksets:

1. All locksets shall meet or exceed ANSI Grade 1 requirements.
2. Provide cylindrical (Schlage ND Series) as specified.

D. Closers:

1. Comply with manufacturer's recommendations for unit size based on door size, weather exposure and usage.
2. Provide parallel arms for all overhead closers, except as otherwise indicated.
3. Closer cylinders shall be cast iron. Closer pinions shall be dual heat treated. Pinion and piston shall be steel alloy. Piston diameter shall be minimum 1-1/2".
4. Furnish all brackets, drop plates and any other necessary hardware required to insure proper installation.

2.3 KEYING

A. All cylinders to be keyed to the districts existing Schlage Primus master system. Hardware supplier to verify proper key system. Keying schedule must be approved by the Owner prior to ordering locks.

1. Hardware supplier shall be responsible for providing the correct type of cylinder for each hardware application, and supplying cylinder with correct tailpiece and/or cam.
2. Cylinders are to be provided with large format permanent cores that are removable on panic devices or where specified.
3. Construction cores are to be provided on all exterior doors, all aluminum doors, and 10 interior doors.

B. Key all locks separately, or alike, as directed by the Owner's representative and Architect.

C. Provide final bitting list to Owner.

D. Provide keys as follows:

1. Change Keys: Two (2) per lock.
2. Master Keys: Six (6) required (per system).

E. Identification: Stamp all (master-type) keys with the following:

1. Do Not Duplicate.
2. Key change number (all keys).

2.4 HARDWARE FINISHES

- A. Provide matching finishes for hardware units at each door to the greatest extent possible, unless otherwise indicated. In general, match items to the finish for the latch, lock or push-pull unit for color and texture.
- a. Product description or schedule:
- 1) 626 satin chrome-plated.
 - 2) 630 satin stainless steel.

2.5 HARDWARE PRODUCTS

- A. Hinges:
1. Specified manufacturer: IVES Hardware; an Allegion Company.
 2. Acceptable substitutions:
 - a. Hager Companies.
 - b. McKinney Products Company; an ASSA ABLOY Group company.
 - c. Stanley Commercial Hardware; Div. of The Stanley Works.
- B. Continuous Gear-Type Hinges:
1. Specified manufacturer: IVES Hardware; an Allegion Company.
 2. Acceptable substitutions:
 - a. Hager Companies.
 - b. Select Products Limited.
 - c. Zero International.
- C. Mullions:
1. Specified manufacturer: Detex Corporation.
 2. Substitutions: Not allowed. Products to match District standard.
- D. Locksets:
1. Specified manufacturer: Schlage Commercial Lock Division; an Allegion Company.
 2. Substitutions: Not allowed. Products to match District standard.
- E. Exit Devices:
1. Specified manufacturer: Von Duprin; an Allegion Company
 2. Substitutions: Not allowed. Products to match District standard.
- F. Electric Strikes
1. Specified manufacturer: Von Duprin; an Allegion Company,
 2. Acceptable substitutions:
 - a. HES
- G. Closers:
1. Specified manufacturer: LCN Closers; an Allegion Company.
 2. Substitutions: Not allowed. Products to match District standard.
- H. Flatgoods:
1. Specified manufacturer: Ives Hardware; an Allegion Company.
 2. Acceptable substitutions:
 - a. Burns.
 - b. Rockwood.
- I. Stops:
1. Specified manufacturer: Ives Hardware; an Allegion Company.
 2. Acceptable substitutions:
 - a. Burns Manufacturing Incorporated.
 - b. Hager Companies.
 - c. Rockwood Manufacturing Company.
 - d. Trimco
- J. Overhead stops:

1. Specified manufacturer: Glynn-Johnson; an Allegion Company.
2. Acceptable substitutions:
 - a. Architectural Builders Hardware Mfg., Inc.
 - b. Ives Hardware; an Allegion Company.
 - c. Rixson Specialty Door Controls; an ASSA ABLOY Group.
 - d. Trimco.

K. Thresholds:

1. Specified manufacturer: Zero International.
2. Acceptable substitutions:
 - a. Hager Companies.
 - b. Reese Enterprises.
 - c. NGP.

L. Door Gasketing/Weatherstripping:

1. Specified manufacturer: Zero International.
2. Acceptable substitutions:
 - a. Hager Companies.
 - b. Reese Enterprises.
 - c. NGP.

M. Automatic Operators:

1. Specified manufacturer: LCN Closers; an Allegion Company.
2. Acceptable substitutions:
 - a. Besam Automatics.

PART 3 - EXECUTION

3.1 PREPARATION

- A. Carefully inspect doors, frames, and conditions under which hardware will be installed. Notify the Architect of any conditions that would adversely affect the installation or subsequent door operations. Do not proceed until unsatisfactory conditions are corrected.
 1. Frames shall be verified, inspected, and confirmed by General Contractor as being plumb and true.
- B. Refer to Sections 08110 for additional installation requirements.
- C. Prior to hardware installation, the Hardware Supplier shall meet with the Owner's Representative, Architect, and Hardware Installer to ensure the Installer has and understands the manufacturers' installation requirements for all hardware items.
 1. The Supplier and Owner shall observe the installation of the first lockset, closer and panic device.

3.2 INSTALLATION

- A. Mount Hardware units at heights indicated in respective DHI Standards, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.
- B. Install each hardware item in compliance with the manufacturer's instructions and written recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be field finished, coordinate removal, storage and reinstallation or application of surface protections with finishing work. Do not install surface-mounted items until finishes have been completed on the substrate.
- C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.
 1. Special care shall be taken to avoid damaging surrounding surfaces.

- 1 D. Provide fasteners and anchoring devices of suitable size, quantity, and type to secure hardware
2 in proper position for heavy use and long life.
3 1. Drill and countersink units which are not factory-prepared for anchorage fasteners. Space
4 fasteners and anchors in accordance with industry standards.
- 5 E. Adjust door closers immediately upon installation. Adjust in exact conformance with
6 manufacturer's printed instructions. Advance backcheck to eliminate shock at dead stop. Set
7 latching speed to assure unassisted positive latching.
8 1. Degrees of swing of doors for self-limiting closers shall be maximum available.
- 9 F. Install each protection plate with a thinly-spread spot of mastic at its center to assure even
10 contact before fastening with screws. Install all such plates on visual centers of closed doors.
11 Set bottom edges of all such plates flush with door bottom.
- 12 G. Cut and fit thresholds to door frame profiles. Prepare thresholds for the attachment of strikes
13 and clearance for spindles as required. Set thresholds in a continuously laid bed of
14 polyisobutylene mastic sealant to completely fill voids and exclude moisture from every source.
- 15 H. Seal weather protection components attached to the exterior sides of doors and frames, such
16 as drip caps and weatherstripping, in place with clear silicone caulk in such a manner as to
17 ensure a continuously filled seam throughout the joinery.
- 18 I. Cut and fit weatherstripping accurately to provide the greatest possible continuity of the contact
19 element. Adjust closer templating as required.
- 20 J. At exterior doors, obtain satisfactory operation of the installation, then apply a thin layer of clear
21 silicone caulk under hinge leaves, and outside lock trim. Remove excess caulk after torquing
22 fasteners.

23 3.3 ADJUST AND CLEAN

- 24 A. Adjust and check each operating item of hardware and each door, to ensure proper operation or
25 function of every unit. Replace units which cannot be adjusted to operate freely and smoothly
26 as intended for the application made.
27 1. Clean adjacent surfaces soiled by hardware installation.
- 28 B. Final Adjustment: Wherever hardware installation is made more than one month prior to
29 acceptance or occupancy of a space or area, return to the work during the week prior to
30 acceptance or occupancy, and make final check and adjustment of all hardware items in such
31 space or area. Clean operating items as necessary to restore proper function and finish of
32 hardware and doors. Adjust door control devices to compensate for final operation of heating
33 and ventilating equipment.

34 3.4 INSTRUCTION AND INSPECTION

- 35 A. Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware
36 finishes, during the final adjustment of hardware.
- 37 B. Post Installation Inspection: After hardware is installed and adjusted, the Supplier shall inspect
38 the job with the Architect and the Contractor to determine if the hardware is functioning properly.
39 An Owners representative and hardware Manufacturer's representative shall participate in this
40 inspection. A punch list shall be generated from this inspection and all problems shall be
41 corrected.
42 1. Maintain the instruction sheets, layout templates, and any supplementary literature
43 regarding hardware in a readable condition. Transmit all such items to the Owner's
44 Representative, together with all spare parts, specialized tools, other accessories
45 supplied with the hardware, and a copy of the approved hardware schedule at the time of
46 instruction.
- 47 C. Continued Maintenance Service: Approximately six months after the acceptance of hardware in
48 each area, the Installer, accompanied by the representative of the latch and lock manufacturer,

shall return to the project and re-adjust every item of hardware to restore proper function of doors and hardware. Consult with and instruct Owner's personnel in recommended additions to the maintenance procedures. Replace hardware items which have deteriorated or failed due to faulty design, materials or installation of hardware units at no cost to the Owner. Prepare a written report of current and predictable problems (of substantial nature) in the performance of the hardware.

3.5 HARDWARE SETS

HARDWARE SET 01

DOOR NUMBER:

11A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
1	EA	CONT. HINGE	112HD	628	IVE
1	EA	PANIC HARDWARE	99-L-NL-996-06	626	VON
1	EA	RIM HOUSING	20-079	626	SCH
1	EA	PRIMUS CORE	20-740	626	SCH
1	EA	SURFACE CLOSER	4111 AVB CUSH	689	LCN
1	EA	CUSH SHOE SUPPORT	4110-30	689	LCN
1	EA	BLADE STOP SPACER	4110-61	689	LCN
1	EA	RAIN DRIP	142AA	AA	ZER
1	EA	DOOR SWEEP	39A	A	ZER
1	EA	DOOR SWEEP	8198AA	AA	ZER
1	EA	THRESHOLD	65A-223	A	ZER
1	EA	DOOR POSITION SWITCH	1078CW-M		GEN
	EA	WEATHERSTRIP/ASTRAGAL BY DOOR/FRAME MANUFACTURER			

HARDWARE SET 02

DOOR NUMBER:

230A

EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
6	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
2	EA	FIRE EXIT HARDWARE	9927-L-BE-F-06	626	VON
2	EA	SURFACE CLOSER	4111 EDA	689	LCN
2	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
2	EA	WALL STOP	WS406/407CCV	630	IVE
2	EA	FIRE/LIFE WALL MAG	SEM7850	689	LCN
1	EA	ASTRAGAL SET	8193AA	AA	ZER
1	EA	GASKETING	488SBK PSA	BK	ZER

OPERATION: DOOR NORMALLY HELD OPEN. PUSHING BUTTON IN OFFICE CLOSES DOORS. ALWAYS FREE FOR EGRESS.

1 **HARDWARE SET 03**

2 DOOR NUMBER:
245A

3 EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	CORRIDOR LOCK	ND73LD RHO	626	SCH
1	EA	PRIMUS K-I-L CYL.	20-765	626	SCH
1	EA	SURFACE CLOSER	4111 EDA	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

4
5

6 **HARDWARE SET 04**

7 DOOR NUMBER:
C-1 C-2 C-G

8 EACH TO HAVE:

QTY		DESCRIPTION	CATALOG NUMBER	FINISH	MFR
3	EA	HINGE	5BB1HW 4.5 X 4.5	652	IVE
1	EA	STOREROOM LOCK	ND80LD RHO	626	SCH
1	EA	PRIMUS K-I-L CYL.	20-765	626	SCH
1	EA	SURFACE CLOSER	4011	689	LCN
1	EA	KICK PLATE	8400 10" X 2" LDW B-CS	630	IVE
1	EA	WALL STOP	WS406/407CCV	630	IVE
1	EA	GASKETING	488SBK PSA	BK	ZER

9
10
11
12
13

END OF SECTION

SECTION 08800 - GLASS AND GLAZING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

- A. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division-1 Specification sections, apply to work of this section.
- B. Extent of glass and glazing work is indicated on drawings and includes the following:
 - 1. Door glass and window glass at exterior locations shown on the plans and as required for new doors and existing window systems.

1.2 SYSTEM DESCRIPTION:

- A. Provide glass and glazing that has been produced, fabricated and installed to withstand normal thermal movement and impact loading (where applicable), without failure including loss or breakage of glass, failure of sealants to remain watertight and airtight, deterioration of glass and glazing materials and other defects in the work.

1.3 SUBMITTALS:

- A. Product Data: Submit manufacturer's technical data for each glazing material and fabrication glass product required, including installation and maintenance instructions.
- B. Samples: Submit, for verification purposes, 12" square samples of each type of glass indicated and 12" long samples of each sealant color required to match existing adjacent conditions.
- C. Certificate: Submit certificates from respective manufacturers attesting that glass and glazing materials furnished for project comply with requirements.

1.4 QUALITY ASSURANCE:

- A. Glazing Standards: Comply with recommendations of Flat Glass Marketing Association (FMGA) "Glazing Manual" and "Sealant Manual" except where more stringent requirements are indicated. Refer to those publications for definitions of glass and glazing terms not otherwise defined in this section or other referenced standards.
- B. Safety Glazing Standard: Where safety glass is indicated, required by the current enforced building code, and authorities having jurisdiction, provide type of products which comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category I and II materials as indicated in Table 2406.1. Provide safety glass permanently marked with certification label of Safety Glazing Certification Council (SGCC) or other certification agency acceptable to authorities having jurisdiction. Human impact loads shall pass the requirements of CPSC 16 CFR 1201, as listed in Chapter 35 of the 2003 IBC.
- C. Single Source Responsibility for Glass: To ensure consistent quality of appearance and performance, provide materials produced by a single manufacturer or fabricator for each kind and condition of glass indicated and composed of primary glass obtained from a single source for each type and class required.
- D. New glass (replacement or new window/door glass) shall match existing adjacent glass for color/tint, reflectance, and color transmission (visibility) to interior of exterior conditions. Glass Contractor shall identify and obtain matching glass from manufacturers used in adjacent installations and submit samples for each location for verification and approval by the Architect.
- E. Use test methods standard with sealant manufacturer to determine if priming and other specific preparation techniques are required for rapid, optimum glazing sealants adhesion to glass and glazing channel substrates.

1.5 DELIVERY, STORAGE, AND HANDLING:

- A. Protect glass and glazing materials during delivery, storage and handling to comply with manufacturer's directions and as required to prevent edge damage to glass, and damage to glass and glazing materials from effects of moisture including condensation, of temperature changes, of direct exposure to sun, and from other causes.

1.6 PROJECT CONDITIONS:

- A. Environmental Conditions: Do not proceed with glazing when ambient and substrate temperature conditions are outside the limits permitted by glazing manufacturer or when joint substrates are wet due to rain, frost, condensation or other causes.

1.7 WARRANTY:

- A. Warranties shall be in addition to, and not a limitation of, other rights the Owner may have under the Contract Documents.

PART 2 - PRODUCTS

2.1 MANUFACTURERS:

- A. Subject to compliance with requirements, manufacturers offering glass products which may be used in the work include; or approved equal:
 - 1. AFG Industries, Inc.
 - 2. Ford Glass Division.
 - 3. Guardian Global - Glass
 - 4. LOF Glass, Inc.
 - 5. PPG Industries, Inc.
- B. Subject to compliance with requirements, manufacturers offering fire-rated/safety-rated glass products which may be incorporated in the work include; or approved equal:
 - 1. Safti First SuperLite I (20 minute).
 - 2. Pilkington (approved equal).
 - 3. Provide where indicated on the drawings.

2.2 GLASS PRODUCTS:

- A. Primary Glass Standard: Provide primary glass which complies with ASTM C 1036 requirements, including those indicated by reference to type, class, quality, and pattern.
- B. Clear Float Glass: ASTM 1048, Condition C (other coated glass), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), 1/4" thickness.
- C. Clear Heat-Treated Float Glass: ASTM 1048, Condition C (other coated glass), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), kind FT (fully tempered) 1/4" thickness.
 - 1. CPSC 16 CFR 1201, Category II 400 ft.lbs.
- D. Heat-Treated Glass Standard: Provide heat-treated glass which complies with ASTM C 1048 requirements Condition C (other coated glass), Type I (transparent glass, flat), Class 1 (clear), Quality q3 (glazing select), with coating type and performance characteristics complying with requirements specified under the coated glass products, kind FT (fully tempered) 1/4" thickness. Manufacture heat-treated glass horizontal (roller hearth) process with roll wave distortion parallel to installed glass bottom edge.
 - 1. CPSC 16 CFR 1201, Category II 400 ft.lbs.
- F. Fire-Rated and Safety-Rated Glazing Material: Proprietary product in the form of a clear "high impact" fire rated glass, 1/4" thickness or otherwise specified, shall be colorless, and free from distortion. Provide safety rated, fire rated glass at all fire rated openings. Each piece of fire-rated glazing material shall be labeled with a permanent logo including name of product, manufacturer, testing laboratory, fire rating period, and safety glazing

standards. Glazing material shall be certified and permanently labeled as meeting applicable requirements referenced by NFPA 80:

1. ANSI Z97.1, 100 ft-LB (1780N)
2. CPSC 16 CFR 1201, Category II 400 ft.lbs.
3. Fire-Resistance: Determined by testing identical products in wood doors and metal-framed assemblies by a testing and inspecting agency acceptable to authorities having jurisdiction:
 - a. One (1) hour rated Corridor partitions shall have 20 minute door rating.
 - b. 45 minute rating for doors and window walls where indicated on drawings.

2.3 PRIMARY GLASS PRODUCTS:

A. **Glass Type 2A – Fire Rated and Safety Rated Glass (Borrowed-light walls, sidelights, and door glass)**

1. Clear “high impact” fire rated glass, 1/4” thickness, shall be clear, non-wired, CPSC Cat. II, and free from distortion. ASTM E-119.
2. Provide clear, heat treated fully tempered glass at all locations required by building/life safety codes and authorities having jurisdiction. Provide "tempered / laminated units" for all glass in doors and in all glass with the nearest vertical edge within 24" radius of doors (in a closed position and a bottom edge less than 60" AFF or "walking" surface) and for all hazardous locations in accordance with current IBC Section 2406 Safety Glazing and Table 2406.1.

B. **Glass Type 3A: Security Glass, Clear Laminated (Borrowed-lights, sidelights, and door glass)**

1. Clear “high impact” laminated glass, 1/4” thickness, shall be clear, **Armour-G by Guardian Global - Glass Products** is the basis-for-design, or pre-approved product by manufacturer's with products equal to the performance characteristics.

2.4 ELASTOMERIC GLAZING SEALANTS AND PREFORMED GLAZING TAPES

A. Compatibility: Select glazing sealants and tapes of proven compatibility with other materials with which they will come into contact, including glass products and glazing channel substrates, under conditions of installation and service, as demonstrated by testing and field experience. Comply with recommendations of sealant and glass manufacturers for selection of glazing sealants and tapes which have performance characteristics suitable for applications indicated.

B. Colors: Provide manufacturer's standard sealant colors as selected by the Architect.

One-Part Non-Acid-Curing Silicone Glazing Sealant: Type S; Grade NS, Glass 25; Uses NT, G, A, and, as applicable to uses indicated, O; and complying with the following requirements for modulus and additional joint movement capability.

C. Products: Subject to compliance with requirements, provide one of the following:

1. Multi-Part Silicone Glazing Sealant:
2. "Dow-Corning 799"; Dow Corning Corp.
3. "Contractors 1000"; General Electric Corp.
4. Preformed Butyl-Polyisobutylene Glazing Tape With Spacer Rod:
5. "Chem-Tape 60"; Bostik Construction Products Div.
6. "Shim-Seal"; Pecora Corp.
7. "Pre-shimmed Tremco 440 Tape"; Tremco Inc.

2.5 MISCELLANEOUS GLAZING MATERIAL:

A. Compatibility: Provide materials with proven record of compatibility with surfaces

contacted in installation.

- B. Cleaners, Primers, and Sealers: Type recommended by sealant manufacturer.
- C. Setting Blocks: EPDM or silicone blocks as required for compatibility with glazing sealants, 80 to 90 Shore A durometer hardness.
- D. Spacers: EPDM or silicone blocks, or continuous extrusions, as required for compatibility with glazing sealant, of size, shape and hardness recommended by glass and sealant manufacturers for application indicated.
- E. Edge Blocks: EPDM or silicone blocks as required for compatibility with glazing sealant, of size and hardness required to limit lateral movement (side-walking) of glass.
- G. Backer Rod: Type recommended by sealant manufacturer for glazing application and performance.

2.6 FABRICATION OF GLASS AND OTHER GLAZING PRODUCTS

- A. Fabricate glass and other glazing products in sizes required to glaze openings indicated for Project, with edge and face clearances, edge and surface conditions, and bite complying with recommendations of product manufacturer and referenced glazing standard as required to comply with system performance requirements.
- B. Clean cut or flat grind vertical edges of butt-glazed monolithic lites in a manner that produces square edges with slight kerfs at junctions with indoor and outdoor faces.

PART 3 - EXECUTION

3.1 EXAMINATION:

- A. Require Glazier to inspect work of glass framing erector for compliance with manufacturing and installation tolerances, including those for size, squareness, offsets at corners; for existence of minimum required face or edge clearances; and for effective sealing of joinery. Obtain Glazier's written report listing conditions detrimental to performance of glazing work. Do not allow glazing work to proceed until unsatisfactory conditions have been corrected.

3.2 PREPARATION:

- A. Clean glazing channels and other framing members to receive glass, immediately before glazing. Remove coatings which are not firmly bonded to substrates. Remove lacquer from metal surfaces where elastomeric sealants are indicated for use.

3.3 GLAZING, GENERAL:

- A. Comply with combined printed recommendations of glass manufacturers, of manufacturers of sealants and other glazing materials, except where more stringent requirements are indicated, including those of referenced glazing standards.
- B. Protect glass from edge damage during handling and installation; use a rolling block in rotating glass units to prevent damage to glass corners. Do not impact glass with metal framing. Use suction cups to shift glass units within openings; do not raise or drift glass with a pry bar. Rotate glass with flares or bevels along one horizontal edge which would occur in vicinity of setting blocks so that these are located at top of opening. Remove from project and dispose of glass units with edge damage or other imperfections of kind that, when installed, weakens glass and impairs performance and appearance.
- C. Glazing channel dimensions as indicated in details are intended to provide for necessary bite on glass, minimum edge and face clearances, and adequate sealant thicknesses, with reasonable tolerances. Adjust as required by job conditions at time of installation.
- D. Apply primers to joint surfaces where required for adhesion of sealants, as determined by construction sealant-substrate testing.

- E. Install setting blocks of proper size in sill rabbet, located one quarter of glass width from each corner, but with edge nearest corner not closer than 6" from corner. Set blocks in thin course of sealant, which is acceptable for heel bead use.
 - F. Provide spacers inside and out, of correct size and spacing to preserve required face clearances, for glass sizes larger than 50 united inches (length plus height), except where glazing tapes with continuous spacer rods are used for glazing. Provide 1/8" minimum bite of spacers on glass and use thickness equal to sealant width, except with sealant tape use thickness slightly less than final compressed thickness of tape.
 - G. Provide edge blocking to comply with requirements of referenced glazing standard, except where otherwise required by glass unit manufacturer.
 - H. Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.
 - I. Force sealants into glazing channels to eliminate voids and to ensure complete "wetting" or bond of sealant to glass and channel surfaces.
 - J. Tool exposed surfaces of sealants to provide a substantial "wash" away from glass. Install pressurized tapes and gaskets to protrude slightly out of channel, so as to eliminate dirt and moisture pockets.
- 3.4 PROTECTION AND CLEANING:
- A. Protect glass from contact with contaminating substances resulting from construction operations. If, despite such protection, contaminating substances do come into contact with glass, remove immediately by method recommended by glass manufacturer.
 - B. Remove and replace glass which is broken, chipped, cracked, abraded or damaged in other ways during construction period, including natural causes, accidents and vandalism.
 - C. Wash glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion in each area of project. Wash glass by method recommended by glass manufacturer.

END OF SECTION 08800

SECTION 09250 - GYPSUM BOARD ASSEMBLIES

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. This Section includes the following:
 - 1. Non-load-bearing steel framing members for gypsum board assemblies.
 - 2. Gypsum board wall assemblies attached to steel framing.
 - 3. Sound attenuation insulation for installations in metal stud partitions.
 - 4. Exterior gypsum sheathing for exterior wall backing.
- B. Related Sections: The following Sections contain requirements that relate to this Section:
 - 1. Division 4 Section "Unit Masonry" for exterior concrete masonry.
 - 2. Division 5 Section "Cold-Formed Metal Framing" for load-bearing steel framing.
 - 3. Division 6 Section "Rough Carpentry" for wood blocking.
 - 4. Division 7 Section "Joint Sealants" for acoustical sealants.
 - 5. Division 7 Section "Exterior and Finish System" for exterior wall finish.

1.3 DEFINITIONS

- A. Gypsum Board Construction Terminology: Refer to ASTM C 11 and GA-505 for definitions of terms for gypsum board assemblies not defined in this Section or in other referenced standards.

1.4 ASSEMBLY PERFORMANCE REQUIREMENTS

- A. Sound Transmission Characteristics: For gypsum board assemblies with STC ratings, provide materials and construction identical to those of assemblies whose STC ratings were determined according to ASTM E 90 and classified according to ASTM E 413 by a qualified independent testing agency.
- B. Fire Resistance: Provide gypsum board assemblies with fire-resistance ratings indicated.

1.5 SUBMITTALS

- A. General: Submit each item in this Article according to the Conditions of the Contract and Division 1 Specification Sections.
- B. Product Data for each type of product specified.
- C. Shop Drawings showing locations, fabrication, and installation of control and expansion joints including plans, elevations, sections, component details, and attachments to other Work.
- D. Product certificates signed by manufacturers of gypsum board assembly components certifying that products comply with specified requirements.

1.6 QUALITY ASSURANCE

- A. Single-Source Responsibility for Steel Framing: Obtain steel framing members for gypsum board assemblies from a single manufacturer, unless otherwise indicated.
- B. Single-Source Responsibility for Panel Products: Obtain each type of gypsum board and other panel products from a single manufacturer.

- 1 C. Single-Source Responsibility for Finishing Materials: Obtain finishing materials from either the
2 same manufacturer that supplies gypsum board and other panel products or from a
3 manufacturer acceptable to gypsum board manufacturer.
4
- 5 D. Fire-Test-Response Characteristics: Where fire-resistance-rated gypsum board assemblies are
6 indicated, provide gypsum board assemblies that comply with the following requirements:
7 1. Fire-Resistance Ratings: As indicated by GA File Numbers in GA-600 "Fire Resistance
8 Design Manual" or design designations in UL "Fire Resistance Directory" or in the listing
9 of another testing and inspecting agency acceptable to authorities having jurisdiction.
10 2. Gypsum board assemblies indicated are identical to assemblies tested for fire resistance
11 according to ASTM E 119 by an independent testing and inspecting agency acceptable to
12 authorities having jurisdiction.
13 3. Deflection and Firestop Track: Top runner provided in fire-resistance-rated assemblies
14 indicated is labeled and listed by UL, Warnock Hersey, or another testing and inspecting
15 agency acceptable to authorities having jurisdiction.
16
- 17 1.7 DELIVERY, STORAGE, AND HANDLING
18
- 19 A. Deliver materials in original packages, containers, or bundles bearing brand name and
20 identification of manufacturer or supplier.
21
- 22 B. Store materials inside under cover and keep them dry and protected against damage from
23 weather, direct sunlight, surface contamination, corrosion, construction traffic, and other causes.
24 Neatly stack gypsum panels flat to prevent sagging.
25
- 26 1.8 PROJECT CONDITIONS
27
- 28 A. Environmental Conditions, General: Establish and maintain environmental conditions for
29 applying and finishing gypsum board to comply with ASTM C 840 requirements or gypsum
30 board manufacturer's recommendations, whichever are more stringent.
31
- 32 B. Room Temperatures: For non-adhesive attachment of gypsum board to framing, maintain not
33 less than 40 deg F (4 deg C). For adhesive attachment and finishing of gypsum board, maintain
34 not less than 50 deg F (10 deg C) for 48 hours before application and continuously after until
35 dry. Do not exceed 95 deg F (35 deg C) when using temporary heat sources.
36
- 37 C. Ventilation: Ventilate building spaces as required to dry joint treatment materials. Avoid drafts
38 during hot, dry weather to prevent finishing materials from drying too rapidly.
39

40 2 PART - PRODUCTS 41

42 2.1 MANUFACTURERS 43

- 44 A. Subject to compliance with requirements, provide products by one of the following:
45 1. Steel Framing and Furring:
46 a. Dietrich Industries, Inc.
47 b. MarinoWare, Division of Ware Industries
48 c. National Gypsum Co.; Gold Bond Building Products Division.
49 d. USG Interiors, Inc.
50 2. Gypsum Board and Related Products:
51 a. Georgia-Pacific Corp.
52 b. National Gypsum Co.; Gold Bond Building Products Division.
53 c. United States Gypsum Co.
54 d.

55 2.2 STEEL FRAMING FOR WALLS, SOFFITS AND PARTITIONS 56

- 57 A. General: Provide steel framing members complying with the following requirements:

1. Protective Coating: Manufacturer's standard corrosion-resistant zinc coating.
 - B. Steel Studs and Runners: ASTM C 645, with flange edges of studs bent back 90 degrees and doubled over to form 3/16-inch- (5-mm-) wide minimum lip (return), and complying with the following requirements for minimum thickness of base (uncoated) metal and for depth:
 1. Thickness: 0.0329 inch (0.84 mm).
 2. Depth: 1-5/8", 2-1/2", 3-5/8" and 6" depths as noted on the drawings or as required by conditions.
 3. Cold-Formed Structural Studs sizes on structural drawings.
 - C. Deflection Track: Manufacturer's standard top runner designed to prevent cracking of gypsum board applied to interior partitions resulting from deflection of the structure above fabricated from steel sheet complying with ASTM A 653 (ASTM A 653M) or ASTM A 568 (ASTM A 568M).

Thickness as indicated for studs, and width to accommodated depth of studs, and of the following configuration:

 1. Top runner with 4-inch- (100.8-mm-) deep flanges that either have V-shaped offsets that compress when pressure is applied from construction above or have slots 1 inch (25.4 mm) o.c. that allow fasteners attached to studs through the slots to accommodate structural movement by slipping.
 - a. Defection track: Subject to compliance with requirements, provide one of the following:
 1. Superior Flex Track System (SFT); Delta Star, Inc.
 2. SLP-TRK; Metal-Lite, Inc.
 - b. Fire rated deflection track: Provide "Fire Trak" manufactured by Fire Trak Corp.
 - D. Steel Rigid Furring Channels: ASTM C 645, hat shaped, depth and minimum thickness of base (uncoated) metal as follows:
 1. Thickness: 0.0329 inch (0.84 mm), unless otherwise indicated.
 2. Depth: 7/8 inch (22.2 mm).
 - E. Fasteners for Metal Framing: Provide fasteners of type, material, size, corrosion resistance, holding power, and other properties required to fasten steel framing and furring members securely to substrates involved; complying with the recommendations of gypsum board manufacturers for applications indicated.
- ### 2.3 GYPSUM BOARD PRODUCTS
- A. General: Provide gypsum board of types indicated in maximum lengths available that will minimize end-to-end butt joints in each area indicated to receive gypsum board application.
 1. Widths: Provide gypsum board in widths of 48 inches (1219 mm).
 - B. Gypsum Wallboard: ASTM C 1396 and C 1629 and as follows:
 1. Type: Type X for all locations. Provide impact resistant panels fabricated of gypsum fiber with mesh reinforcement for use at all walls. Provide sag-resistant panels for all ceiling and soffits.
 2. Edges: Tapered.
 3. Thickness: 5/8 inch (15.9 mm) unless otherwise indicated.
 - C. Glass-Mat Gypsum Sheathing Board: ASTM C 1177/C 1177M, with fiberglass mat laminated to both sides and with manufacturer's standard edges.
 1. Basis-of-Design Product: Subject to compliance with requirements, provide Georgia-Pacific Gypsum; "DensGlass Sheathing" or a comparable product by one of the following:
 - a. CertainTeed Corp.
 - b. National Gypsum Company.
 - c. USG Corporation.
 2. Core: As indicated, Type X.

2.4 TRIM ACCESSORIES

- A. Accessories for Interior Installation: Corner-bead, edge trim, and control joints complying with ASTM C 1047 and requirements indicated below:
1. Material: Formed metal or plastic, with metal complying with the following requirement:
 - a. Steel sheet zinc coated by hot-dip or electrolytic process, or steel sheet coated with aluminum or rolled zinc.
 2. Shapes indicated below by reference to Fig. 1 designations in ASTM C 1047:
 - a. Corner-bead on outside corners, unless otherwise indicated.
 - b. LC-bead with both face and back flanges; face flange formed to receive joint compound. Use LC-beads for edge trim, unless otherwise indicated.
 - c. L-bead with face flange only; face flange formed to receive joint compound. Use L-bead where indicated.
 - d. One-piece control joint formed with V-shaped slot with removable strip covering.
- B. Exterior Trim: ASTM C 1047; Material: Hot-dip galvanized steel sheet, plastic, or rolled zinc.
1. Shapes:
 - a. Cornerbead.
 - b. LC-Bead: J-shaped; exposed long flange receives joint compound.
 - c. Expansion (Control) Joint: One-piece, rolled zinc with V-shaped slot and removable strip covering slot opening.

2.5 JOINT TREATMENT MATERIALS

- A. General: Provide joint treatment materials complying with ASTM C 475 and the recommendations of both the manufacturers of sheet products and of joint treatment materials for each application indicated.
- B. Joint Tape for Gypsum Board: Paper reinforcing tape for use with all abuse resistant panels.
1. Use pressure-sensitive, open-weave, glass-fiber reinforcing tape with compatible joint compound at other locations where recommended by manufacturer of gypsum board and joint treatment materials for application indicated.
 2. 10 inch by 10 inch fiberglass mesh for gypsum sheathing.
 3. As recommended by panel manufacturer for tile backer.
- C. Setting-Type Joint Compounds for Water-resistant Gypsum Board Applications: Factory-packaged, job-mixed, chemical-hardening powder products formulated for use for use as both taping and filling that is compatible with other joint compounds applied over it. Use formulation recommended by gypsum board manufacturer.
1. For filling joints and treating fasteners of water-resistant gypsum backing board behind base for ceramic tile, use formulation recommended by gypsum board manufacturer.
 2. For topping compound, use sandable formulation.
- D. Drying-Type Joint Compounds for Interior Gypsum Board: Factory-packaged vinyl-based products complying with the following requirements for formulation and intended use.
1. Ready-Mixed Formulation: Factory-mixed product, all-purpose compound formulated for both taping and topping compounds.
- E. Joint compounds as recommended by manufacturer at any other types of gypsum board panels installed.

2.6 MISCELLANEOUS MATERIALS

- A. General: Provide auxiliary materials for gypsum board construction that comply with referenced standards and recommendations of gypsum board manufacturer.
- B. Spot Grout: ASTM C 475, setting-type joint compound recommended for spot-grouting hollow metal door frames.
- C. Fastening Adhesive for Metal: Gypsum panel laminating adhesive recommended for framing.
- D. Steel drill screws complying with ASTM C 1002 for the following applications:

1. Fastening gypsum board to steel members less than 0.033 inch (0.84 mm) thick.
 2. Fastening gypsum board to gypsum board.
 3. Fastening gypsum sheathing and tile backer board as recommended by panel manufacturer.
- E. Steel drill screws complying with ASTM C 954 for fastening gypsum board to steel members from 0.033 to 0.112 inch (0.84 to 2.84 mm) thick.
- F. Asphalt-Saturated Organic Felt: ASTM D 226, Type I (No. 15 asphalt felt), non-perforated for separation sheets between studs and exterior walls.
- G. Foam Gaskets: Closed-cell vinyl foam adhesive-backed strips that allow fastener penetration without foam displacement, 1/8 inch (3.2 mm) thick, in width to suit metal stud size for separation to exterior walls.
- H. Sound-Attenuation Blankets: Un-faced mineral-fiber blanket insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type I (blankets without membrane facing).
1. Mineral-Fiber Type: Fibers manufactured from glass.

3 PART - EXECUTION

3.1 EXAMINATION

- A. Examine substrates to which gypsum board assemblies attach or abut, installed hollow metal frames, cast-in-anchors, and structural framing, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of assemblies specified in this Section. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Ceiling Anchorages: Coordinate installation of ceiling suspension systems with installation of overhead structural assemblies to ensure that inserts and other provisions for anchorages to building structure have been installed to receive ceiling hangers that will develop their full strength and at spacing required to support ceilings.
1. Furnish concrete inserts and other devices indicated to other trades for installation well in advance of time needed for coordination with other construction.

3.3 INSTALLING STEEL FRAMING, GENERAL

- A. Steel Framing Installation Standard: Install steel framing to comply with ASTM C 754 and with ASTM C 840 requirements that apply to framing installation.
- B. Install supplementary framing, blocking, and bracing at terminations in gypsum board assemblies to support fixtures, equipment services, heavy trim, grab bars, toilet accessories, furnishings, or similar construction. Comply with details indicated and with recommendations of gypsum board manufacturer or, if none available, with United States Gypsum Co.'s "Gypsum Construction Handbook."
- C. Isolate steel framing from building structure at locations indicated to prevent transfer of loading imposed by structural movement. Comply with details shown on Drawings.
1. Where building structure abuts ceiling perimeter or penetrates ceiling.
 2. Where partition framing and wall furring abut structure, except at floor.
 - a. Install deflection track top runner to attain lateral support and avoid axial loading.
 - b. Install deflection and fire-stop track top runner at fire-resistance-rated assemblies.
- D. Do not bridge building control and expansion joints with steel framing or furring members.

Independently frame both sides of joints with framing or furring members as indicated.

3.4 INSTALLING STEEL FRAMING FOR WALLS, SOFFIT AND PARTITIONS

- A. Install runners (tracks) at floors, ceilings, and structural walls and columns where gypsum board stud assemblies abut other construction.
 - 1. Where studs are installed directly against exterior walls, install asphalt felt strips or foam gaskets between studs and wall.
- B. Installation Tolerances: Install each steel framing and furring member so that fastening surfaces do not vary more than 1/8 inch from the plane formed by the faces of adjacent framing.
- C. Extend partition framing full height to structural supports or substrates above suspended ceilings. Continue framing over frames for doors and openings and frame around ducts penetrating partitions above ceiling to provide support for gypsum board.
 - 1. Cut studs 1/2 inch (13 mm) short of full height to provide perimeter relief.
 - 2. For corridors, acoustics and fire-resistance-rated partitions that extend to the underside of roof decks or other continuous solid structural surfaces to obtain ratings, install framing around structural and other members extending below roof decks, as needed, to support gypsum board closures needed to make partitions continuous from floor to underside of solid structure.
- D. Install steel studs and furring in sizes and at spacing indicated.
 - 1. Single-Layer Construction: Space studs 16 inches o.c., unless otherwise indicated.
- E. Install steel studs so flanges point in the same direction and leading edge or end of each gypsum board panel can be attached to open (unsupported) edges of stud flanges first.
- F. Frame door openings to comply with GA-219, and with applicable published recommendations of gypsum board manufacturer, unless otherwise indicated. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for cripple studs) at head and secure to jamb studs.
 - 1. Install 2 studs at each jamb, unless otherwise indicated.
 - 2. Install cripple studs at head adjacent to each jamb stud, with a minimum 1/2-inch (12.7-mm) clearance from jamb stud to allow for installation of control joint.
 - 3. Extend jamb studs through suspended ceilings and attach to underside of floor or roof structure above.
- G. Frame openings other than door openings to comply with details indicated or, if none indicated, as required for door openings. Install framing below sills of openings to match framing required above door heads.

3.5 APPLYING AND FINISHING GYPSUM BOARD, GENERAL

- A. Gypsum Board Application and Finishing Standards: Install and finish gypsum panels to comply with ASTM C 840 and GA-216.
- B. Install sound-attenuation blankets in all walls and partitions, full height, prior to installing gypsum panels unless blankets are readily installed after panels have been installed on one side.
- C. Install ceiling board panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in the central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.
- D. Install gypsum panels with face side out. Do not install imperfect, damaged, or damp panels. Butt panels together for a light contact at edges and ends with not more than 1/16 inch (1.5 mm) of open space between panels. Do not force into place.

- 1
2 E. Locate both edge or end joints over supports, except in ceiling applications where intermediate
3 supports or gypsum board back-blocking is provided behind end joints. Do not place tapered
4 edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Avoid
5 joints other than control joints at corners of framed openings where possible.
6
7 F. Attach gypsum panels to steel studs so leading edge or end of each panel is attached to open
8 (unsupported) edges of stud flanges first.
9
10 G. Attach gypsum panels to framing provided at openings and cutouts.
11
12 H. Spot grout hollow metal door frames for solid-core wood doors, hollow metal doors, and doors
13 over 32 inches (813 mm) wide. Apply spot grout at each jamb anchor clip and immediately
14 insert gypsum panels into frames.
15
16 I. Form control and expansion joints at locations indicated and as detailed, with space between
17 edges of adjoining gypsum panels, as well as supporting framing behind gypsum panels.
18
19 J. Cover both faces of steel stud partition framing with gypsum panels in concealed spaces (above
20 ceilings, etc.), except in chases that are braced internally.
21 1. Except where concealed application is indicated or required for sound, fire, air, or smoke
22 ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
23 2. Fit gypsum panels around ducts, pipes, and conduits.
24 3. Where partitions intersect open concrete coffers, concrete joists, and other structural
25 members projecting below underside of floor/roof slabs and decks, cut gypsum panels to
26 fit profile formed by coffers, joists, and other structural members; allow 1/4- to 3/8-inch-
27 (6.4- to 9.5-mm-) wide joints to install sealant.
28
29 K. Isolate perimeter of non-load-bearing gypsum board partitions at structural abutments, except
30 floors, as detailed. Provide 1/4- to 1/2-inch wide spaces at these locations and trim edges of
31 exposed gypsum panels. Seal joints between edges and abutting structural surfaces with
32 acoustical sealant.
33
34 L. Gypsum board partition assemblies in Classrooms, Elevator Lobby and Work rooms, seal
35 construction at perimeters, behind control and expansion joints, openings, and penetrations with a
36 continuous bead of acoustical sealant including a bead at both faces of the partitions. Comply with
37 ASTM C 919 and manufacturer's recommendations for location of edge trim, closing off sound-
38 flanking paths around or through gypsum board assemblies, including sealing partitions acoustical
39 ceilings.
40
41 M. Space fasteners in gypsum panels according to referenced gypsum board application and
42 finishing standard and manufacturer's recommendations.
43 1. At fire rated partitions, space screws in strict accordance with the tested design
44 requirements noted on the drawings.
45
46 3.6 GYPSUM BOARD APPLICATION METHODS
47
48 A. Single-Layer Application: Install gypsum panels to supports with screws and as follows:
49 1. On ceilings, apply gypsum panels prior to wall/partition board application to the greatest
50 extent possible and at right angles to framing, unless otherwise indicated.
51 2. On partitions/walls, apply gypsum panels vertically (parallel to framing), unless otherwise
52 indicated, and provide panel lengths that will minimize end joints.
53 a. Stagger abutting end joints one framing member in alternate courses of board.
54 b. At high walls, install panels horizontally.
55 3.7 INSTALLING TRIM ACCESSORIES
56
57 A. General: For trim accessories with back flanges, fasten to framing with the same fasteners

used to fasten gypsum board. Otherwise, fasten trim accessories according to accessory manufacturer's directions for type, length, and spacing of fasteners.

- B. Install corner-bead at external corners.
- C. Install edge trim where edge of gypsum panels would otherwise be exposed. Provide edge trim type with face flange formed to receive joint compound, except where other types are indicated.
 - 1. Install LC-bead where gypsum panels are tightly abutted to other construction and back flange can be attached to framing or supporting substrate.
 - 2. Install L-bead where edge trim can only be installed after gypsum panels are installed.
- D. Install control joints according to ASTM C 840 and manufacturer's recommendations and in specific locations approved by Architect for visual effect.

3.8 FINISHING GYPSUM BOARD ASSEMBLIES

- A. General: Treat gypsum board joints, interior angles, flanges of cornerbead, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration.
- B. Pre-fill open joints, beveled edges, and damaged areas using setting-type joint compound.
- C. Apply joint tape over gypsum board joints and to flanges of trim accessories as recommended by trim accessory manufacturer.
- D. Levels of Gypsum Board Finish: Provide the levels of gypsum board finish per GA-214.
 - 1. Level 1 for ceiling plenum areas, concealed areas, and where indicated, unless a higher level of finish is required for fire-resistance-rated assemblies and sound-rated assemblies.
 - 2. Level 4 for gypsum board surfaces indicated to be paint finished.
- E. Level 1 gypsum board finish is indicated, embed tape in joint compound.
- F. Level 4 gypsum board finish: Embed tape in joint compound and apply first, fill (second), and finish (third) coats of joint compound over joints, angles, fastener heads, and accessories. Touch up and sand between coats and after last coat as needed to produce a surface smooth and free of tool marks and ridges, ready for decoration.
- G. Finish water-resistant gypsum backing board for "wet walls" behind lavatories, toilets, service sinks to comply with ASTM C 840 and gypsum board manufacturer's directions for treatment of joints.

- E. Gypsum sheathing and tile backer boards finish according to manufacturer's written instructions.

3.10 INSTALLING TRIM ACCESSORIES

- A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer's written instructions.
- B. Control Joints: Install control joints at locations indicated on Drawings] [according to ASTM C 840 and in specific locations approved by Architect for visual effect].
- C. Interior Trim: Install in the following locations and to match existing appearance:
 - 1. Cornerbead: Use at outside corners unless otherwise indicated.
 - 2. Bullnose Bead: Use [at outside corners and where indicated
 - 3. LC-Bead: Use at exposed panel edges
 - 4. L-Bead: Use where indicated

- 1 5. U-Bead: Use at exposed panel edge
- 2
- 3 D. Exterior Trim: Install in the following locations and to match existing appearance:
- 4 1. Cornerbead: Use at outside corners.
- 5 2. LC-Bead: Use at exposed panel edges
- 6
- 7 3.11 CLEANING AND PROTECTION
- 8
- 9 1. Promptly remove any residual joint compound from adjacent surfaces.
- 10
- 11 2. Provide final protection and maintain conditions, in a manner acceptable to Installer, that
- 12 ensure gypsum board assemblies are without damage or deterioration at the time of
- 13 Substantial Completion.
- 14
- 15
- 16
- 17 **END OF SECTION 09250**

SECTION 09511 - ACOUSTICAL PANEL CEILINGS

1 PART - 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. This Section includes ceilings composed of acoustical panels and exposed suspension systems and fire rated assemblies, where indicated on the drawings.

1.3 SUBMITTALS

- A. General: Submit each submittal according to the Contract Conditions and Division 1 Specifications.
- B. Product data: Provide product data for each type of product specified.
- C. Coordination drawings for reflected ceiling plans drawn accurately to scale and coordinating penetrations and ceiling-mounted items by this Contractor. As part of the submittal to the Architect prior to commencing work show the following:
 - 1. Ceiling suspension system members.
 - 2. Method of attaching suspension system hangers to building structure.
 - 3. Ceiling-mounted items including light fixtures; mechanical air outlets and inlets; speakers; detectors and special moldings at walls, column penetrations, and other junctures of acoustical ceilings with adjoining construction.
 - 4. Minimum Drawing Scale: 1/8 inch = 1 foot.
- D. Samples for verification of each type of exposed finish required, prepared on samples of size indicated below. Where finishes involve normal color and texture variations, include sample sets showing the full range of variations expected.
 - 1. Full-size samples of each acoustical panel type, pattern, and color.
 - 2. Set of 12-inch- (300-mm-) long samples of exposed suspension system members, including moldings, for each color and system type required.
- E. Qualification data for firms and persons specified in the "Quality Assurance" Article to demonstrate their capabilities and experience. Include lists of completed projects with project names and addresses, and names and addresses of architects and owners.
- F. Product test reports from a qualified independent testing agency that is based on its testing of current products for compliance of acoustical panel ceilings and components with requirements.
 - 1. Research reports or evaluation reports of the model code organization acceptable to authorities having jurisdiction that show compliance of acoustical panel ceilings and components with the building code in effect for the Project.

1.4 QUALITY ASSURANCE

- A. Installer Qualifications: Engage an experienced Installer who has completed acoustical panel ceilings similar in material, design, and extent to that indicated for this Project and with a record of successful in-service performance.
- B. Fire-Test-Response Characteristics: Provide fire-resistance-rated, acoustical panel ceilings as indicated by design designations listed in the UL "Fire Resistance Directory," in the Warnock

- Hersey "Certification Listings," or in the listing of another qualified testing and inspecting agency.
- C. Single-Source Responsibility for Ceiling Units: Obtain each type of acoustical ceiling panel from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
 - D. Single-Source Responsibility for Suspension System: Obtain each type of suspension system from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying the Work.
 - E. Pre-installation Conference: Conduct conference at Project site to comply with requirements of Division 1 Section "Project Meetings."
- 1.5 DELIVERY, STORAGE, AND HANDLING
- A. Deliver acoustical panels and suspension system components to Project site in original, unopened packages and store them in a fully enclosed space where they will be protected against damage from moisture, direct sunlight, surface contamination, and other causes.
 - B. Before installing acoustical panels, allow them to reach room temperature and moisture content.
 - C. Handle acoustical panels carefully to avoid chipping edges or damaging units in any way.
- 1.6 PROJECT CONDITIONS
- A. Space Enclosure and Environmental Limitations: Do not install acoustical panel ceilings until spaces are enclosed and weatherproof, wet-work in spaces is completed and dry, work above ceilings are complete, and ambient temperature and humidity conditions are being maintained at the levels indicated for Project when occupied for its intended use.
- 1.7 COORDINATION
- A. Coordinate layout and installation of acoustical panels and suspension system components with other construction that penetrates ceilings or is supported by them.
- 1.8 EXTRA MATERIALS
- A. Furnish extra materials described below that match products installed, are packaged with protective covering for storage, and are identified with labels clearly describing contents.
 - 1. Acoustical Ceiling Units: Furnish quantity of each type full-size units equal to 2.0 percent of amount installed, but no opened packages.
 - 2. Exposed Suspension System Components: Furnish quantity of each exposed component and hold-down clips equal to 2.0 percent of amount installed.

2 PART- PRODUCTS

2.1 ACOUSTICAL PANELS, GENERAL

- A. Broad Spectrum Antimicrobial Fungicide and Bactericide Treatment: Provide acoustical panels treated with manufacturer's standard antimicrobial formulation that inhibits fungus, mold, mildew, and gram-positive and gram-negative bacteria and showing no mold, mildew, or bacterial growth when tested according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.

- 1 B. Antimicrobial Fungicide Treatment: Provide acoustical panels with face and back surfaces coated
2 with antimicrobial treatment consisting of manufacturer's standard formulation with fungicide
3 added to inhibit growth of mold and mildew and showing no mold or mildew growth when tested
4 according to ASTM D 3273 and evaluated according to ASTM D 3274 or ASTM G 21.
5

6 2.2 MANUFACTURERS

- 7
8 A. Subject to compliance with requirements, acoustical panel and suspension manufacturers that
9 may be incorporated in the Work include, but are not limited to, the following:

- 10 1. Armstrong World Industries, Inc.
11 2. Certain Teed Corporation
12 3. Gordon
13 4. **USG, United States Gypsum Company (Basis of Design)**
14

15 2.3 ACOUSTICAL PANELS, GENERAL

- 16
17 A. Acoustical Panel Standard: Provide manufacturer's standard panels of configuration indicated
18 that comply with ASTM E 1264 classifications as designated by type, pattern, acoustical ratings,
19 and light reflectance, unless otherwise indicated.
20
21 B. Mounting Method for Measuring Noise Reduction Coefficient (NRC): Type E-400 (plenum
22 mounting, when test specimen face is 15-3/4 inches away from the test surface) per ASTM E 795
23
24 C. Test Method for Ceiling Attenuation Class (CAC): Where acoustical panel ceilings are specified
25 by CAC, provide units identical to those tested per ASTM E 1414 by a qualified testing agency.
26
27 D. Where appearance characteristics of acoustical panels are indicated by reference to ASTM E
28 1264 pattern designations and not to manufacturers' proprietary product designations, provide
29 products selected by Architect from each manufacturer's full range of products that comply with
30 requirements for type, pattern, color, light reflectance, acoustical performance, edge, and size.
31

32 2.4 CEILINGS OF ACOUSTICAL PANELS

- 33 A. Panel Characteristics: acoustical panels per ASTM E 1264, based on the manufacturer's
34 products meeting the requirements listed above may be incorporated in the work, complying with
35 pattern and other requirements indicated below.

- 36 B. Standard Panel Ceiling: Finish Schedule designation **ACT- 1**.
37 1. Mineral Fiber; Type IV; PVC-free.
38 2. Edge Detail: Square.
39 3. Thickness: 5/8 inch (21 mm).
40 4. Size: 24 by 48 inches (610 by 1220 mm). **Match existing ceiling tile and grid.**

41 2.5 METAL SUSPENSION SYSTEMS, GENERAL

- 42 A. Metal Suspension System Standard: Provide manufacturer's standard metal suspension systems
43 of types, structural classifications, and finishes indicated that comply with applicable ASTM C 635
44 requirements.
45

- 46 B. Wide-Face, Single-Web, Steel Suspension System: Main and cross runners roll formed from pre-
47 painted or electrolytic zinc-coated, cold-rolled steel sheet, with pre-painted 15/16-inch- (24-mm-)
48 wide flanges. Other suspension system characteristics are as follows:

- 49 1. Structural Classification: Intermediate-duty system.
50 2. Provide Non-Fire-Resistance-Rated, Direct-Hung Suspension Systems except as noted.
51 3. Finishes: Provide manufacturer's standard baked enamel according to paint manufacturer's

specifications for cleaning, conversion coating, and applying organic coating.

a. Color: As selected by Architect from manufacturer's standard colors.

C. Installation Devices: Provide manufacturer's standard components as described below:

1. Attachment Devices: Size for 5 times the design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.
 - a. Corrosion Protection: Carbon steel components zinc plated to comply with ASTM B 633, Class Fe/Zn 5 (0.005 mm) for Class SC service condition (mild).
2. Wire Hangers, Braces, and Ties: Provide wires complying with the following requirements:
 - a. Zinc-Coated Carbon Steel Wire: ASTM A 641 (ASTM A 641M), Class 1 zinc coating, soft temper, meeting design load as noted.
 - b. At ACT 2 and ACT 3 ceilings: hanger wire of stainless steel meeting design load as noted.
 - b. Size: Select wire diameter so that its stress at 3 times the hanger design load (ASTM C 635, Table 1, Direct Hung) will be less than the yield stress of wire, but provide not less than 0.106-inch- (2.69-mm-) diameter wire.
3. Hanger Rods: Mild steel, zinc coated, or protected with rust-inhibitive paint.
4. Sheet-Metal Edge Moldings and Trim: Manufacturer's standard moldings for edges and penetrations that fit acoustical panel edge details and suspension systems indicated; formed from sheet metal of same material and finish as that used for exposed flanges of suspension system runners.

2.6 ACOUSTICAL SEALANT

- A. Acoustical Sealant for Exposed and Concealed Joints: Manufacturer's standard nonsag, paintable, non-staining latex sealant complying with ASTM C 834 and the following requirements:
1. Product is effective in reducing airborne sound transmission through perimeter joints and openings in building construction, demonstrated by testing assemblies per ASTM E 90.
 2. Product has flame-spread and smoke-developed ratings of less than 25 per ASTM E 84.
 3. Products: Subject to compliance with requirements, provide one of the following:
 - a. AC-20 FTR Acoustical and Insulation Sealant; Pecora Corp.
 - b. SHEETROCK Acoustical Sealant; United States Gypsum Company.

2.7 ACOUSTICAL TILE ADHESIVE

- A. Adhesive for Direct Attachment of Acoustical Tile: Manufacturer's standard adhesive or recommended adhesive for the direct attachment of acoustical ceiling to a solid substrate.

3 PART- EXECUTION

3.1 EXAMINATION

- A. Examine substrates and structural framing to which acoustical panel ceilings attach or abut, with Installer present, for compliance with requirements specified in this and other Sections that affect ceiling installation and anchorage. Do not proceed with installation until unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Coordination: Furnish layouts for cast-in-place anchors, clips, and other ceiling anchors whose installation is specified in other Sections.
- B. Furnish cast-in-place anchors and similar devices to other trades for installation well in advance of time needed for coordinating other work.

- C. Measure each ceiling area and establish the layout of acoustical panels to balance border widths at opposite edges of each ceiling. Avoid using less-than-half-width panels at borders, and conform to the layout shown on reflected ceiling plans.

3.3 INSTALLATION

- A. General: Install acoustical panel ceilings to comply with ASTM C 636 and seismic design requirements per manufacturer's instructions and CISCA "Ceiling Systems Handbook."
1. Ceiling Suspension Systems Requiring Seismic Restraint: Comply with ASTM E 580.
 - a. CISCA Recommendations for Acoustical Ceilings: Comply with CISCA "Recommendations for Direct-Hung Acoustical Tile and Lay-In Panel Ceilings."
 - b. CISCA Guidelines for Systems Requiring Seismic Restraint: Comply with CISCA "Guidelines for Seismic Restraint of Direct-Hung Suspended Ceiling Assemblies."
- B. Suspend ceiling hangers from building's structural members and as follows:
1. Install hangers plumb and free from contact with insulation or other objects within ceiling plenum that are not part of the supporting structure or of the ceiling suspension system.
 2. Splay hangers only where required, and if permitted with fire-resistance-rated ceilings, to miss obstructions; offset resulting horizontal forces by bracing, counter-splaying, or other equally effective means.
 3. Where width of ducts and other construction within ceiling plenum produces hanger spacing that interfere with the location of hangers at spacing required to support standard suspension system members, install supplemental suspension members and hangers in the form of trapezes or equivalent devices. Size supplemental suspension members and hangers to support ceiling loads within performance limits established by referenced standards and publications.
 4. Secure wire hangers to ceiling suspension members and to supports above with a minimum of 3 tight turns. Connect hangers either directly to structures or to inserts, eye screws, or other devices that are secure, that are appropriate for substrate, and that will not deteriorate or otherwise fail due to age, corrosion, or elevated temperatures.
 5. Secure bracing wires to ceiling suspension members and to supports with a minimum of 4 tight turns. Fasten bracing wires to concrete with cast-in-place or post-installed anchors.
 6. Do not attach hangers to steel deck tabs or steel roof deck. Attach hangers to structural members.
 7. Space hangers not more than 48 inches (1200 mm) o.c. along each member supported directly from hangers, unless otherwise shown; and provide hangers not more than 8 inches (200 mm) from ends of each member.
- C. Install edge moldings and trim of type indicated at perimeter of acoustical ceiling area and where necessary to conceal edges of acoustical panels.
1. Apply acoustical sealant in a continuous ribbon concealed on back of vertical legs of moldings before they are installed.
 2. Screw attach moldings to substrate at intervals not over 16 inches (400 mm) o.c. and not more than 3 inches (75 mm) from ends, leveling with ceiling suspension system to a tolerance of 1/8 inch in 12 feet (3.18 mm in 3.66 m). Miter corners accurately and connect securely.
 3. Do not use exposed fasteners, including pop rivets, on moldings and trim.
- D. Install suspension system runners so they are square and securely interlocked with one another. Remove and replace dented, bent, or kinked members.
- E. Install acoustical panels with undamaged edges and fitted accurately into suspension system runners and edge moldings. Scribe and cut panels at borders and penetrations to provide neat, precise fit.
1. For square-edged panels, install panels with edges fully hidden from view by flanges of

- 1 suspension system runners and moldings.
- 2 2. Paint the cut panel edges remaining exposed after installation; match color of exposed
- 3 panel surfaces using coating recommended for this purpose by acoustical panel
- 4 manufacturer.
- 5
- 6 3.4 CLEANING
- 7
- 8 A. Clean exposed surfaces of acoustical panel ceilings, including trim, edge moldings, and
- 9 suspension system members. Comply with manufacturer's instructions for cleaning and touchup
- 10 of minor finish damage. Remove and replace ceiling components that cannot be successfully
- 11 cleaned and repaired to permanently eliminate evidence of damage.
- 12
- 13
- 14 **END OF SECTION 09511**

SECTION 09650 - RESILIENT FLOORING

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. This Section includes:
 - 1. Vinyl composition floor tile repair and patching.
 - 2. Resilient wall base, reducer/transition strips, and accessories installed with resilient flooring.
 - 3. Preparation of flooring substrate to receive resilient flooring, including removal of any existing adhesive from previously removed floor finishes, patching of holes/abrasions which would telegraph through new floor finish, leveling of substrate, by grinding or floating with underlayment and leveling compound to remove swales and depressions (greater than 1/4" in 10').
 - 4. Preparation and installation of vapor barrier/sealer over existing building slabs and substrates to create conditions, as required by the floor covering manufacturer to allow a fully warranted finish floor installation.
 - 5. Protect all surrounding existing and new finishes, which are to remain, from damage resulting from the installation of all new resilient floor finishes. Damaged finishes shall be removed and replaced or restored to their original finish, prior to commencement of resilient flooring Work.

1.3 SUBMITTALS

- A. General: Submit in accordance with Conditions of Contract and Division 1 Specification Sections.
- B. Product data for each type of product specified.
 - 1. Certification by tile manufacturer that tile products supplied for installation comply with all regulations controlling use of volatile organic compounds (VOC's).
- C. Samples for initial selection purposes in form of manufacturer's boxes of actual tiles or sections of tiles showing full range of colors and patterns available for each type of resilient floor tile, wall base and accessories indicated.
- D. Maintenance data for resilient floor tile, wall base and accessories to include in Operating and Maintenance Manual specified in Division 1.

1.4 QUALITY ASSURANCE

- A. Single-Source Responsibility for Flooring: Obtain each type, color, and pattern of floorings from a single source with resources to provide products of consistent quality in appearance and physical properties without delaying progress of the Work.
- B. Fire Performance Characteristics: Provide resilient flooring with the following fire performance characteristics as determined by testing products per ASTM test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction.
 - 1. Critical Radiant Flux: 0.45 watts per sq.cm or more per ASTM E 648.
 - 2. Smoke Density: Less than 450 per ASTM E 662.
- C. Installer Qualifications: Engage Installer that is certified by floor covering manufacturer:
 - 1. Engage installers that are certified by the Manufacturer as "Master Mechanics". Proof of certification of "Master Mechanic" must be submitted prior to commencement of Work. "Master Mechanic" to perform all installation labor and be on job site during all preparation Work

1.5 DELIVERY, STORAGE, AND HANDLING

- A. Deliver flooring and installation accessories to Project site in original manufacturer's unopened cartons and containers each bearing names of product and manufacturer, Project identification, and shipping and handling instructions.
- B. Store flooring materials in dry spaces protected from the weather with ambient temperatures maintained between 50 deg F and 90 deg F. Store flooring on flat surfaces. Move materials and installation accessories into spaces where they will be installed at least 48 hours in advance of installation.

1.6 PROJECT CONDITIONS

- A. Maintain a minimum temperature of 65 deg F (18 deg C) in spaces to receive flooring for at least 48 hours prior to installation, during installation, and for not less than 48 hours after installation. After this period, maintain a temperature of not less than 55 deg F (13 deg C).
- B. Do not install flooring and accessories until they are at the same temperature as the space where they are to be installed.

1.7 SEQUENCING AND SCHEDULING

- A. Install flooring and accessories after other finishing operations, including painting, have been completed. Close spaces to traffic during flooring installation.
- B. Do not install flooring over concrete slabs until the slabs have cured and are sufficiently dry to bond with adhesive as determined by tile manufacturer's recommended bond and moisture test.

1.8 EXTRA MATERIALS

- A. Deliver extra materials to Owner. Furnish extra materials matching products installed as described below, boxed and packaged with protective covering for storage and identified with labels clearly describing contents.
 - 1. Furnish not less than 5% of material but not less than one box for each type, wearing surface, color, pattern and size of resilient floor tile, base and accessories installed.
 - 2. Furnish not less than 10 linear feet in roll form for each type of wearing surface, color.

PART 2 - PRODUCTS

2.1 RESILIENT FLOOR MATERIALS AND BASE

- A. Vinyl Composition Floor Tile: Products complying with FS SS-T-312, Type IV, and with requirements:
 - 1. Size: 12" x 12"
 - 2. Thickness: 1/8".
 - 3. Design: Architect may select six (6) colors from complete range of colors offered in the manufacturer's line of premium patterns and solids.
 - 4. Subject to compliance with requirements, resilient flooring that may be incorporated in the Work include, but are not limited to:
 - a. Armstrong, Standard Excelon or approved equal.
- B. Wall Base: Vinyl products complying with FS SS-W-40, Type TV, top set, continuous rolled goods:
 - 1. Height: 4 and 6 inches, where noted on the drawings.
 - 2. Thickness: 1/8"
 - 3. Cove design for resilient flooring and straight design for carpet, unless otherwise noted.
 - 4. Subject to compliance with requirements wall base may be incorporated in the Work include, but not limited to: Roppe, Armstrong or approved equal.
 - 5. Design: Architect may select two (2) colors unless indicated to match.

2.2 INSTALLATION ACCESSORIES

- A. Concrete Slab Primer: Non-staining type as recommended by flooring manufacturer.
- B. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
- C. Adhesives (Cements): Water-resistant type recommended by flooring manufacturer to suit types of floorings and substrate conditions indicated.
 - 1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
 - a. VCT and Accessory Adhesives: Not more than 50 g/L.
- D. Sheet or fluid applied vapor/moisture barrier membrane to prevent excessive moisture/humidity conditions as determined by pre-installation testing, from allowing a fully warranted floor installation.
- E. Provide transition/reducing strips tapered to meet abutting materials including but not limited to:
 - 1. Transition between resilient flooring and resinous flooring.
 - 2. Transition between resilient flooring and carpet.
 - 3. Transition between resilient flooring and exposed concrete slab.
 - 4. And all other locations identified on the drawings or required due to existing conditions.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. General: Examine areas where installation of flooring will occur, with Installer present, to verify that substrates and conditions are satisfactory for flooring material installation and comply with flooring material manufacturer's requirements and those specified in this Section.
- B. Concrete Subfloors: Verify that concrete slabs comply with ASTM F710 and the following:
 - 1. Slab substrates are dry and free of curing compounds, sealers, hardeners, and other materials whose presence would interfere with bonding of adhesive.
 - 2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
 - 3. Determine adhesion and dryness characteristics by performing bond and moisture tests recommended by tile manufacturer.
 - 4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.
 - a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 5 lb of water/1000 sq. ft. (2.27 kg of water/92.9 sq. m) in 24 hours.
 - b. Perform relative humidity test using in situ probes, ASTM F 2170. Proceed with installation only after substrates have a maximum 75% relative humidity level measurement.
 - 5. Finishes of subfloors comply with tolerances and other requirements specified in Division 3 Section "Cast-In-Place Concrete" for slabs receiving resilient flooring.
 - 6. Subfloors are free of cracks, ridges, depressions, scale, and foreign deposits of any kind.
- C. Do not proceed with installation until unsatisfactory conditions have been corrected and acceptable to flooring installer.

3.2 PREPARATION

- A. General: Comply with manufacturer's installation specifications to prepare substrates indicated to receive flooring. Installer is responsible for all substrate preparation and floor material preparation,

including but not limited to floor stoning, grinding, leveling, patching compound installation, etc. required to bring floor and wall substrates into compliance with manufacturer's installation specifications and required to bring existing floor substrates to 1/8" in 10'-0".

- B. Install flooring manufacturer's recommended sheet or fluid applied vapor/moisture barrier membrane, to prevent excessive moisture/humidity conditions, allowing a fully warranted floor installation.
- C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.
- D. Remove coatings, including curing compounds, and other substances that are incompatible with flooring adhesives and that contain soap, wax, oil, or silicone, by using a terrazzo or concrete grinder, a drum sander, or a polishing machine equipped with a heavy-duty wire brush.
- E. Broom or vacuum clean substrates to be covered by tiles immediately before flooring installation. Following cleaning, examine substrates for moisture, alkaline salts, carbonation, or dust.
- F. Apply concrete slab primer, if recommended by flooring manufacturer, prior to applying adhesive. Apply according to manufacturer's directions.
- G. Provide solid backing material (wood blocking, hardboard, or other appropriate backing material as specified in Division 6, Rough Carpentry) to support wall base, where new or existing wall and cabinet substrate has a gap of more than 1/4 inch between floor substrate, wall substrate, or cabinetry substrate.

3.3 INSTALLATION

- A. General: Comply with flooring material manufacturer's installation directions and other requirements indicated that are applicable to each type of tile installation included in Project.
- B. Lay out flooring from center marks established with principal walls, discounting minor offsets, so flooring at opposite edges of room are of equal width. Adjust as necessary to avoid using cut widths at perimeter that equal less than one-half of a tile. Install tiles in direction and pattern as directed by the Architect.
- C. Match flooring material for color and pattern by selecting tiles from cartons in same sequence as manufactured and packaged, if so numbered. Cut tiles neatly around all fixtures. Discard broken, cracked, chipped, or deformed tiles.
- D. Lay tiles with grain running pattern to match existing School patterns or in a single grain pattern as directed by the Architect.
- E. Scribe, cut, and fit flooring material to butt tightly to vertical surfaces, permanent fixtures, built-in furniture including cabinets, pipes, outlets, edgings and thresholds.
- F. Extend flooring into toe spaces, door reveals, closets, and similar openings.
- G. Maintain reference markers, holes, or openings that are in place or plainly marked for future cutting by repeating on finish flooring as marked on sub-floor. Use chalk or other nonpermanent marking device.
- H. Install flooring material on covers for telephone/receptacles, clean-outs, and electrical ducts, and similar items occurring within finished floor areas. Maintain overall continuity of color and pattern with pieces of flooring installed on these covers. Tightly adhere edges to perimeter of floor around covers and to covers.
- I. Adhere flooring material to flooring substrates without producing open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, or other surface imperfections in completed tile installation.

- J. Use full spread of adhesive applied to substrate in compliance with flooring material manufacturer's directions including those for trowel notching, adhesive mixing, adhesive open and working times.
- K. Apply resilient wall base to walls, columns, pilasters, casework, and other permanent fixtures in rooms and areas where base is required. Install wall base in lengths as long as practicable. Tightly adhere wall base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.
1. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient wall base with manufacturer's recommended adhesive filler material.
 2. Install inside and exterior corners before installing straight pieces.
 3. Form inside corners on job from straight pieces of maximum lengths possible by cutting an inverted V-shaped notch in toe of wall base at the point where corner is formed. Shave back of base where necessary to produce snug fit to substrate.
 4. Form outside corners on job from straight pieces of maximum lengths possible by shaving back of base at point where bending will occur. Remove a strip perpendicular to length of base and only deep enough to produce a snug fit without bends whitening or removal of more than half the thickness of wall base.
 5. Place resilient accessories so they are butted to adjacent materials of type indicated and bond to substrates with adhesive. Install reducer strips at edges of flooring that would otherwise be exposed.
 6. Apply resilient accessories to stairs as indicated and according to manufacturer's installation instructions.

3.4 CLEANING AND PROTECTION

- A. Vinyl Tile: Perform initial maintenance operations immediately after completing tile installation according to the latest edition of "Armstrong Guaranteed Installation System", F-5061.
- B. Protect flooring against mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period. Use protection methods indicated or recommended by tile manufacturer.
- C. Cover flooring with un-dyed, untreated building paper until inspection for Substantial Completion.
- D. Do not move heavy and sharp objects directly over flooring. Place plywood or hardboard panels over tiles and under objects while they are being moved. Slide or roll objects over panels without moving panels.
- E. Clean all flooring not more than 4 days prior to dates scheduled for inspections intended to establish date of Substantial Completion in each area of Project. Clean flooring using method recommended by manufacturer.

END OF SECTION 09650

SECTION 09910 - PAINTING

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. This Section includes surface preparation, paintable corner protection, and field painting or staining of the following:
1. Exposed exterior items and surfaces.
 2. Exposed interior items and surfaces.
 3. Surface preparation, priming, and finish coats specified in this Section are in addition to shop priming and surface treatment specified in other Sections.
- B. Paint exposed surfaces (existing and new), except where the paint schedules indicate that a surface or material is not to be painted or is to remain natural. If the paint schedules do not specifically mention an item or a surface, paint the item or surface the same as similar adjacent materials or surfaces whether or not schedules indicate colors. If the schedules do not indicate color or finish, the Architect will select from standard colors and finishes available.
- C. Painting generally includes field painting of exposed steel and iron, exposed ductwork, mechanical/electrical equipment that does not have a factory-applied finish, and exposed conduits or pipes. Exposed mechanical and electrical components shall be coordinated with the mechanical and electrical drawings, specifications, and contractors.
- D. Painting is not required on pre-finished items, finished metal surfaces, concealed surfaces (except as noted to be painted), operating parts, and labels.
1. Pre-finished items generally include the following factory-finished components, but pre-finished items as noted below may also require painting:
 - a. Acoustical ceiling panels and grid (except where noted to be painted).
 - b. Architectural woodwork and casework with plastic laminate finish.
 - c. Pre-finished mechanical equipment (except wall/ceiling mounted air registers shall typically be painted to match adjacent wall/ceiling color, exposed mechanical duct and supply/return registers shall be painted color directed by the Architect).
 - d. Pre-finished electrical equipment (except exposed conduit, raceways, boxes, etc. in finished spaces shall be painted, color as directed by the Architect).
 - e. Light fixtures (except trim which is to be painted to match ceiling color).
- E. Concealed surfaces not to be painted include walls or ceilings in the following generally inaccessible spaces:
- a. Ceiling plenums (except where visible thru diffusers, paint all visible surfaces inside plenum, color as directed by the Architect).
 - b. Inside ducts and duct/mechanical shafts (except where visible thru diffusers, paint all visible surfaces inside duct, color as directed by the Architect).
- F. Finished metal surfaces include the following:
- a. Anodized aluminum.
 - b. Stainless steel.
 - c. Chromium plate.

- 1 G. Operating parts include moving parts of operating equipment and the following:
- 2 a. Valve and damper operators.
- 3 b. Linkages.
- 4 c. Sensing devices.
- 5 d. Motor and fan shafts.
- 6
- 7 H. Labels: **Do not** paint over Underwriters Laboratories (UL), Factory Mutual (FM), or other code-
- 8 required labels or equipment name, identification, performance rating, or nomenclature plates.
- 9 If labels are painted over, clean or replace label so it will be exposed to view and legible, prior to
- 10 acceptance by the Architect.
- 11
- 12 I. Related Sections include the following:
- 13 1. Division 4 Section "Unit Masonry" for painting concrete unit masonry.
- 14 2. Division 5 Section "Structural Steel" for shop priming structural steel.
- 15 3. Division 5 Section "Metal Fabrications" for shop priming ferrous metal.
- 16 4. Division 6 Section "Rough Carpentry" for priming/sealing exterior sheathing.
- 17 6. Division 7 Section "Joint Sealants" for caulking and sealants in areas to be painted.
- 18 7. Division 8 Section "Steel Doors and Frames" for shop priming steel doors and frames.
- 19 8. Division 9 Section "Gypsum Drywall" for surface preparation for gypsum board.
- 20 9. Divisions 25 and 26: Painting of mechanical and electrical work specified herein is further
- 21 described in Divisions 25 and 26, respectively.
- 22
- 23 J. Refer to Finish Systems Schedules shown on the drawings
- 24
- 25 1.3 DEFINITIONS
- 26
- 27 A. "Paint" includes coating systems, materials, primers, emulsions, enamels, stains, sealers, fillers,
- 28 and other applied materials whether used as prime, intermediate, or finish coats.
- 29
- 30 B. General: Standard coating terms defined in ASTM D 523 apply to this Section.
- 31 1. Gloss Level 1 (traditional matte/flat): Not more than 5 units at 60 degrees and 10 units at
- 32 85 degrees.
- 33 2. Gloss Level 2 (flat/velvet finish): Not more than 10 units at 60 degrees and 10 to 35 units
- 34 at 85 degrees.
- 35 3. Gloss Level 3 (traditional eggshell/low luster): 10 to 25 units at 60 degrees and 10 to 35
- 36 units at 85 degrees.
- 37 4. Gloss Level 4 (traditional satin): 20 to 35 units at 60 degrees and not less than 35 units
- 38 at 85 degrees.
- 39 5. Gloss Level 5 (traditional semi-gloss): 35 to 70 units at 60 degrees
- 40 6. Gloss Level 6 (traditional gloss): 70 to 85 units at 60 degrees.
- 41 7. Gloss Level 7 (high gloss): More than 85 units at 60 degrees.
- 42
- 43 1.4 SUBMITTALS
- 44
- 45 A. Product Data: For each paint system specified. Include block fillers and primers.
- 46 1. Material List: Provide an inclusive list of required coating materials. Indicate each material
- 47 and cross-reference specific coating, finish system, and application. Identify each
- 48 material by manufacturer's catalog number and general classification.
- 49 2. Manufacturer's Information: Provide manufacturer's technical information, including label
- 50 analysis and instructions for handling, storing, and applying each coating material.
- 51 3. Certification by the manufacturer that products supplied comply with "Low VOC" paints.
- 52
- 53 B. Samples for Initial Selection: Manufacturer's color charts showing the full range of colors and
- 54 stains available for each type of finish-coat material indicated.

1. After general stain color selection, stain samples shall be submitted on actual wood species type and cut for final color selection. Submit a minimum of 3 samples of each color and resubmit as required to obtain exact shade and finish selected by the Architect.
 2. After color selection, furnish 3 – 4" x 8" actual paint on heavy card stock for each surface to be coated.
- C. Contractor shall review and evaluate systems listed in the painting schedule. Any system not found to be compatible and or the best product for the substrate shall be updated and modified during the submittal process. Supplier shall update each system with latest products/numbers.

1.5 QUALITY ASSURANCE

- A. Applicator Qualifications: Engage an experienced applicator who has completed painting system applications similar in material and extent to that indicated for this Project with a record of successful in-service performance.
- B. Source Limitations: Obtain block fillers, primers, and undercoat materials for each coating system from the same manufacturer as the finish coats.
- C. Field Samples: Provide samples under provisions of Section 01300.
- D. Adequately protect other surfaces from paint and damage. Repair damage as a result of inadequate or unsuitable protection.
- E. Material Quality: Provide the manufacturer's best quality trade sale paint material of the various coating types specified. Paint material containers not displaying manufacturer's product identification will not be acceptable.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver materials to the Project Site in manufacturer's original, unopened packages and containers bearing manufacturer's name and label, and the following information:
1. Product name or title of material.
 2. Product description (provide generic classification or binder type).
 3. Manufacturer's stock number and date of manufacture.
 4. Contents by volume (pigment and vehicle constituents).
 5. Thinning instructions.
 6. Application instructions.
 7. Color name and number.
 8. VOC content.
- B. Store materials not in use in tightly covered containers in a well-ventilated area at a minimum ambient temperature of 45 deg F. Maintain containers used in storage in a clean condition, free of foreign materials and residue.
1. Protect from freezing. Keep storage area neat and orderly. Remove oily rags and waste daily. Take necessary measures to ensure that workers and work areas are protected from fire and health hazards resulting from handling, mixing, and application.

1.7 PROJECT CONDITIONS

- A. Apply water-based paints only when the temperature of surfaces to be painted and surrounding air temperatures are between 50 and 90deg F.

- 1 B. Apply solvent-thinned paints only when the temperature of surfaces to be painted and
2 surrounding air temperatures are between 45 and 95deg F.
3

4 1.8 EXTRA MATERIALS
5

- 6 A. Furnish extra paint materials from the same production run as the materials applied in the
7 quantities described below. Package paint materials in unopened, factory-sealed containers for
8 storage and identify with labels describing contents. Deliver extra materials to the Owner.
9 1. Quantity: Furnish the Owner with extra paint materials in the quantities indicated below:
10 a. Exterior, Semi-gloss Acrylic Enamel: 2 gal. (7.57 L) of each color applied.
11 b. Interior, Flat Acrylic Paint: Two gallons of each color applied.
12 c. Interior, Semi-gloss Acrylic Enamel: Two gallons of each color applied.
13 d. Interior, Waterborne Epoxy: Two gallons of each color applied.
14 e. Interior, any system provided: Two gallons of each color applied.
15

16 **PART 2- PRODUCTS**
17

18 2.1 MANUFACTURERS
19

- 20 A. The products of Benjamin Moore are referred to in the Paint Schedule are the basis for design
21 standard (preferred) paint of the Owner. Subject to compliance with requirements, provide one
22 of the products equal to that specified in the Paint Schedule. Coordinate the type of paint
23 required in the Paint Schedule with the Finish Schedule and the Drawings.
24 1. PPG Porter Paints
25 2. ICI
26

27 2.2 PAINT MATERIALS, GENERAL
28

- 29 A. Material Compatibility: Provide block fillers, primers, undercoats, and finish-coat materials that
30 are compatible with one another and the substrates indicated under conditions of service and
31 application, as demonstrated by manufacturer based on testing and field experience.
32
33 B. Material Quality: Provide manufacturer's best-quality paint material of the various coating types
34 specified. Paint-material containers not displaying manufacturer's product identification will not
35 be acceptable.
36 1. Proprietary Names: Use of manufacturer's proprietary product names to designate colors
37 or materials is not intended to imply that products named are required to be used to the
38 exclusion of equivalent products of other manufacturers. Furnish manufacturer's material
39 data and certificates of performance for proposed substitutions.
40
41 C. Colors: Provide color selections made by the Architect and provided in Finish Systems on the
42 Finish Schedule approved by the Owner and forwarded to the Contractor before or after the bid.
43
44 D. Verify compatibility of paints prior to beginning work.
45

46 **PART 3- EXECUTION**
47

48 3.1 EXAMINATION
49

- 50 A. Examine substrates, areas, and conditions, with the Applicator present, under which painting
51 will be performed for compliance with paint application requirements.
52 1. Do not begin to apply paint until unsatisfactory conditions have been corrected and
53 surfaces receiving paint are thoroughly dry.

2. Start of painting will be construed as the Applicator's acceptance of surfaces and conditions within a particular area.

B. Coordination of Work: Review other Sections in which primers are provided to ensure compatibility of the total system for various substrates. On request, furnish information on characteristics of finish materials to ensure use of compatible primers.

1. Notify the Architect about anticipated problems using the materials specified over substrates primed by others.

C. Correct minor defects and clean surfaces which affect work of this Section according to manufacturer's written instructions. Remove all nails, fill all holes, remove all foreign substances, caulking, joints in material and sand out imperfections in the surfaces requiring paint. Patch and fill all holes, depressions, and damage to existing surfaces to create a smooth flush substrate for painting.

D. Shellac and seal marks which may bleed through surface finishes.

3.2 PREPARATION

A. General: Remove hardware and hardware accessories, screws, connectors, plates, machined surfaces, lighting fixtures, and similar items already installed that are not to be painted. If removal is impractical or impossible because of the size or weight of the item, provide an applied surface protection before surface preparation and painting to protect all surfaces to remain unpainted and/or damaged during preparation work.

1. After completing painting operations in each space or area, reinstall items removed using workers skilled in the trades involved.

B. Cleaning: Before applying paint or other surface treatments, clean the substrates of substances that could impair the bond of the various coatings. Remove oil and grease before cleaning.

1. Schedule cleaning and painting so dust and other contaminants from the cleaning process will not fall on wet, newly painted surfaces.

C. Surface Preparation: Clean and prepare surfaces to be painted according to manufacturer's written instructions for each particular substrate condition and as specified below for each material or system:

1. Provide barrier coats over incompatible primers or remove and re-prime.

2. Cementitious Materials: Prepare concrete, concrete masonry block, cement plaster, and mineral-fiber-reinforced cement panel surfaces to be painted. Remove efflorescence, chalk, dust, dirt, grease, oils, and release agents. Roughen as required to remove glaze. If hardeners or sealers have been used to improve curing, use mechanical methods of surface preparation.

a. Use abrasive blast-cleaning methods if recommended by paint manufacturer.

b. Determine alkalinity and moisture content of surfaces by performing appropriate tests. If surfaces are sufficiently alkaline to cause the finish paint to blister and burn, correct this condition before application. Do not paint surfaces where moisture content exceeds that permitted in manufacturer's written instructions.

c. Eliminate all bug holes in concrete (existing or new) scheduled to receive paint.

3. Wood and Previously Painted Surfaces: Clean surfaces of dirt, oil, and other foreign substances with scrapers, mineral spirits, and sandpaper, as required. Sand surfaces exposed to view smooth and dust off.

a. Scrape and clean small, dry, seasoned knots, and apply a thin coat of white shellac or other recommended knot sealer before applying primer. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood filler. Sand smooth when dried.

- b. Caulk or wood putty fill all joints solid and smooth, before final painting. Prime caulking and wood putty as recommended by paint manufacturer.
 - c. Prime, stain, or seal surfaces to be painted immediately. Prime edges, ends, faces, undersides, and backsides of wood, including cabinets, cases, and paneling.
 - c. When transparent finish is required, back prime with spar varnish.
 - d. Seal tops, bottoms, and cutouts of unprimed wood doors with a heavy coat of varnish or sealer immediately on delivery.
4. Ferrous Metals: Clean non-galvanized ferrous-metal surfaces that have not been shop coated; remove oil, grease, dirt, loose mill scale, and other foreign substances. Use solvent or mechanical cleaning methods that comply with the Steel Structures Painting Council's (SSPC) recommendations.
 - a. Blast steel surfaces clean as recommended by paint system manufacturer.
 - b. Treat bare and sandblasted or pickled clean metal with a metal treatment wash coat before priming.
 - c. Touch up bare areas and shop-applied prime coats that have been damaged. Wire-brush, clean with solvents recommended by paint manufacturer and touch up with the same primer as the shop coat.
 - d. Fill depressions and recess anchors/connectors and fill with metal putty, sand flush and smooth, free of surface scratches and pits.
 5. Galvanized Surfaces: Clean galvanized surfaces with non-petroleum-based solvents so surface is free of oil and surface contaminants. Remove pretreatment from galvanized sheet metal fabricated from coil stock by mechanical methods.
- D. Materials Preparation: Mix and prepare paint materials according to manufacturer's written instructions.
1. Maintain containers used in mixing and applying paint in a clean condition, free of foreign materials and residue.
 2. Stir material before application to produce a mixture of uniform density. Stir as required during application. Do not stir surface film into material. If necessary, remove surface film and strain material before using.
 3. Use only thinners approved by paint manufacturer and only within recommended limits.
- E. Tinting: Tint each undercoat a lighter shade to simplify identification of each coat when multiple coats of the same material are applied. Tint undercoats to match the color of the finish coat, but provide sufficient differences in shade of undercoats to distinguish each separate coat.
- ### 3.3 APPLICATION
- A. General: Apply paint according to manufacturer's written instructions. Use applicators and techniques best suited for substrate and type of material being applied.
1. Paint colors, surface treatments, and finishes are indicated in the schedules.
 2. Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions detrimental to formation of a durable paint film.
 3. Provide finish coats that are compatible with primers used. Notify Architect at completion of primer coat and each coat required thereafter.
 4. The term "exposed surfaces" includes areas visible when permanent or built-in fixtures, convactor covers, covers for finned-tube radiation, grilles, and similar components are in place. Extend coatings in these areas, as required, to maintain the system integrity and provide desired protection.
 5. Paint surfaces behind movable equipment, furniture, and case/mill work the same as similar exposed surfaces. Before the final installation of equipment, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
 6. Paint interior surfaces of ducts with a flat, non-specular black paint where visible through registers or grilles.

7. Sand lightly between each succeeding enamel or varnish coat.
 8. Paint drips and runs on any surface shall be sanded and paint shall be reapplied.
- B. Scheduling Painting: Apply first coat to surfaces that have been cleaned, pretreated, or otherwise prepared for painting as soon as practicable after preparation and before subsequent surface deterioration.
1. The number of coats and the film thickness required are the same regardless of application method. Do not apply succeeding coats until the previous coat has cured as recommended by the manufacturer. If sanding is required to produce a smooth, even surface according to manufacturer's written instructions, sand between applications.
 2. Omit primer on metal surfaces that have been shop primed and touchup primer. If undercoats, stains, or other conditions show through final coat of paint, apply additional coats until paint film is of uniform finish, color, and appearance. Give special attention to ensure edges, corners, crevices, welds, and exposed fasteners receive a dry film thickness equivalent to that of flat surfaces.
 3. Allow sufficient time between successive coats to permit proper drying. Do not recoat surfaces until paint has dried to where it feels firm, does not deform or feel sticky under moderate thumb pressure, and where application of another coat of paint does not cause the undercoat to lift or lose adhesion.
- C. Application Procedures: Apply paints and coatings by brush, roller, spray, or other applicators according to manufacturer's written instructions.
1. Brushes: Use brushes best suited for the type of material applied. Use brush of appropriate size for the surface or item being painted.
 2. Rollers: Use rollers of carpet, velvet back, or high-pile sheep's wool as recommended by the manufacturer for the material and texture required.
 3. Airless spray equipment is best for the acrylic dry fall applied to the tectum panels. Cross spray at a right angle.
- D. Minimum Coating Thickness: Apply paint materials no thinner than manufacturer's recommended spreading rate. Provide the total dry film thickness of the entire system as recommended by the manufacturer.
- E. Mechanical and Electrical Work: Painting mechanical and electrical work is limited to all items exposed in occupied spaces, and all exterior and rooftop components. Mechanical items include but are not limited to: wall and/or ceiling diffusers (unfinished and pre-finished items shall be painted to match wall/ceiling or color as selected by the Architect), exposed ductwork and supply/return diffusers and grills, sprinkler and gas piping. Electrical items include but are not limited to: exposed conduit, j-boxes, fittings, trims, and light fixture trims (painted to match ceiling or color as selected by the Architect).
- F. Block Fillers: Apply block fillers to concrete masonry block at a rate to ensure complete coverage with pores filled.
- G. Prime Coats: Before applying finish coats, apply a prime coat of material, as recommended by the manufacturer, to material that is required to be painted or finished and that has not been prime coated by others. Recoat primed and sealed surfaces where evidence of suction spots or unsealed areas in first coat appears, to ensure a finish coat with no burn through or other defects due to insufficient sealing.
- H. Pigmented (Opaque) Finishes: Completely cover surfaces as necessary to provide a smooth, opaque surface of uniform finish, color, appearance, and coverage. Cloudiness, spotting, holidays, laps, brush marks, runs, sags, ropiness, or other surface imperfections will not be acceptable.

- I. Completed Work: Match approved samples for color, texture, and coverage. Remove, refinish, or repaint work not complying with requirements.

3.4 FIELD QUALITY CONTROL

- A. The Owner reserves the right to invoke the following test procedure at any time and as often as the Owner deems necessary during the period when paint is being applied:
1. The Owner will engage the services of an independent testing agency to sample the paint material being used. Samples of material delivered to the Project will be taken, identified, sealed, and certified in the presence of the Contractor.
 2. The testing agency may perform appropriate tests for the following characteristics as required by the Owner:
 - a. Quantitative material analysis.
 - b. Alkali and mildew resistance.
 - c. Mil thickness required.
- B. The Owner may direct the Contractor to stop painting if test results show material being used does not comply with specified requirements. The Contractor shall remove non-complying paint from the site, pay for testing, and repaint surfaces previously coated with the rejected paint. If necessary, the Contractor may be required to remove rejected paint from previously painted surfaces if, on repainting with specified paint, the 2 coatings are incompatible. Repainting of the entire scope of work itemized by "Painting" will be required if the test results consistently do not meet requirements.

3.5 CLEANING

- A. Cleanup: At the end of each workday, remove empty cans, rags, rubbish, and other discarded paint materials from the site.
1. After completing painting, clean glass and paint-spattered surfaces. Remove spattered paint by washing and scraping. Be careful not to damage adjacent finished surfaces.

3.6 PROTECTION

- A. Protect work of other trades, whether being painted or not, against damage by painting. Correct damage by cleaning, repairing or replacing, and repainting, as approved by Architect.
- B. Provide "Wet Paint" signs to protect newly painted finishes. Remove temporary protective wrappings provided by others to protect their work after completing painting operations.
1. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces. Comply with PDCA P1 procedures.
 2. Any touch-up painting required for damages or defective surfaces shall be repainted to the nearest inside or outside corner of the surface plane with the defect and from the top of base molding or floor to the bottom of the ceiling. Paint flash conditions or spot touch-up will not be allowed.

EXTERIOR PAINT SCHEDULE (existing and new surfaces)

Provide paint products by Benjamin Moore, ICI, Pittsburgh/Iowa or comparable products by pre-approved manufacturers for substrates:

- A. **Ferrous Metal:** Semi-gloss Alkyd Finish: 3 coats
1. Prime Coat: Moore's SuperSpec HP Alkyd Metal Primer P06 (not less than 2 mils dry)
 2. Second Coat: Moorcraft SuperSpec HP DTM Alkyd Semi Gloss P24
 3. Third Coat: Moorcraft SuperSpec HP DTM Alkyd Semi Gloss P24(1.1 mils dry/coat)

1 **B. Galvanized Metal:** Semi-gloss Alkyd Finish: 3 coats

- 2 1. Prime Coat: Moore's SuperSpec HP Acrylic Metal Primer P04 (not less than 2 mils dry)
3 2. Second Coat: Moore's SuperSpec HP DTM Alkyd Semi Gloss P24
4 3. Third Coat: Moore's SuperSpec HP DTM Alkyd Semi Gloss P24 (1.1 mils dry/coat)
5
6

7 **INTERIOR PAINT SCHEDULE:** (existing and new surfaces)

8 Provide paint products by Benjamin Moore, ICI, Pittsburgh/Iowa approved for substrates:
9

10 **A. Masonry/Concrete:** Gloss Water Based Epoxy Finish: 3 coats

11 Use in **Corridors,**

- 12 1. Prime Coat: Moore's SuperSpec HP Waterborne Epoxy Block Filler P31 (10.0 mils dry)
13 2. Second Coat: Moore's SuperSpec HP Waterborne Polyamide Epoxy P42
14 3. Third Coat: Moore's SuperSpec HP Waterborne Polyamide Epoxy P42 (4.0 mils
15 dry/coat)
16

17 **B. Gypsum Drywall:** Semi-gloss Latex Finish: 3 coats

18 Use in **Classrooms, Work Rooms, and Storage Rooms**

- 19 1. Prime Coat: Moorcraft Super Spec Latex Enamel Undercoater No. 253
20 (not less than 1.2 mils dry)
21 2. Second Coat: Moorcraft Super Spec Latex Semi-gloss Enamel No. 276
22 3. Third Coat: Moorcraft Super Spec Latex Semi-gloss Enamel No. 276
23 (not less than 1.2 mils dry per coat)
24

25 **C. Gypsum Drywall:** Low-Luster Latex Finish: 3 coats

26 Use on **drywall ceilings and soffits only**

- 27 1. Prime Coat: Moorcraft Super Spec Latex Enamel Undercoater No. 253
28 (not less than 1.2 mils dry)
29 2. Second Coat: Moorcraft Super Spec Flat Latex No. 275
30 3. Third Coat: Moorcraft Super Spec Flat Latex No. 275
31 (not less than 1.3 mils dry/coat)
32

33 **E. Ferrous Metal:** Semi-Gloss Acrylic Finish: 3 coats

- 34 1. Prime Coat: Moore's SuperSpec HP Alkyd Metal Primer P06 (not less than 2.0 mils dry)
35 2. Second Coat: Moorcraft Super Spec Latex Semi-gloss Enamel No. 276
36 3. Third Coat: Moorcraft Super Spec Latex Semi-gloss Enamel No. 276
37 (not less than 1.2 mils dry per coat)
38

39 **F. Galvanized Metal:** Semi-gloss Acrylic Finish: 3 coats

- 40 1. Prime Coat: Moore's SuperSpec HP Alkyd Metal Primer P04 (not less than 2 mils dry)
41 2. Second Coat: Moorcraft Super Spec Latex Semi-gloss Enamel No. 276
42 3. Third Coat: Moorcraft Super Spec Latex Semi-gloss Enamel No. 276
43 (not less than 1.2 mils dry per coat)
44

45 **END OF SECTION 09910**

SECTION 14210 - ELECTRIC TRACTION ELEVATORS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

- A. Work Required: The work required under this section consists of all labor, materials and services required for the complete installation (including systems verification) of all the equipment required for the elevator as herein specified.
 - 1. All work shall be performed in a first class, safe and workmanlike manner.
 - 2. In all cases where a device or part of the equipment is referred to in the singular, it is intended that such reference apply to as many of such devices or parts as are required to make complete installation.
- B. Related Sections: The following sections contain requirements that relate to this Section: Setting of sleeves, inserts, and anchoring devices in concrete is specified in a Division 3 section.
 - 1. Unit Masonry is specified in Division 4.
 - 2. Subsills and structural framing of hoistway entrances are specified in Division 5.
 - 2. Ventilation of hoistway is specified in Division 23.
 - 3. Electrical service to the elevator, including fused disconnect switch, telephone system, fire alarm systems, wiring etc. is specified in Division 26 thru 28.
- C. Products Supplied But Not Installed Under this Section:
 - 1. Hoist Beam
 - 2. Pit Ladder
 - 3. Inserts mounted in block walls for rail attachments.
- D. Work Supplied Under Other Sections:
 - 1. Temporary lighting, including temporary lighting in hoistway for machine space with switch located in hoistway on the strike jamb side of top landing door.
 - 2. Main line disconnects for each elevator.
 - a. One fused three phase permanent power in building electrical distribution room.
 - b. One non-fused three phase permanent power in hoist way at top landing.
 - 3. Hoistway ventilation shall be in accordance with local and national building code requirements.
 - 4. Guide Rail Support shall be structurally adequate to extend from pit floor to top of hoistway, with spans in accordance with requirements of authority having jurisdiction and final layouts.
 - 5. Removable barricades at all hoistway openings, in compliance with OSHA 29 CFR 1926.502 in addition to any local code requirements.
 - 6. Lifeline attachments capable of withstanding 5000 lb load in accordance with OSHA 29 CFR 1926.502. Provide a minimum of 2 at the top, front of each hoistway.
 - 7. Pit lighting: Fixture with switch and guards. Provide illumination level equal to or greater than that required by ASME A17.1/CSA B44 2000, or applicable version.
 - 8. Control space lighting with switch. Coordinate switch with lighting for machine space as allowable by code.

1.03 APPLICABLE CODES

- A. Comply with applicable building codes and elevator codes at the project site, including but not limited to the following:

1. ANSI A117.1, Buildings and Facilities, Providing Accessibility and Usability for Physically Handicapped People
2. ADAAG – Accessibility Guidelines for Buildings and Facilities
3. ANSI/NFPA 70, National Electrical Code
4. ANSI/NFPA 80, Fire Doors and Windows
5. ASME/ANSI A17.1, Safety Code for Elevators and Escalators.
6. Model & Local Building Codes
7. All other local applicable codes

1.04 QUALITY ASSURANCE

- A. All load ratings and safety factors must be certified by a professional engineer.
- B. Manufacturer: Minimum of fifteen years experience in the fabrication, installation and service of elevators of the type and performance of the specified. The manufacturer shall have a documented quality assurance program.
- C. Elevator shall be subject to state, local and city approval prior to installation and subject to inspection after installation. Permits, Inspections and Certificates: The Elevator Contractor shall obtain and pay for necessary Municipal or State Inspection and permit as required by the elevator inspection authority, and make such tests as are called for by the regulations or such authorities. These tests shall be made in the presence of such authorities or their authorized representatives.
- D. Installer Qualifications: Engage the elevator manufacturer or an installer approved by the elevator manufacturer and who has completed elevator installations similar in material, design, and extent to that indicated for Project which have resulted in installations with a record of successful in-service performance.

1.05 SYSTEM PERFORMANCE REQUIREMENTS

- A. Elevator "PRODUCTS" indicates required performances, controls, capacities, features, and finishes for each elevator is included at end of this Section.
- B. System Performance:
 1. Vertical Vibration (maximum): 25 mg
 2. Horizontal Vibration (maximum): 25 mg
 3. Jerk Rate (maximum): 3.3 ft/sec³
 4. Acceleration (maximum) 1.3 ft/sec²
 5. In Car Noise: = 55 dB(A)
 6. Leveling Accuracy: ±0.2 inches
 7. Starts per hour (maximum): 120

1.06 SUBMITTALS

- A. General: Submit in accordance with Conditions of Contract and Division 1 Sections.
- B. The contractor shall provide a certified statement that the elevator manufacturer will provide all detailed electrical schematics for maintenance and service of equipment. All applicable information shall be provided to Operations and Maintenance. **Shop drawings will not to be approved until after this information is provided.**
- C. Product Data for each principal component or product of each elevator, including certified test reports on required testing. Indicate capacities, sizes, performance and operating characteristics, features of control system, finishes, and similar information. Indicate any variations from specified requirements.

- 1 D. Shop Drawings including dimensioned drawings showing plans, elevations, sections and
2 large-scale details indicating service at each landing, coordination with building structure and
3 relationships with other construction, and details of car enclosures and hoistway entrances.
4 Include elevator diagrams to indicate elevator service to each level. Also include the
5 following:
6 1. Controls, signal and operating fixtures, operating panels and indicators
7 2. Cab design, dimensions and layout
8 3. Hoistway-door and frame details
9 4. Electrical characteristics and connection requirements
10 5. Expected heat dissipation of elevator equipment in control closet and machine space
11 6. Color selection chart for Cab and Entrances
12 7. Car, guide rails, buffers and other components in hoistway
13 8. Maximum rail bracket spacing
14 9. Maximum loads imposed on guide rails requiring load transfer to building structure
15 10. Clearances and travel of car
16 11. Clear inside hoistway and pit dimensions
17 12. Location and sizes of access doors, hoistway entrances and frames
18 13. Layout, finishes, and accessories and available options.
19 14. Hoist beam requirements.
20
21 E. Wiring diagram detailing wiring for power, signal and control systems differentiating clearly
22 between manufacturer-installed wiring and field-installed wiring. Indicate maximum and
23 average power demands.
24
25 F. Samples of exposed finishes of car enclosures, hoistway entrances, and signal equipment.
26 Provide 6-inch- to 8-inch-square samples of sheet materials and 10-inch to 12-inch lengths of
27 running trim members.
28
29 F. Maintenance Manuals: Bound manual for each elevator or group of elevators, with operating
30 and maintenance instructions, parts listing, recommended parts inventory listing, purchase
31 source listing for major and critical components, emergency instructions, and similar
32 information.
33
34 G. Certificates and Permits: Provide Owner with copies of all inspection/acceptance certificates
35 and operating permits as required by governing authorities to allow normal, unrestricted use of
36 elevators.
37

38 1.07 WARRANTY

39

- 40 A. Special Project Warranty: Provide special project warranty, 12 months starting on date of
41 Substantial Completion for the Project, signed by Contractor, Installer, and Manufacturer,
42 agreeing to replace, repair, or restore defective materials and workmanship of elevator work
43 during warranty period. This warranty shall be in addition to, and not a limitation of, other
44 rights the Owner may have against the Contractor under the Contract Documents.
45 1. "Defective" is hereby defined to include, but not by way of limitation, operation or control
46 system failures, performances below required minimums, excessive wear, unusual
47 deterioration or aging of materials or finishes, unsafe conditions, the need for excessive
48 maintenance, abnormal noise or vibration, and similar unusual, unexpected, and
49 unsatisfactory conditions.
50 2. Warranties: Provide coincidental product warranties where available for major
51 components of elevator work. Submit with maintenance manuals.
52 3. If electronic devices are required to program the elevator's operation, one of them shall
53 be provided for each project installing or renovating one or more elevators.
54 4. Service personnel must advise the Operations and Maintenance staff of their presence
55 at a facility prior to servicing equipment. Failure to do so is sufficient grounds for the
56 school district not to honor claims for compensation.
57 5. Prior to seeking final acceptance for the completed project as specified by the Contract
58 Documents, the Elevator Contractor shall deliver to the Owner any specialized tool(s)

that may be required to perform diagnostic evaluations, adjustments, and/or parametric software changes and/or test and inspections on any piece of control or monitoring equipment installed. This shall include any specialized tool(s) required for monitoring, inspection and/or maintenance where the means of suspension other than conventional wire ropes are furnished and installed by the Elevator Contractor. Any and all such tool(s) shall become property of the Owner. Any diagnostic tool provided to the Owner by the Elevator Contractor shall be configured to perform all levels of diagnostics, systems adjustment and parametric software changes which are available to the Elevator Contractor. In those cases where diagnostic tools provided to the Owner require periodic recalibration/or re-initiation, the Elevator Contractor shall perform such tasks at no additional cost to the Owner for a period equal to the term of the maintenance agreement from the date of final acceptance of the competed project. During those intervals in which the Owner might find it necessary to surrender a diagnostic tool for re-calibration, re-initiation, or repair, the Elevator Contractor shall provide a temporary replacement for the tool at no additional cost to the Owner. The Elevator Contractor shall deliver to the Owner, printed instructions for the proper use of any tool that may be necessary to perform diagnostic evaluations, system adjustment, and/or parametric software changes on any unit of microprocessor-based elevator control equipment and means of suspension other than standard elevator steel cables furnished and install by the Elevator Contractor. Accompanying the printed instructions shall be any and all access codes, password, or other proprietary information that is necessary to interface with the microprocessor-control equipment.

1.08 MAINTENANCE SERVICE

- A. Initial Maintenance Service: The Elevator Contractor shall furnish full maintenance service by skilled, competent employees for period of 12 months, including 24-hours-per-day, 7-days-per-week emergency callback service, after the established Date of Substantial Completion for the Project. Include monthly preventive maintenance performed during normal working hours. Include repair or replacement of worn or defective parts or components and lubricating, cleaning, and adjusting as required for proper elevator operation in conformance with specified requirements. Exclude only repair or replacement due to misuse, abuse, accidents, or neglect caused by persons other than Installer's personnel.
1. A written report of the monthly examination shall be sent to Operations & Maintenance, to the attention of the Maintenance Supervisor.
 2. Service shall include all necessary adjustments, greasing, oiling, cleaning, supplies, and parts to keep the equipment in good operation, except such parts made necessary by misuse, accidents, or negligence not caused by the Contractor.
 3. The Elevator Contractor shall notify Operations and Maintenance in writing 30 days prior to expiration of the maintenance warranty.
- B. Continuing Maintenance Service: Installer shall provide a continuing maintenance proposal to Owner, in the form of a standard yearly (or other period) maintenance agreement, starting on the date construction contract maintenance requirements are concluded. State services, obligations, conditions, and terms for agreement period and for future renewal options.
- C. The elevator control system must:
1. Provide in the controller the necessary devices to run the elevator in inspection operation.
 2. Provide on top of the car the necessary devices to run the elevator in inspection operation.
 3. Provide in the controller an emergency stop switch. This emergency stop switch when opened disconnects power from the brake and prevents the motor from running.
 4. Provide in the event of a power outage, means from the controller to mechanically lift and control the elevator brake to safely bring the elevator to the nearest available landing.
 5. Provide the means from the controller to reset the governor over speed switch and also trip the governor.
 6. Provide the means from the controller to reset the emergency brake when set because of an unintended car movement or ascending car over speed.

1 1.09 DELIVERY, STORAGE AND HANDLING

- 2
- 3 A. Comply with manufacturer's recommendations for delivery, storage and handling.
- 4 B. If the construction site is not prepared to receive the elevator equipment at the agreed ship date,
- 5 the General Contractor shall be responsible to provide a safe, dry, and easily accessible
- 6 storage area on or off the premises. Additional labor costs for double handling will be the
- 7 responsibility of the general contractor.
- 8
- 9 C. Delivered elevator materials shall be stored in a protected environment in accordance with
- 10 manufacturer recommendations. A minimum storage area of 10 feet by 20 feet is required
- 11 adjacent to the hoistway.
- 12

13 **PART 2 - PRODUCTS**

14

15 2.01 MANUFACTURERS

- 16
- 17 A. Provide AC gearless machine room-less traction passenger elevator with control system and
- 18 car design based on materials and systems as manufactured by KONE Inc. EcoSpace™, or
- 19 approved equal system designs by:
- 20 1. Otis Elevator Corporation, Gen 2
- 21 2. Schindler Elevator Corporation, 3300 MRL
- 22
- 23 B. Specifically, the system shall consist of the following components:
- 24 1. An AC gearless machine using embedded permanent magnets mounted to the guide
- 25 rails. Non-proprietary controls and technology. Installer approved by the Manufacturer.
- 26
- 27 C. Design elevator and components is based on the following by KONE Inc. - EcoSpace:
- 28 1. Elevator equipment: KONE EcoSpace™ gearless traction elevator.
- 29 2. Equipment Control: Microprocessor KCM831 control system
- 30 3. Quantity of Elevators: 1
- 31 4. Landings: 3
- 32 5. Openings: One Front opening.
- 33 6. Travel: 11'-1 Ground floor to first floor / 11'-8" First floor to second floor.
- 34 7. Rated Capacity: 2500 lb.
- 35 8. Rated Speed: 150 fpm
- 36 9. Clear Inside Dimensions (W x D): 6'-8" x 4'-3" (ADA-wheelchair minimum)
- 37 10. Cab Height: 8'-0"
- 38 11. Clear height under suspended ceiling: 7'-0"
- 39 12. Entrance Type and Width: 3'-6" wide - refer to drawings for orientation type
- 40 13. Entrance Height: 7'-0"
- 41 14. Power Supply: 480V +5%, three-Phase
- 42 15. Car Lighting Power Supply: 120 Volts, Single-phase, 15 Amp, 60 Hz.
- 43 16. Machine Location: Mounted on car guide rail in hoistway.
- 44 17. Controller Location: Controller(s) shall be located adjacent to the hoistway at the top
- 45 landing in a integral control space.
- 46 a. Car Speed: \pm 5% of contract speed under any loading condition or direction of
- 47 travel.
- 48 b. Car Capacity: Safely lower, stop and hold (per code) up to 125% of rated load.
- 49 18. Maintenance Service: 12 months.
- 50
- 51 D. Simplex Collective Operation: Using a microprocessor-based controller, operation shall be
- 52 automatic by means of the car and hall buttons. If all calls in the system have been answered,
- 53 the car shall park at the last landing served.
- 54 1. Operating Features – Standard
- 55 a. Full Collective Operation
- 56 b. Fan and Light Control.
- 57 c. Load Weighing Bypass.
- 58 d. Independent Service.

- e. Ascending Car Uncontrolled Movement Protection
- f. Firefighters' Service Phase I and Phase II.
- g. Top of Car Inspection Station.
- h. Hoist way access at bottom and top landing.
- i. Provide provisions for coaxial cable for CCTV (CCTV by others).
- j. Emergency Battery Power Supply:
 - 1). When the main line power is lost for longer than 5 seconds the emergency battery power supply provides power automatically to the elevator controller. The elevator will rise or lower to the first available landing, open the doors, and shut down. The elevator will return to service upon the return of normal main line power. An auxiliary contact on the main line disconnect and shunt trip breaker (if used) will be provided by others.

E. Door Control Features:

- 1. Door Operator: A closed loop permanent magnet VVVF high performance door operator shall be provided to open and close the car and hoistway doors simultaneously. Door movement shall be cushioned at both limits of travel. Electro-mechanical interlock shall be provided at each hoistway entrance to prevent operation of the elevator unless all doors are closed and locked. An electric contact shall be provided on the car at each car entrance to prevent the operation of the elevator unless the car door is closed.
- 2. The door operator shall be arranged so that, in case of interruption or failure of electric power, the doors can be readily opened by hand from within the car, in accordance with applicable code. Emergency devices and keys for opening doors from the landing shall be provided as required by Code
- 3. Doors shall open automatically when the car has arrived at or is leveling at the respective landings. Doors shall close after a predetermined time interval or immediately upon pressing of a car button. A door open button shall be provided in the car. Momentary pressing of this button shall reopen the doors and reset the time interval.
- 4. Door hangers and tracks shall be provided for each car and hoistway door. Tracks shall be contoured to match the hanger sheaves. The hangers shall be designed for power operation with provisions for vertical and lateral adjustment. Hanger sheaves shall have polyurethane tires and pre-lubricated sealed-for-life bearings.
- 5. Electronic Door Safety Device. The elevator car shall be equipped with an electronic protective device extending the full height of the door. When activated, this sensor shall prevent the doors from closing or cause them to stop and reopen if they are in the process of closing. The doors shall remain open as long as the flow of traffic continues and shall close shortly after the last person passes through the door opening.

2.02 MATERIALS AND COMPONENTS

- A. General Requirement: Provide manufacturer's standard pre-engineered elevator systems that will comply with or fulfill the requirements of this Section or, at manufacturer's option, provide custom-manufactured elevator systems that will fulfill requirements. Where components are not otherwise indicated, provide standard components by manufacturer as included in standard pre-engineered elevator systems and as required for a complete system.

2.03 EQUIPMENT: CONTROL ROOM COMPONENTS

- A. Controller: A micro-computer based control system shall be provided to perform all of the functions of safe elevator operation. The system shall also perform car and group operational control.
- 1. All high voltage (110V or above) contact points inside the controller cabinet shall be protected from accidental contact in a situation where the controller doors are open.
 - 2. Controller shall be separated into two distinct halves; Motor Drive side and Control side. High voltage motor power conductors shall be routed and physically segregated from the rest of the controller. Provide a serial card rack and main CPU board containing a non-erasable EPROM and operating system firmware.

- 1 3. Variable field parameters and adjustments shall be contained in a non-volatile memory
2 module.
3
4 B Drive: A Variable Voltage Variable Frequency AC drive system shall be provided to develop
5 high starting torque with low starting current.
6
7 C. Controller Location: Locate controller{s} in the front wall integrated with the top landing
8 entrance frame, machine side of the elevator. A separate control space should not be
9 required.

10
11 2.04 EQUIPMENT: HOISTWAY COMPONENTS
12

- 13 A. Machine: AC gearless machine, with a permanent magnet synchronous motor, direct current
14 electro-mechanical disc brakes and integral traction drive sheave, mounted to the car guide
15 rail at the top of the hoistway.
16
17 B. Governor: Provide a friction type over-speed governor rated for the duty of the elevator specified.
18
19 C. Buffers, Car and Counterweight: Polyurethane buffer.
20
21 D. Hoistway Operating Devices:
22 1. Emergency stop switch in the pit
23 2. Terminal stopping switches.
24 3. Emergency stop switch on the machine
25
26 E. Positioning System: Consists of magnets and proximity switches.
27
28 F. Guide Rails and Attachments: Guide rails shall be steel rails with brackets and fasteners. Side
29 counterweight arrangements have a dual-purposed bracket that combines one car rail with one
30 counterweight rail on the machine side. Another bracket supports the other counterweight rail
31 on the machine side and a separate bracket supports the other car rail opposite the machine.
32
33 G. Ropes: Provide 5, 10-mm diameter hoist ropes made with steel wire wound about a steel core.
34
35 H. Pit Ladder: Galvanized steel pit ladder, anchored to concrete pit wall/floor.
36 I. Governor Rope: Provide 3/8" diameter steel cable governor rope of at least eight strands
37 wound about a sisal core center.
38
39 J. Fascia: Galvanized sheet steel shall be provided at the front of the hoistway.
40
41 K. Hoistway Entrances: Hoistway door and frame construction shall be UL rated, with required
42 fire rating. Doors shall be of rigid flush panel construction and contain sound-deadening
43 material.
44
45 L. Frames: Entrance frames shall be of bolted construction for complete one-piece unit
46 assembly. All frames shall be securely fastened to fixing angles mounted in the hoistway and
47 shall be of 14-gauge (2 mm) sheet steel.
48
49 M. Sills shall be extruded aluminum.
50
51 N. Doors: Entrance doors shall be of hollow metal construction with vertical internal channel
52 reinforcements.
53
54 O. Fire Rating: Entrance and doors shall be UL fire rated for 1-1/2 hour.
55
56 P. Entrance Finish: stainless steel at all floors - brushed stainless steel

- 1 Q. Entrance marking plates: Entrance jambs shall be marked with 4" x 4" (102 mm x 102 mm)
2 plates having raised floor markings with Braille located adjacent to the floor marking. Marking
3 plates shall be provided on both sides of the entrance.
4
5 R. Sight Guards: Black sight guards will be furnished with any metal finish door.
6
7 S. Hoist Beam: Manufacturer's standard, sized as required for hoisting elevator equipment and
8 supplied to Elevator Manufacturer.
9

10 2.05 EQUIPMENT: CAR COMPONENTS

- 11
12 A. Carframe and Safety: A suitable car frame shall be provided with adequate bracing to support
13 the platform and car enclosure.
14
15 B. Car Guides: Guide-shoes shall be provided and mounted to the top and bottom of both the
16 car and counterweight frame. Each guide-shoe assembly shall be arranged to maintain
17 constant contact on the rail surfaces. Retainers are used in Seismic areas.
18
19 C. Platform: Platform shall be all steel construction. No plywood.
20
21 D. Load weighing device shall be strain gauge, mounted to the dead-end hitch attached atop the
22 hoistway guide-rail.
23
24 E. Steel Cab
25
26 F. Car Wall Panels, non-removable panels, plastic laminate selected from manufacturer's full
27 range of catalog of choices to include color, metal or wood finishes by WilsonArt, Nevamar
28 and Formica.
29 1. Aluminum trim and base plate with a brushed stainless finish.
30 2. Car Front Finish: Brushed stainless steel
31 3. Car Door Finish: Brushed stainless steel
32 4. Ceiling Type: Ceiling LF-88; shall be suspended can downlight ceiling - with 6 lights and
33 stainless steel #4 satin finish. Three panel suspended ceiling with two light holes per
34 panel for Round LED lights.
35 5. Handrail: Handrails shall be provided on the rear wall of the car enclosure. Handrails
36 shall be round 1.25" (32mm) maximum outside diameter extruded brushed stainless
37 steel with flat end-caps having the same finish and material as the handrail.
38 6. Threshold: Aluminum
39 7. Flooring: Refer to Division 9.
40
41 G. Emergency Car Signals
42 1. Emergency Car Lighting: An emergency power unit employing a 12-volt sealed
43 rechargeable battery and totally static circuits shall be provided to illuminate the elevator
44 car and provide current to the alarm bell in the event of building power failure.
45 2. Emergency Siren: Siren mounted on top of the car that is activated when the Alarm
46 button in the car operating panel is engaged. Siren shall have a rated sound pressure
47 level of 80 dB(A) at a distance of 3.0 m from the device. Siren shall respond with a
48 delay of not more than 1 second after the switch or push button has been pressed.
49 3. Emergency Exit Contact: An electrical contact shall be provided on the car-top exit.
50
51 H. Ventilation: Power ventilation single-speed fan.
52

53 2.06 EQUIPMENT: SIGNAL DEVICES AND FIXTURES

- 54
55 A. Car Operating Panel: A car operating panel shall be provided which contains all push buttons,
56 key switches, and message indicators for elevator operation.
57 1. KSS 570 Fixtures Integral car operating panel shall be furnished. It shall contain a bank
58 of round mechanical illuminated buttons marked to correspond to the landings served,

- an emergency call button, door open and door close buttons, and switches for lights, inspection and the exhaust fan. All buttons to have both raised and Braille markings. Buttons have amber illumination (halo) with and shall be flush. The car operating display panel shall be a 7-segment amber display. All texts, when illuminated, shall be amber. The car operating panel shall have a brushed stainless steel finish.
2. The car operating panel shall be equipped with the following standard and optional features:
- a. Raised markings and Braille shall be provided to the left hand side of each push-button.
 - b. Car Position Indicator within the car operating panel (amber).
 - c. Door open and door close buttons.
 - d. Light key-switch
 - e. Fan key-switch
 - f. Elevator Data Plate marked with elevator capacity and car number on car top.
 - g. Help button with raised markings. Illuminated alarm button with raised markings.
 - h. In car stop switch (toggle or key unless local code prohibits use)
 - i. Firefighter's hat
 - j. Firefighter's Phase II Key-switch
 - k. Call Cancel Button
 - l. Help Button – The help button shall initiate two-way communication between the car and a location inside the building, switching over to another location if the call is unanswered, where personnel are available who can take the appropriate action. Visual indicators are provided for call initiation and call acknowledgement.
 - m. Firefighter's Phase II emergency in-car operating instructions.
 - n. Pre-programmed integrated ADA phone (complete description of krms features included as standard)
- B. Hall Fixtures: Hall fixtures shall be provided with necessary push buttons and key switches for elevator operation. Hall fixtures shall have a brushed stainless steel finish at all levels. KSS 570 Fixtures Hall fixtures shall feature round mechanical illuminated buttons marked to correspond to the landings, in raised fixture housings. Buttons shall be flat flush in vertically mounted fixture. Hall Lanterns and hall indicators shall feature amber illumination, all numbers will be 7-segment amber display.
- C. Car Lantern and Chime: A directional lantern visible from the corridor shall be provided in the car entrance. When the car stops and the doors are opening, the lantern shall indicate the direction in which the car is to travel and a chime will sound. The chime will sound once for up and twice for down.
- D. Telephone Cabinet: A telephone compartment shall be furnished in the return panel below the car operating panel. Necessary wires for the telephone shall be included in the compartment and connected to the car traveling cable. The telephone instrument shall be furnished by others.

PART 3 - EXECUTION

3.01 EXAMINATION

- A. Prior to commencing elevator installation, examine hoistway, hoistway opening, pit, and machine space, as constructed; verify all critical dimensions and examine supporting structure and all other conditions under which elevator work is to be installed. Notify Contractor in writing of any dimensional discrepancies or other conditions detrimental to the proper installation or performance of elevator work. Do not proceed with elevator installation until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.
- B. Field measure and examine substrates, supports, and other conditions under which elevator work is to be performed.
- C. Do not proceed with work until unsatisfactory conditions are corrected.

- D. Prior to start of Work, verify hoistway is in accordance with shop drawings. Dimensional tolerance of hoistway from shop drawings: -0 inches +2 inches. Do not begin work of this section until dimensions are within tolerances.
- E. Prior to start of Work, verify projections greater than 2 inches (4 inches if ASME A17.1/CSA B44 2000 applies) must be beveled not less than 75 degrees from horizontal.
- F. Prior to start of Work, verify landings have been prepared for entrance sill installation. Traditional sill angle or concrete sill support shall not be required.
- G. Prior to start of Work, verify elevator pit has been constructed in accordance with requirements, is dry and reinforced to sustain vertical forces, as indicated in approved submittal. Verify that sumps or sump pumps located within pit will not interfere with installed elevator equipment.
- H. Prior to start of Work, verify control space has been constructed in accordance with requirements, with access coordinated with elevator shop drawings, including Sleeves and penetrations.
- I. Verify installation of GFCI protected 20-amp in pit and adjacent to each signal control cabinet in control space.

3.02 INSTALLATION

- A. Elevator shall be installed in accordance with approved plans, specifications, and manufacturer's installation instructions. This specification indicates equipment required but does not cover details of design or construction. Elevator contractor shall perform all work and supply all material necessary to install the elevator equipment.
- B. Codes: All designs, clearances, construction, workmanship and material, unless specifically excepted, shall be in accordance with all codes having legal jurisdiction as identified by the building designer. Elevator shall be in compliance with all applicable inspection requirements. Determination of and adherence to these regulations is the responsibility of the elevator contractor.
 - 1. Maintenance: Elevator must be maintained in accordance with manufacturer's instructions and all applicable codes.
- C. Interface with Other Work:
 - 1. Guide rail brackets attached to steel shall be installed prior to application of fireproofing.
 - 2. Coordinate construction of entrance walls with installation of door frames and sills.
 - 3. Maintain front wall opening until elevator equipment has been installed.
 - a. Ensure adequate support for entrance attachment points at all landings.
 - b. Coordinate wall openings for hall push buttons, signal fixtures and sleeves. Each elevator requires sleeves within the hoistway wall.
 - c. Coordinate emergency power transfer switch and power change pending signals as required for termination at the primary elevator signal control cabinet in each group.
 - d. Coordinate interface of elevators and fire alarm system.
 - e. Coordinate interface of dedicated telephone line.
 - f. Coordinate the installation of the non-fused three phase permanent power disconnect in hoist way at top landing

3.03 FIELD QUALITY CONTROL

- A. Acceptance Testing: Upon nominal completion of each elevator installation, and before permitting use of elevator (either temporary or permanent), perform acceptance tests as required and recommended by Code and by governing regulations or agencies.
- B. Adjust for smooth acceleration and deceleration of car so not to cause passenger discomfort. Adjust doors to prevent opening of doors at any landing on the corridor side unless the car is

1 at rest at that landing, or is in the leveling zone and stopping at that landing. Adjust automatic
2 floor leveling feature at each floor to achieve within 1/4" of the landing.

- 3
4 C. Advise Contractor, Owner, Architect, and inspection department of governing agencies in
5 advance of dates and times tests are to be performed on elevators.
6

7 3.04 PROTECTION
8

- 9 A. Prior to Substantial Completion of elevator work (or portion thereof), provide suitable
10 protective coverings, barriers, devices, signs, or such other methods or procedures to protect
11 elevator work from damage or deterioration. Maintain protective measures throughout
12 remainder of construction period.
13

- 14 B. Provide protective measures for elevator units that will be placed in temporary service,
15 including inspection and maintenance service during period of temporary service.
16

17 3.05 DEMONSTRATION
18

- 19 A. Instruct Owner's personnel in proper use, operations, and daily maintenance of elevators.
20 Review emergency provisions, including emergency access and procedures to be followed at
21 time of failure in operation and other building emergencies. Train Owner's personnel in
22 normal procedures to be followed in checking for sources of operational failures or
23 malfunctions. Confer with Owner on requirements for a complete elevator maintenance
24 program.
25

- 26 B. Make a final check of each elevator operation with Owner's personnel present and just prior to
27 date of Substantial Completion. Determine that control systems and operating devices are
28 functioning properly.
29
30
31
32

33 **END OF SECTION 14210**

DIVISION 22
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SECTION 220500 – PLUMBING PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Plumbing Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

- A. This DIVISION requires the furnishing and installing of complete functioning Plumbing systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
- B. Refer to Architectural, Structural and Electrical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing piping and ductwork in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

- A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, FAX 913-492-2437, EMAIL admin@pkmreng.com.
- B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
- C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
- D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
- E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
- F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
- G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
- H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
- J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

- A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

- A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

- A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

- A. Locations of equipment, piping and other plumbing work are indicated diagrammatically by the plumbing drawings. The Contractor shall determine the exact locations on site, subject to structural conditions, work of other Contractors, and access requirements for installation and maintenance to approval of Architect-Engineer. Provide additional piping and ductwork offsets as required at no additional cost.
- B. Study and become familiar with the contract drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with other contractors and install work in such a way as to avoid interference with their work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
- C. Any pipe, ductwork, equipment, apparatus, appliance or other item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other work caused by this Contractor, the Subcontractor, or workers shall be restored as specified for new work.
- D. Do not scale mechanical, plumbing and electrical drawings for dimensions. Contractor shall accurately layout work from the dimensions indicated on the Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

- A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
- B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of plumbing systems by Owner.

1.9. WARRANTY

- A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
- B. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

- A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

- A. The intent of these specifications is to allow ample opportunity for Contractor to use his ingenuity and abilities to perform the work to his and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
- B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
- C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
- D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
- E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
- F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered

approved when listed by addendum.

- G. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in plumbing or electrical service requirements necessary to accommodate such substitution.
- H. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. ELECTRONIC PLAN FILES

- A. Electronic files of the contract documents may be available from the Engineer to successful bidders and manufacturers for a fee of \$50 per sheet, \$100 minimum and \$25 email/shipping charge. A release of liability form will be required along with payment prior to release of files.

1.13. OPENINGS, ACCESS PANELS AND SLEEVES

- A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.
- B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.14. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

- A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.15. EXTENT OF CONTRACT WORK

- A. Provide plumbing systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of plumbing systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.
- B. Contractor shall become familiar with equipment provided by other contractors that require plumbing connections and controls.
- C. Electrical work required to install and control plumbing equipment, which is not shown on plans or specified under Division 26, shall be included in Contractor's base bid proposal.
- D. All automatic temperature control devices shall be mounted as indicated in automatic temperature control section of specifications.
- E. The cost of larger wiring, conduit, control and protective devices resulting from installation of equipment which was not used for basis of design as outlined in specifications shall be paid for by Plumbing Contractor at no cost to Owner or Architect-Engineer.
- F. Contractor shall be responsible for providing supervision to Electrical Contractor to insure that required connections, interlocking and interconnection of plumbing and electrical equipment are made to attain intended control sequences and system operation.
- G. Furnish four complete sets of electrical wiring diagrams to Architect-Engineer to be included in the maintenance manuals and three complete sets to Electrical Contractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Contractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.
- H. Contractor shall obtain complete electrical data on plumbing shop drawings and shall list this data on an approved form that shall be presented monthly or on request, to Electrical Contractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of plumbing equipment such as HP, voltage, amperes, watts, locked rotor current to allow Electrical Contractor to order electrical equipment required in his contract.

1.16. WORK NOT INCLUDED IN CONTRACT

- A. Consult Division 21, 23, and 26 of specifications for work to be provided by Electrical Contractor in conjunction with installation of plumbing equipment.

1.17. CODES, RULES AND REGULATIONS

- A. Provide Work in accordance with applicable codes, rules and regulations of Local and State, Federal Governments and other authorities having lawful jurisdiction.
- B. Conform to latest editions and supplements of following codes, standards or recommended practices.

1.18. SAFETY CODES:

- A. National Electrical Safety Code Handbook H30 - National Bureau of Standards.
- B. Occupational Safety and Health Standard (OSHA) - Department of Labor.

1.19. NATIONAL FIRE CODES:

- A. NFPA No. 54 Gas Appliance & Gas Piping Installation
- B. NFPA No. 70 National Electrical Code
- C. NFPA No. 89M Clearances, Heat Producing Appliances

1.20. UNDERWRITERS LABORATORIES INC:

- A. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

1.21. MISCELLANEOUS CODES:

- A. ANSI A117.1 - Handicapped Accessibility
- B. Applicable State Boiler Codes
- C. Americans with Disabilities Act (ADA)

1.22. ENERGY EFFICIENCY REQUIREMENTS:

- A. All plumbing systems and components shall be manufactured and installed in compliance with ASHRAE 90.1 – 2007 and latest adopted version of IECC.

1.23. STANDARDS

- A. Drawings and specifications indicate minimum construction standard. Should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect-Engineer in writing before proceeding with work so that necessary changes can be made. However, if the Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, Contractor shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.24. PERMITS/FEEES

- A. The Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect-Engineer with request for final inspection.
- B. The Contractor shall include in their base bid any fees or charges by the local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exactly which part of the work required for the new utility service, is to be performed by the contractor and which part will be supplied by the utility company.

PART 2 - PRODUCTS

2.1. Not Used

PART 3 - EXECUTION

3.1. SHOP DRAWINGS

- A. Contractor shall furnish shop drawings of all materials and equipment in an Adobe PDF format.
- B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
- C. Where catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Mark each submitted item with applicable section and sheet number of these specifications, or plan sheet number when item does not appear in the specifications. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization. Each catalog sheet shall bear the equipment manufacturer's name and address. All shop drawings on materials and equipment listed by UL shall indicate UL approval on submittal.

- D. Contractor shall check all shop drawings to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All shop drawings submitted to Architect-Engineer shall bear contractor's approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All shop drawings not meeting Contractor's approval shall be returned to their supplier for re-submittal.
- E. No shop drawing submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
- F. The shop drawing submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required. Submittal of all shop drawings as soon as possible before construction starts is preferred. All shop drawings submitted shall contain the following: The project name, the applicable specification section and paragraph, the submittal date, the Contractor's stamp which shall certify that the stamped drawings have been checked by the Contractor, comply with the drawings and specifications and have been coordinated with other trades. Submittals not so identified will be returned without action for re-submittal.
- G. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
- H. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
- I. Shop drawings that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
- J. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- K. Plumbing shop drawings for pipe fabrication shall be a minimum of 1/4" scale. Provide drawings where the complexity of the system or confines of the space require coordination with construction and other trades. Plumbing shop drawings shall not be a reproduction of the contract document and shall show details of the following: Plans, elevations above finished floor, sections, components, insulation and attachments to other work. Plumbing layout indicating sizes on plans, fittings, insulation, clearances, penetrations through fire-rated and other partitions, hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and attachment.
- L. Architect-Engineer's review of shop drawings will not relieve Contractor of responsibility for deviations from drawings and specifications unless the Architect-Engineer has specifically approved such deviations in writing, nor shall it relieve the Contractor of responsibility for errors in shop drawings. No work shall be fabricated until Architect-Engineer's review has been obtained. Any time delay caused by correcting and re-submitting shop drawings will be the Contractor's responsibility.

3.2. SHOP DRAWING COORDINATION

- A. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.3. SUBMITTALS

- A. Contractor shall provide the following submittal sections that apply to this project:
 - 1. SECTION 220520 - BASIC PLUMBING MATERIALS AND METHODS:
 - a. Test methods and pressures
 - b. Sterilization of domestic water systems
 - c. Piping, and fittings
 - 2. SECTION 220530 - MOTOR CONTROL AND EQUIPMENT DISCONNECTS
 - a. Disconnect Switches

- b. Motor Starters
- 3. SECTION 221116 – PLUMBING PIPING:
 - a. Piping materials
 - b. Supports, anchors
 - c. Sleeves and seals
- 4. SECTION 221319 – SANITARY WASTE PIPING SPECIALTIES:
 - a. Roof drains / downspout nozzles

3.4. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

- A. Submit with shop drawings of equipment, four copies of installation, operating, maintenance instructions, and parts lists for equipment provided. Equipment manufacturer shall prepare instructions.
- B. Keep in safe place, keys and wrenches furnished with the equipment provided under this contract. Present to the Owner and obtain a receipt for them upon completion of project.
- C. Prepare a complete brochure, covering systems and equipment provided and installed under this contract. Submit brochures to Architect-Engineer for review before delivery to Owner. Brochures shall contain following:
 - 1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined above.
 - 2. Record copy of all submittals indicating actual equipment installed indicating options, characteristics. Copies of submittals shall bear the stamps of all parties that reviewed submittals.
 - 3. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
 - 4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of plumbing system.
- D. Provide brochures bound in three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:
 - 1. Project name and address.
 - 2. Section of work covered by brochure, i.e., "Plumbing", etc.

3.5. RECORD DOCUMENTS

- A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
- B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.
- C. Provide one copy of on high quality heavy weight presentation type paper. Media which fade shall not be used.
- D. Provide one electronic version of record documents in Adobe PDF format on a DVD or otherwise electronically transmitted. Transmit electronic copies in conjunction with hard copy documents.

3.6. CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
- B. Contractor shall clean up all ductwork and equipment at the completion of the project.
- C. All equipment, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.7. WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.8. CUTTING AND PATCHING

- A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Remove walls, ceilings and floors (or portions thereof) necessary to accomplish scope of work. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's and Structural Engineer's approval and in a manner approved by them.

- B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
- C. Patching shall be by the contractors of the particular trade involved, shall match the existing construction type, quality, finish and texture, and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of plumbing work shall be repaired at Contractor's expense to approval of Architect-Engineer.

3.9. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

- A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundation and provide proper anchor bolts and isolation as shown, specified or required by manufacturers in installation instructions. Level, shim and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instructions.
- B. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.
- C. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.
- D. Provide floor or slab mounted equipment with 3-1/2" high concrete bases unless specified otherwise. Plumbing contractor shall form all pads; General contractor shall provide and place all concrete and reinforcing for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.
- E. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best-recognized practice. Verify that structural members of buildings are adequate to support equipment and unless otherwise indicated on plans or specified, arrange for their inclusion and attachment to building structure. Provide hangers with vibration isolators.
- F. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect-Engineer for review before proceeding with fabrication or installation.

3.10. START-UP, CHANGEOVER, TRAINING AND OPERATIONAL CHECK

- A. Contractor shall perform the initial start-up of the systems and equipment and shall provide necessary supervision and labor to make the first seasonal changeover of systems. Personnel qualified to start-up and service this equipment, including manufacturer's technicians, and the Owner's operating personnel shall be present during these operations.
- B. Contractor shall be responsible for training Owner's operating personnel to operate and maintain the systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructors name, names of Owner's personnel attending and total hours of instruction given each individual.
- C. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall become property of the owner.

3.11. FINAL CONSTRUCTION REVIEW

- A. At final construction review, each respective Contractor and major subcontractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by the Architect-Engineer, that the work complies with the purpose and intent of the contract documents. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 220500

SECTION 220505 – PROJECT COORDINATION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

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

1.3. COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

1.4. SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches. Format shall be PDF or other electronic format to facilitate multiple user commenting and sharing easily.
 - 3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including project managers, superintendent and other personnel in attendance at Project site to the General Contractor and other major subcontractors. Identify individuals and their duties and responsibilities; list email addresses and telephone numbers. Update the list as required during the project if personnel change.

1.5. COORDINATION

- A. Certain materials will be provided by other trades. Examine the Contract Documents and reviewed record Submittals to ascertain these general requirements. Contract Documents reflect a basis of design and may not reflect actual equipment or items being utilized.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
- E. Obtain equipment submittal information for all pieces of equipment to be connected to from other trades that clearly indicates all connection requirements, locations, sizes, and similar requirements. Obtain this information in ample time to coordinate other trade submittals and equipment coordination. Where requirements differ from that on plans or differs from provisions made in the work, immediately notify the Architect/Engineer. Do not proceed with work that is incompatible with equipment provided.
- F. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- G. The Drawings show only the general run of piping and ductwork and approximate location of outlets. Any significant changes in location of items necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.
- H. Adjust location of piping, ductwork, etc. to prevent interferences, both anticipated and encountered. Determine the exact route and location of each item prior to fabrication.

1. Right-of-Way:

- a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
- b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.
- I. Wherever the work is of sufficient complexity, prepare additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field.
- J. Coordinate with the local Utility Companies to their requirements for service connections and provide all necessary materials, labor and testing.
- K. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
- L. Conduct a coordination meeting after reviewing all other trade coordination drawings with other relevant trades. This meeting shall be held to prevent conflicts during construction. Each major relevant subcontractor shall attend this meeting. Report any potential conflicts or clearance problems to Architect/Engineer after meeting.

1.6. PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated. Organize meeting with agenda and invite all pertinent attendees. Notify Architect and owner of relevant meetings. Record all decisions made and distribute minutes within 3 days of meeting.
- B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.

- d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Manufacturer's written recommendations.
 - l. Warranty requirements.
 - m. Compatibility of materials.
 - n. Space and access limitations.
 - o. Regulations of authorities having jurisdiction.
 - p. Testing and inspecting requirements.
 - q. Installation procedures.
 - r. Coordination with other work.
 - s. Required performance results.
 - t. Protection of adjacent work.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work. Notify Architect of meeting.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contractor is on time, ahead or behind schedule, in relation to Construction Schedule. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Discuss impact of various contractor schedules upon other contractors and how to remedy impacts.
 - b. Review present and future needs of each contractor present, including the following:
 - i. Interface requirements.
 - ii. Sequence of operations.
 - iii. Status of submittals.
 - iv. Deliveries.
 - v. Off-site fabrication.
 - vi. Access.
 - vii. Quality and work standards.
 - viii. Change Orders.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.7. REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.
1. Submit Contractor's suggested solution(s) to RFI. If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 2. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 220505

SECTION 220513 – COMMON MOTOR REQUIREMENTS FOR PLUMBING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. MOTORS

- A. Motors shall be installed in strict accordance with rules set forth by NEC and equipment manufacturer.
- B. ELECTRIC MOTORS (Less than ½ HP)
 - 1. Motors 1/3 horsepower and smaller shall be selected by manufacturer of driven equipment with motor speed and torque characteristics best suited for application.
 - 2. Motors shall have a minimum service factor of 1.15 for open dripproof enclosure and 1.00 for totally enclosed motors. Wherever applicable provide motors with cushion bases. Motor enclosure shall be proper type required for operating environment.
 - 3. Motors shall have a plus or minus 10% voltage tolerance and plus or minus 5% frequency tolerance. Motors shall operate satisfactorily in ambient temperature range of 0 degrees C (32°F) to 140°C (104°F) at altitudes below 3300 feet.
 - 4. Provide motors with built-in thermal overload protection. Motors readily accessible to operating personnel shall have manual reset protector. All other shall have automatic reset protectors.
 - 5. Motors shall have AFBMA standard double-shielded ball bearings sized for average life of at least 100,000 hours under normal loading conditions. Bearings housing shall have provisions for adding new lubricant without major disassembly and shall have seals to prevent entrance of foreign matter and leakage of bearing lubricant.
 - 6. Motor bolts, screws and other external hardware shall be treated with corrosion resistant plating and motor enclosure prime painted with corrosion resistant metal primer finished with a durable machinery enamel.
 - 7. Unless indicated otherwise motors shall be rated for continuous operation at 115, 200, or 277 volt single phase 60 hertz. Where equipment manufacturer offers a choice provide permanent split capacitor motors in lieu of shaded pole motors.
 - 8. Motor leads shall be marked throughout entire length for easy identification and terminate with brass or copper terminal lugs. Motor shall have permanently attached nameplate with electrical characteristics and wiring connection diagram.
- C. ELECTRIC MOTORS (1/2 HP and Larger)
 - 1. Provide equipment requiring electric motors with NEMA Standard motors. Shop drawings, submitted and equipment provided with electric motors shall include motor manufacturer, horsepower, voltage, full load amperes, NEMA design type, insulation class, shaft bearing type, mounting base type, and enclosure type. To greatest extent possible motors for this project shall be by one manufacturer.
 - 2. Motors shall conform to current NEMA Standard MG1. Motor shall operate successfully without derating under the following conditions.
 - 3. 40 degrees C (104°F) maximum ambient temperature, 3,300 Ft. maximum altitude, voltage variations of plus or minus 10% of nameplate rating, frequency variations of plus or minus 5% of nameplate rating, combined voltage and frequency variation of plus or minus 10% total as long as frequency does not exceed plus or minus 5%.
 - 4. Motors shall meet or exceed locked rotor (Starting) and breakdown (maximum) torques specified for the NEMA design rating. Lock rotor currents shall not exceed NEMA maximum values for motor NEMA design rating.
 - 5. Motor service factors shall be 1.15 for open dripproof motors and 1.00 for totally enclosed motors.
 - 6. Unless indicated otherwise, motor insulation may be manufacturers standard for Class A, B or F provided that maximum permissible temperature for insulation is not exceeded when motor is operating at its service factor load in a 40 Degrees C (104°F) ambient.
 - 7. Motor frame/HP relationship shall conform to current NEMA Standard for "T" frames. Motors shall have antifriction ball or roller bearings sized for average life of at least 100,000 hours under normal v-belt loading conditions. Bearings shall be AFBMA Standard and shield mounted ball bearings of ample capacity for motor rating. Bearing housing shall have provisions for adding new lubricant and draining out old lubricant without major motor disassembly. Bearing housing shall have seals to protect bearing

- from entrance of foreign matter and to prevent leakage of bearing lubricant.
8. Conduit box mounting shall rotate to allow conduit entrance from top, bottom or either side. Conduit holes shall conform to NEC Standards.
 9. Motor leads shall have same insulation class as motor windings. Leads shall be marked throughout entire length for easy identification and terminated with brass or copper terminal lugs. Motor shall have permanently attached nameplate with electrical characteristics and wiring connection diagram.
 10. Motor bolts, screws and other external hardware shall be treated with a corrosion resistant plating. Motor enclosure shall be prime painted with corrosion resisting metal primer and finished with a durable machinery enamel paint.
 11. Unless indicted otherwise motors shall be rated for continuous operation at rated voltage, three phase, 60 hertz. Motors shall be T-frame squirrel cage induction. Type NEMA design B with Class B insulation. Motors shall be dripproof totally enclosed or explosion-proof as required by motor environment.

PART 3 – EXECUTION (NOT APPLICABLE)

END OF SECTION 220513

SECTION 220520 – BASIC PLUMBING MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

PART 3 - EXECUTION

3.1. TESTING PROCEDURES FOR PIPING SYSTEMS

- A. Test all lines and systems before they are insulated, painted or concealed by construction or backfilling. Provide fuel, water, electricity, materials, labor and equipment required for tests.
- B. Where entire system cannot be tested before concealment, test system in sections. Verify that system components are rated for maximum test pressures to be applied. Where specified test pressures exceed component ratings, remove or isolate components from system during tests. Upon completion, each system shall be tested as an entire system.
- C. Repair or replace defects, leaks and material failures revealed by tests and then retest until satisfactory. Make repairs with new materials.
- D. All systems shall hold scheduled test pressures for specified time without loss of initial test pressure.
- E. Upon completion of testing submit five copies of a typewritten report to A/E. Report shall list systems tested, test methods, test pressures, holding time and all failures with corrective action taken.
- F. For test pressure schedules see Section 221100 of this specification.

3.2. TEST METHODS AND PRESSURES

- A. Test methods and pressures shall be as follows:
 - 1. Hydrostatic Test (Closed Systems):
 - a. Hydrostatic test shall be performed using clean unused domestic water. Test pressures shall be as scheduled for system or 150% of operating pressure where not specified.
 - 2. Hydrostatic Test (Open System):
 - a. Test entire system with 10-foot head of water. Where system is tested in sections each joint in building except uppermost 10 feet of system shall be submitted to at least 10-foot head of water. Water shall be held in system for 15 minutes before inspection starts. System shall hold test pressure without leaks.
 - 3. Pneumatic Test:
 - a. Test entire system with compressed air. Systems operating above 25 PSI shall be tested at 75 PSI or 15% of operating pressure or whichever is greater.
 - b. Allow at least 1 hour after test pressure has been applied before making initial test.
 - c. Curing test, completely isolate entire system from compressor or other sources of air pressure.
 - 4. Pressure Relief and Safety Valve:
 - a. Before installation, test pressure temperature, and safety relief valves to confirm relief settings comply with specifications.
 - b. Tag items that pass test with date of test, observed relief pressure setting and inspector's signature.
 - c. Items installed in systems without test tag attached will be rejected.

3.3. CLEANING OF SYSTEMS AND EQUIPMENT

- A. After pressure testing of systems and equipment and before operational test thoroughly clean interiors of piping and equipment. Clean equipment as recommended by equipment manufacturers. Where specific instructions are not provided clean equipment systems as follows:

3.4. MAINTENANCE OF SYSTEMS

- A. Contractor shall be responsible for operation, maintenance and lubrication of equipment installed under this contract.

- B. Keep a complete record of equipment maintenance and lubrication and submit two copies with request for final construction review.
- C. Records shall indicate types of lubricants used and date or time when next maintenance or lubrication will need to be performed by Owner. Where special lubricants are required, Contractor shall provide Owner with a one year supply as determine by Equipment Manufacturer's recommendations.

3.5. PAINTING OF MATERIALS AND EQUIPMENT

- A. Paint all exterior piping with (2) two coats of an enamel rust inhibiting exterior paint in a color selected by architect.
- B. Touch-up painting and refinishing of factory applied finishes shall be by Plumbing Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
- C. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
- D. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
- E. Where extensive refinishing is required equipment shall be completely repainted.

3.6. EXCAVATION AND BACKFILL

- A. Perform necessary excavation to receive Work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove it at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
- B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
- C. Conduct excavations so no walls or footings are disturbed or injured. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by Architect-Engineer. Mechanically tamp backfill under concrete and pavings in six inch layers to 95% standard density, Reference Division 2.
- D. Backfill trenches and excavations to required heights with allowance made for settlement. Tamp fill material thoroughly and moistened as required for specified compaction density. Dispose of excess earth, rubble and debris as directed by Architect.
- E. When available, refer to test hole information on Architectural or Civil drawings or specifications for types of soil to be encountered in excavations.

3.7. FIRE BARRIERS

- A. General: For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are 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.
- B. SUBMITTALS
 - 1. Product Data: For each type of product indicated.
 - 2. Shop Drawings: For each through-penetration firestop system, show each type of construction condition penetrated, relationships to adjoining construction, and type of penetrating item. Include firestop design designation of qualified testing and inspecting agency that evidences compliance with requirements for each condition indicated.
 - a. Submit documentation, including illustrations, from a qualified testing and inspecting agency that is applicable to each through-penetration firestop system configuration for construction and penetrating items.
 - b. Where Project conditions require modification to a qualified testing and inspecting agency's illustration for a particular through-penetration firestop condition, submit illustration, with modifications marked, approved by through-penetration firestop system manufacturer's fire-protection engineer as an engineering judgment or equivalent fire-resistance-rated assembly.
 - 3. Through-Penetration Firestop System Schedule: Indicate locations of each through-penetration firestop system, along with the following information:
 - a. Types of penetrating items.
 - b. Types of constructions penetrated, including fire-resistance ratings and, where applicable, thicknesses of construction penetrated.
 - c. Through-penetration firestop systems for each location identified by firestop design designation of qualified testing and inspecting agency.

- C. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- E. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- F. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.
- G. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.
- H. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- I. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
- J. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations. Equivalent by Hilti, Inc., Johns Manville, Nelson Firestop Products, NUCO Inc., RectorSeal Corporation, Specified Technologies Inc., 3M, Tremco, USG, Dow, Chemelex.

END OF SECTION 220520

SECTION 220530 – MOTOR CONTROL AND EQUIPMENT DISCONNECTS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220500.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. DISCONNECT SWITCHES

- A. General
 - 1. Provide heavy-duty horsepower rated Safety Switches rated in accordance with NEMA enclosed Switch Standard KS 1-1969 and L98 Standard.
 - 2. Equivalents by: G.E., Cutler Hammer, or I.T.E. Siemens, or Square D.
- B. Product
 - 1. Enclosure shall be NEMA type and material required by switch location and environment. Enclosure door shall latch with means for padlocking and cover interlock with defeater to prevent opening door when switch is energized or closing switch with door open. Switch shall have an embossed nameplate permanently attached to door front with switch rating, short circuit interrupting capacity and application information.
 - 2. Line terminals shall be permanently marked and shielded. Contact shall be tin plated, equipped with arch chutes and have movable contacts visible in off position with door open. Wiring terminals shall be pressure type suitable for copper or aluminum wire. Switching mechanism shall be quick-make, quick-break spring driven anti-tease mechanism and shall be integral part of box. All current carrying parts shall be plated.
 - 3. Fuse holders shall be high pressure suitable for use with dual element fuses or rejection type current limiting fuses where required. Fuse holders shall be completely accessible from front of switch and fuses shall be installed so that the label may be easily read from the front and without removing the fuse.
- C. Execution
 - 1. All fuse holders shall have rejection clips installed.
 - 2. Mount switch enclosure rigidly and with proper alignment on building structure or steel supports with centerline of operating handle not more than 6 feet above finished floor unless otherwise required. Use steel supports fabricated from standard rolled structural steel shapes or framing channel to provide one-inch separation between enclosure and building wall for vertical flow of air.
 - 3. Furnish and install a nameplate for each disconnect switch engraved with the equipment designation which the disconnect serves.
 - 4. All disconnect switches as specified shall be installed in strict accordance with rules set forth by NEC.

END OF SECTION 220530

SECTION 221100 – PLUMBING PIPING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 220500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

- A. Piping used throughout project shall conform to the following specifications. Piping shall be plainly marked with manufacturers name and weight. See piping material schedule at end of this Section for materials to be used for each piping system.
 - 1. Hubless Cast Iron Soil Pipe
 - a. Pipe and fittings shall be gray cast iron conforming to CISPI 301.
 - b. Pipe joints shall be no-hub heavy duty couplings consisting of neoprene rubber sleeve conforming to ASTM C-564 and mfg. by Husky SD 4000, Clamp all-125 or MG. Equivalent Mission.Heavyweight couplings.
 - c. Pipe and fittings shall be marked with the CISPI trademark or receive approval of engineer.
 - d. Pipe and fittings by AB&I, Charlotte, Star or Tyler
 - 2. Carbon Steel Pipe (1/8" thru 2"):
 - a. Pipe:
 - i. Provide seamless carbon steel conforming to ASTM specification A-106.
 - ii. Pipe joints shall be threaded conforming to ANSI Standard B2.1.
 - b. Malleable Iron Screwed Fittings:
 - i. Provide screwed malleable iron fittings conforming to ANSI Standard B16.3, and ASTM Specification A-47 grade 32510.
 - c. Cast Iron Screwed Fittings:
 - i. Provide screwed cast iron fittings conforming to ANSI Standard B16.4, B2.1, and ASTM Specification A-126, Class A.
 - 3. Polyvinyl Chloride Drain Waste Pipe:
 - a. Pipe:
 - i. Provide Schedule 40 polyvinyl chloride solid core plastic drain waste and vent pipe conforming to ASTM D2665. Joints shall be properly cleaned, primed and glued where scheduled.
 - ii. Polyvinyl Chloride (PVC) Pipe & Fittings Cell Class 12454 B. ASTM D 2241 SDR-26
 - iii. Pipe by Charlot, Genova, Crestline or equal.
 - b. PVC Fittings:
 - PVC Socket Fittings: ASTM D 2665, made to ASTM D 3311, drain, waste, and vent patterns and to fit Schedule 40 pipe. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.
 - ii. Equivalents: Spears, Lasco or equal.

PART 3 EXECUTION

3.1. PIPING INSTALLATION

- A. No piping containing water shall be located in areas subject to freezing temperatures, including: unheated attics, unheated plenums, chases wall spaces or cavities within exterior walls, under slabs, or in concrete.
- B. Pipe sizes indicated on plans and as specified refer to nominal size in inches, unless otherwise indicated. Pipes are sized to nearest 1/2". In no case shall piping smaller than size specified be used.
- C. Contractor shall provide and be responsible for proper location of pipe sleeves, hangers, supports, and inserts.

- Install hangers, supports, inserts, etc., as recommended by manufacturer and as specified and detailed on drawings.
- D. Verify construction types and provide proper hangers, inserts and supports for construction used. Install inserts, hangers and supports in accordance with manufacturers load ratings and provide for thermal expansion of piping without exceeding allowable stress on piping or supports. Provide solid type hangers and supports where pipe travel exceeds manufacturer's recommendations for fixed hanger and supports.
 - E. Install piping parallel with building lines and parallel with other piping to obtain a neat and orderly appearance of piping system. Secure piping with approved anchors and provide guides where required to insure proper direction of piping expansion. Piping shall be installed so that allowable stress for piping, valves and fittings used are not exceeded during normal operation or testing of piping system.
 - F. Install piping so that systems can be completely drained. Provide piping systems with valve drain connections at all low pipe and ahead of all sectionalizing valves whether shown on plans or not. Drain lines shall be $\frac{3}{4}$ ".
 - G. Pitch all piping and where possible make connections from horizontal piping so that air can be properly vented from system. Provide air vents as specified at all system high points and at drop in piping in direction of flow. Use eccentric reducers where necessary to avoid air pockets in horizontal piping.
 - H. Provide unions or flanged joints in each pipe line preceding connections to equipment to allow removal for repair or replacement. Provide all screwed and control valves with unions adjacent to each piping connection. Provide screwed end valves with union adjacent to valve unless valve can be otherwise easily removed from line.
 - I. Fittings pressures and temperature ratings shall be equal to or exceed maximum operating temperature and working pressure of piping system. No mitered or field fabricated pipe fittings will be permitted.
 - J. All pipe threads shall meet ANSI Standard B2.1 for taper pipe threads. Lubricate pipe threads with Teflon thread sealant and lubricating compound applied full strength. Powdered or made-up compound will not be permitted. Pipe thread compound shall be applied only to male pipe threads.
 - K. Make changes in piping size and direction with approved factory made fittings. Provide fittings suitable for at least 125 PSI working pressure or of pressure rating required for maximum working pressure of system whichever is greater.

3.2. PIPING SUPPORTS, ANCHORS, SLEEVES AND SEALS

- A. Furnish proper type and size pipe sleeves to General Contractor for installation in concrete or masonry walls or floors. Sleeves are not required for supply and waste piping through wall supporting plumbing fixtures or for cast iron soil pipe passing through concrete slab or grade except where penetrating a membrane waterproof floor.
- B. Plumbing Contractor shall supervise installation of sleeves to insure proper location and installation.
- C. Each sleeve shall be continuous through wall floor or roof and shall be cut flush on each side except where indicated otherwise. Sleeves shall not be installed in structural member except where indicated or approved.
- D. Sleeves passing through above grade floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchens shall be cast iron with integral flanges and shall extend 1 inch above finished floor. Size sleeves for and seal space between pipe sleeve with Thunderline Link-Seal.
- E. Provide steel pipe sleeves in bearing walls and masonry walls. Opening in non-bearing walls, floors and ceilings may be 20 gauge galvanized pipe sleeves or openings cut with concrete core drill.
- F. Pipe wall penetrations exposed to view shall have tight fitting escutcheons or flanges to cover all voids around openings.
- G. All below grade and exterior wall penetrations shall be installed in a pipe sleeve and sealed between the pipe and pipe sleeve with Thunderline High Temperature Link Seal.
- H. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations. Equivalent by Hilti, Inc., Johns Manville, Nelson Firestop Products, NUCO Inc., RectorSeal Corporation, Specified Technologies Inc., 3M, Tremco, USG, Dow, Chemelex.

3.3. PIPE HANGERS AND SUPPORTS

- A. Provide and be responsible for locations of piping hangers, supports and inserts, etc., required for installation of piping under this contract. Design of hangers and supports shall conform to current issue of Manufacturers Standardization Society Specification (MSS) SP-58.
- B. Pipe hangers shall be capable of supporting piping in all conditions of operation. They shall allow free expansion and contraction of piping, and prevent excessive stress resulting from transferred weight being induced into pipe or connected equipment. Support horizontal or vertical pipes at locations of least vertical movement.
- C. Where horizontal piping movements are such that hanger rod angularity from vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger, pipe, and structural attachments to that rod is vertical in hot position.
- D. Hangers shall not become disengaged by movements of supported pipe.
- E. Provide sufficient hangers to adequately support piping system at specified spacing, at changes in piping

direction and at concentrated loads. Hangers shall provide for vertical adjustment to maintain pitch required for proper drainage, and for longitudinal travel due to expansion and contraction of piping. Fasten hangers to building structural members wherever practicable.

- F. Unless indicated otherwise on drawings support horizontal steel piping as follows:

PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1-1/4"	3/8"	8 Ft.
1-1/2" to 2"	3/8"	10 Ft.

- G. Support horizontal cast iron soil pipe with two hangers for each section located close to each hub.
H. Support vertical cast iron soil pipe at every floor, steel and copper tubing at every other floor except where indicated otherwise on drawings.
I. Provide continuous threaded hanger rods wherever possible. No chain, wire, or perforated straps shall be used.
J. Hanger rods shall be subject to tensile loading only, where lateral or axial pipe movement occurs provide suitable linkage to permit swing. Provide pipe support channels with galvanized finish for concealed locations and painted finish for exposed locations. Submit design for multiple pipe supports indicating pipe sizes, service and support detail to Architect-Engineer for review prior to fabrication.
K. Provide Grinnell pipe hangers for vertical pipe risers as follows:

PIPE MATERIAL	PIPE SIZE	HANGER FIG. NO.
Steel	3/4" thru 20"	261

- L. Provide Grinnell Fig. 194, 195 or 199 steel wall brackets for piping suspended or supported from walls. Brackets shall be prime coated carbon steel.
M. Mount hangers for insulated piping on outside of pipe insulation sized to allow for full thickness of pipe insulation.

3.4. INSULATION MATERIALS AND APPLICATIONS METHODS (HANGERS, SUPPORTS, ANCHORS, GUIDES, EXPANSION JOINTS, ETC.)

- A. Structural attachments for pipe hangers shall be as follows:
B. Concrete Structure: Provide Grinnell Fig. No. 285 cast in concrete insert for loads up to 400 lbs. and Grinnell Fig. 281 wedge cast in type concrete insert for loads up to 1200 lbs.
C. Provide Grinnell pipe hangers for horizontal single pipe runs as follows:

PIPE MATERIALS	PIPE SIZE	HANGER FIG. NO.
Steel	3/8" thru 4"	65

*Copper Plated

- D. Pipe supports for horizontal piping mounted on pipe racks or stanchions shall be Advanced Thermal Systems low friction graphite slide supports or equivalent by Elcen or Grinnell. Where racks and supports are not detailed on drawings submit detailed support drawings to Architect-Engineer for review prior to fabrication.
E. Provide necessary structural steel and attachment accessories for installations of pipe hangers and supports. Where heavy piping loads are to be attached to building structure verify structural loading with Architect-Engineer prior to installations.
F. Equivalent hangers and supports by Auto-Grip, Basic Engineer, Bee Line, Elcen, Fee & Mason, Fluorocarbon Company, Unistrut or Super Strut Inc.

END OF SECTION 221100

SECTION 221319 – SANITARY WASTE PIPING SPECIALTIES

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 sanitary drainage piping specialties:
 - 1. Roof and Overflow Drains
 - 2. Downspout Nozzles

1.3. SUBMITTALS

- A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for the following:
 - 1. Roof and Overflow Drains
 - 2. Downspout Nozzles

1.4. QUALITY ASSURANCE

- A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.
- 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 NSF 14, "Plastics Piping Components and Related Materials," for plastic sanitary piping specialty components.

PART 2 PRODUCTS

2.1. ROOF AND OVERFLOW DRAINS

- A. Drains shall be type and style listed below.
 - 1. Equivalent drains by J.R. Smith, Zurn, or Josam.
- B. Roof Drain Type 1
 - 1. Wade #W-3000 cast iron roof drain with flange, flashing ring with gravel stop and mushroom dome.
- C. Overflow Roof Drain Type 1
 - 1. Wade #W-3000 cast iron roof drain with flange, flashing ring with gravel stop and mushroom dome. Provide with 2" dam.

2.2. DOWNSPOUT NOZZLES

- A. Provide Wade series 3940 cast bronze downspout nozzles with threaded outlet and flange to secure nozzle to wall.
- B. Equivalent drains by J.R. Smith, Zurn, or Josam.

2.3. FLASHING MATERIALS

- A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:
 - 1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
 - 2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
 - 3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.
- B. Zinc-Coated Steel Sheet: ASTM A 653/A 653M, with 0.20 percent copper content and 0.04-inch (1.01-mm) minimum thickness, unless otherwise indicated. Include G90 (Z275) hot-dip galvanized, mill-phosphatized finish for painting if indicated.
- C. Elastic Membrane Sheet: ASTM D 4068, flexible, chlorinated polyethylene, 40-mil (1.01-mm) minimum thickness.
- D. Fasteners: Metal compatible with material and substrate being fastened.
- E. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

- F. Solder: ASTM B 32, lead-free alloy.
- G. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.
- B. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.
- C. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.
- D. Install through-penetration firestop assemblies in plastic **conductors and stacks** at floor penetrations.
- E. 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.

3.2. CONNECTIONS

- A. Coordinate piping installations and specialty arrangements with schematics on Drawings and with requirements specified in piping systems. If Drawings are explicit enough, these requirements may be reduced or omitted.
- B. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- C. Install piping adjacent to equipment to allow service and maintenance.
- D. Ground equipment according to Division 26 Section "Grounding and Bonding for Electrical Systems."
- E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.3. FLASHING INSTALLATION

- A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:
 - 1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.
 - 2. Copper Sheets: Solder joints of copper sheets.
- B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.
 - 1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
 - 2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
 - 3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.
- C. Set flashing on floors and roofs in solid coating of bituminous cement.
- D. Secure flashing into sleeve and specialty clamping ring or device.
- E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 07 Section "Sheet Metal Flashing and Trim."
- F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.
- G. Fabricate and install flashing and pans, sumps, and other drainage shapes.

3.4. 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 221319

SECTION 221429 – SUMP PUMPS

PART 1 GENERAL

1.1. SUMMARY

- A. This Section includes wet-pit-mounted, vertical and submersible sump pumps and accessories, inside the building, for building storm drainage systems.

1.2. SUBMITTALS

- A. Product Data: For each type and size of sump pump specified. Include certified performance curves with operating points plotted on curves, and rated capacities of selected models, furnished specialties, and accessories.
- B. Shop Drawings: Diagram power, signal, and control wiring.
- C. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. 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.

PART 2 PRODUCTS

2.1. SUBMERSIBLE SUMP PUMPS

- A. Manufacturers:
 - 1. ABS Pumps, Inc.
 - 2. Goulds Pumps; ITT Industries.
 - 3. Grundfos Pumps Corp.
 - 4. Liberty Pumps.
 - 5. Little Giant Pump Co.
 - 6. Paco Pumps, Inc.
 - 7. Stancor, Inc.
 - 8. Weil Pump Company, Inc.
 - 9. Zoeller Company.
- B. Description: Factory-assembled and tested, simplex or duplex as scheduled, single-stage, centrifugal, end-suction, submersible, direct-connected sump pumps complying with UL 778 and HI 1.1-1.2 and HI 1.3 for submersible sump pumps.
- C. Casing: Cast iron; with cast-iron inlet strainer, legs that elevate pump to permit flow into impeller, and vertical discharge with companion flange for piping connection.
- D. Impeller: ASTM A 48/A 48M, Class No. 25 A or higher cast iron; statically and dynamically balanced, semiopen nonclog design, overhung, single suction, keyed and secured to shaft.
- E. Casing and Impeller: Cast iron casing with metal inlet strainer and brass, bronze, or cast-iron impeller.
- F. Casing and Impeller: Cast iron or plastic casing with inlet strainer and metal or plastic impeller.
- G. Pump and Motor Shaft: Stainless steel with factory-sealed, grease-lubricated ball bearings and single-mechanical seals.
- H. Motor: Hermetically sealed, capacitor-start type, with built-in overload protection; three-conductor waterproof power cable of length required, and with grounding plug and cable-sealing assembly for connection at pump. Comply with requirements in Division 22 Section "Common Motor Requirements for Plumbing Equipment"
- I. Pump Discharge Piping: Factory or field fabricated, ASTM A 53/A 53M, Schedule 40, galvanized-steel pipe.
- J. Basin Cover: Cast iron or steel with bituminous coating and strong enough to support controls.
- K. Controls: NEMA 250, Type 1 enclosure, pedestal-mounted float switch; with float, float rod, and rod buttons. Include automatic alternator to alternate operation of pump units on successive cycles and to operate multiple units if one pump cannot handle load.
- L. Controls: NEMA 250, Type 6, 120-V ac, float switch, mounted on discharge piping and alarm for simplex pumps.

2.2. SUMP PUMP PITS

- A. Description: Concrete pit with sump, pipe connections, curb frame, and separate cover.
- B. Sump: Construct of watertight, cast-in-place, reinforced concrete with sidewall openings for pipe connections.
- C. Curb Frame and Cover:
 - 1. Curb Frame Material: Galvanized steel or steel with bituminous coating.

- a. Pattern: Z-cross-section shape with raised outer rim of height matching cover, for recessed mounting having installed cover flush with top of floor slab.
2. Cover: Fabricate with openings having gaskets, seals, and bushings, for access to pumps, pump shafts, control rods, discharge piping, vent connections, and power cables.
 - a. Material: Cast iron or steel with bituminous coating.
 - b. Reinforcement: Steel or cast iron, capable of supporting foot traffic for pits installed in foot-traffic areas.

PART 3 EXECUTION

3.1. CONCRETE

- A. Install concrete bases of dimensions indicated for pumps and controllers. Refer to Division 22 Section "Common Work Results for Plumbing."
 1. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch centers around full perimeter of base.
 2. For supported equipment, install epoxy-coated anchor bolts that extend through concrete base and anchor into structural concrete floor.
 3. Place and secure anchorage devices. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 4. Install anchor bolts to elevations required for proper attachment to supported equipment.
- B. Cast-in-place concrete materials and placement requirements are specified in Division 03.

3.2. SUMP PUMP INSTALLATION

- A. Install sump pumps according to applicable requirements in HI 1.4.
- B. Install pumps and arrange to provide access for maintenance including removal of motors, impellers, couplings, and accessories.
- C. Suspend wet-pit-mounted, vertical sump pumps from **basin and pit** covers. Make direct connections to storm drainage piping.
- D. Set submersible sump pumps on **basin or pit** floor. Make direct connections to storm drainage piping.
- E. Install sump pump basins and connect to drainage piping. Brace interior of basins according to manufacturer's written instructions to prevent distortion or collapse during concrete placement. Set basin cover and fasten to basin top flange. Install cover so top surface is flush with finished floor.
- F. Construct sump pump pits and connect to drainage piping. Set pit curb frame recessed in and anchored to concrete. Fasten pit cover to pit curb flange. Install cover so top surface is flush with finished floor.
- G. Support piping so weight of piping is not supported by pumps.
- H. Install piping adjacent to sump pumps to allow service and maintenance.
- I. Connect storm drainage piping to pumps.
 1. Install flexible connectors adjacent to pumps in discharge piping.
 2. Install check and shutoff valves on discharge piping from each pump. Install unions on pumps having threaded pipe connections. Install valves same size as connected piping.
- J. Ground equipment according to Division 26.
- K. Connect wiring according to Division 26.

END OF SECTION 221429

END OF DIVISION 220000

END OF DIVISION 220000

DIVISION 23
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SECTION 230500 – MECHANICAL PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Mechanical Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

- A. This DIVISION requires the furnishing and installing of complete functioning Mechanical systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
- B. Refer to Architectural, Structural and Electrical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing piping and ductwork in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

- A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, FAX 913-492-2437, EMAIL admin@pkmreng.com.
- B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
- C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
- D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
- E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
- F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
- G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
- H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
- J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

- A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

- A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

- A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

- A. Locations of equipment, piping and other mechanical work are indicated diagrammatically by the mechanical drawings. The Contractor shall determine the exact locations on site, subject to structural conditions, work of other Contractors, and access requirements for installation and maintenance to approval of Architect-Engineer. Provide additional piping and ductwork offsets as required at no additional cost.
- B. Study and become familiar with the contract drawings of other trades and in particular the general construction plans and details in order to obtain necessary information for figuring installation. Cooperate with other contractors and install work in such a way as to avoid interference with their work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
- C. Any pipe, ductwork, equipment, apparatus, appliance or other item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other work caused by this Contractor, the Subcontractor, or workers shall be restored as specified for new work.
- D. Do not scale mechanical and electrical drawings for dimensions. Contractor shall accurately layout work from the dimensions indicated on the Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

- A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
- B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of mechanical systems by Owner.

1.9. WARRANTY

- A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
- B. Warranty for all equipment shall take effect from the date of substantial completion regardless of the date equipment was installed.
- C. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

- A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

- A. The intent of these specifications is to allow ample opportunity for Contractor to use his ingenuity and abilities to perform the work to his and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
- B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
- C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
- D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
- E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
- F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they

shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.

- G. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in mechanical or electrical service requirements necessary to accommodate such substitution.
- H. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. TEMPORARY USE OF PERMANENT HVAC UNITS

- A. If the Contractor elects to use permanent equipment for temporary conditioning only that permanent equipment associated with the heating system shall be allowed for use as space conditioning during the construction period. The Mechanical Contractor shall take full responsibility for all permanent equipment used for temporary conditioning during the construction period and shall provide a total of two years warranty covering all parts and labor on all permanent equipment utilized for temporary conditioning. This warranty shall cover all piping, fittings, valves, pipe and equipment insulation, pumps, boilers, chillers, condensing units, cooling towers, air handling units, exhaust and relief air fans, ductwork, ductwork insulation, diffusers, temperature controls, all electric motors, starters, disconnect switches, fuses, wire and conduit. This warranty shall cover all required maintenance on the system with the exception of filter changes, and shall start on the date shown on the final completion certificate.
- B. CAUTION: The Contractor is being warned that the Architect-Engineer will not accept dirty equipment caused by construction contamination.

1.13. OPENINGS, ACCESS PANELS AND SLEEVES

- A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all pipes passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.
- B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.14. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

- A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.15. EXTENT OF CONTRACT WORK

- A. Provide mechanical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of mechanical systems. In no case will claims for "Extra Work" be allowed for work about which Contractor could have been informed before bids were taken.
- B. Electrical work required to install and control mechanical equipment, which is not shown on plans or specified under Division 26, shall be included in Contractor's base bid proposal. Mechanical systems and components are to be installed as a complete system, including all miscellaneous interlock (low voltage and minor line voltage power wiring such as control motors, limit switches, relays, etc), control wiring, safeties. Coordinate interlock to other systems such as fire alarm that interlock to mechanical systems and insure that provisions are made in equipment for connection of these systems. Coordinate with all other trades for specific needs and requirements based on submitted systems.
- C. Contractor shall become familiar with equipment provided by other contractors that require mechanical connections and controls.
- D. All automatic temperature control devices shall be mounted as indicated in automatic temperature control section of specifications.
- E. The cost of larger wiring, conduit, control and protective devices resulting from installation of equipment which was not used for basis of design as outlined in specifications shall be paid for by Mechanical Contractor at no cost to Owner or Architect-Engineer.

- F. Contractor shall be responsible for providing supervision to Electrical Contractor to insure that required connections, interlocking and interconnection of mechanical and electrical equipment are made to attain intended control sequences and system operation.
- G. Furnish four complete sets of electrical wiring diagrams to Architect-Engineer to be included in the maintenance manuals and three complete sets to Electrical Contractor. Diagrams shall show factory and field wiring of components and controls. Control devices and field wiring to be provided by Electrical Contractor shall be clearly indicated by notation and drawing symbols on wiring diagrams.
- H. Contractor shall obtain complete electrical data on mechanical shop drawings and shall list this data on an approved form that shall be presented monthly or on request, to Electrical Contractor. Data shall be complete with wiring diagrams received to date and shall contain necessary data on electrical components of mechanical equipment such as HP, voltage, amperes, watts, locked rotor current to allow Electrical Contractor to order electrical equipment required in his contract.

1.16. WORK NOT INCLUDED IN CONTRACT

- A. Consult Division 26 of specifications for work to be provided by Electrical Contractor in conjunction with installation of mechanical equipment.

1.17. CODES, RULES AND REGULATIONS

- A. Provide Work in accordance with applicable codes, rules and regulations of Local and State, Federal Governments and other authorities having lawful jurisdiction.
- B. Conform to latest editions and supplements of following codes, standards or recommended practices.

1.18. SAFETY CODES:

- A. National Electrical Safety Code Handbook H30 - National Bureau of Standards.
- B. Occupational Safety and Health Standard (OSHA) - Department of Labor.

1.19. NATIONAL FIRE CODES:

- A. NFPA No. 70 National Electrical Code (2011 Edition)
- B. NFPA No. 90A Air Conditioning and Ventilating Systems (2012 Edition)
- C. NFPA No. 99 Standard for Health Care Facilities (2012 Edition)
- D. NFPA No. 101 Life Safety Code (2012 Edition)
- E. NFPA No. 204 Standard for Smoke and Heat Venting (2012 Edition)

1.20. UNDERWRITERS LABORATORIES INC:

- A. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

1.21. MISCELLANEOUS CODES:

- A. ANSI A117.1 - Handicapped Accessibility
- B. Americans with Disabilities Act (ADA)

1.22. STANDARDS

- A. Drawings and specifications indicate minimum construction standard. Should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect-Engineer in writing before proceeding with work so that necessary changes can be made. However, if the Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations, Contractor shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.23. PERMITS/FEES

- A. The Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect-Engineer with request for final inspection.
- B. The Contractor shall include in their base bid any fees or charges by the local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exactly which part of the work required for the new utility service, is to be performed by the contractor and which part will be supplied by the utility company.

PART 2 - PRODUCTS

2.1. Not Used

PART 3 - EXECUTION

3.1. SHOP DRAWINGS

- A. Contractor shall furnish shop drawings of all materials and equipment in an Adobe PDF format.
- B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
- C. Where catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Mark each submitted item with applicable section and sheet number of these specifications, or plan sheet number when item does not appear in the specifications. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization. Each catalog sheet shall bear the equipment manufacturer's name and address. All shop drawings on materials and equipment listed by UL shall indicate UL approval on submittal.
- D. Contractor shall check all shop drawings to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All shop drawings submitted to Architect-Engineer shall bear contractor's approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All shop drawings not meeting Contractor's approval shall be returned to their supplier for re-submittal.
- E. No shop drawing submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
- F. The shop drawing submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required. Submittal of all shop drawings as soon as possible before construction starts is preferred. All shop drawings submitted shall contain the following: The project name, the applicable specification section and paragraph, the submittal date, the Contractor's stamp which shall certify that the stamped drawings have been checked by the Contractor, comply with the drawings and specifications and have been coordinated with other trades. Submittals not so identified will be returned without action for re-submittal.
- G. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
- H. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
- I. Shop drawings that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
- J. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
- K. Sheet metal shop drawings for duct fabrication shall be a minimum of 1/4" scale. Sheet metal shop drawings shall not be a reproduction of the contract document and shall show details of the following: Fabrication, assembly, and installation, including plans, elevations above finished floor, sections, components, and attachments to other work. Duct layout indicating pressure classifications and sizes on plans, fittings, reinforcement and spacing, seam and joint construction, penetrations through fire-rated and other partitions, hangers and supports, including methods for building attachment, vibration isolation, seismic restraints, and duct attachment.
- L. Architect-Engineer's review of shop drawings will not relieve Contractor of responsibility for deviations from drawings and specifications unless the Architect-Engineer has specifically approved such deviations in writing, nor shall it relieve the Contractor of responsibility for errors in shop drawings. No work shall be fabricated until Architect-Engineer's review has been obtained. Any time delay caused by correcting and re-submitting shop drawings will be the Contractor's responsibility.

3.2. SHOP DRAWING COORDINATION

- A. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.3. SUBMITTALS

- 1. BASIC MECHANICAL MATERIALS AND METHODS:
 - a. Test methods and pressures
 - b. Piping, and fittings
- 2. PIPING:
 - a. Piping specialties
 - b. Supports, anchors
 - c. Sleeves and seals
 - d. Valves
 - e. Piping and equipment insulation
 - f. Thermometers and gauges
- 3. HVAC AIR SIDE EQUIPMENT:
 - a. Mini Split system
 - b. Electric heaters
- 4. SYSTEM TESTING & BALANCING:
 - a. Testing Contractor
 - b. Balance Report

3.4. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

- A. Submit with shop drawings of equipment, four copies of installation, operating, maintenance instructions, and parts lists for equipment provided. Equipment manufacturer shall prepare instructions.
- B. Keep in safe place, keys and wrenches furnished with the equipment provided under this contract. Present to the Owner and obtain a receipt for them upon completion of project.
- C. Prepare a complete brochure, covering systems and equipment provided and installed under this contract. Submit brochures to Architect-Engineer for review before delivery to Owner. Brochures shall contain following:
 - 1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined above.
 - 2. Record copy of all submittals indicating actual equipment installed indicating options, characteristics. Copies of submittals shall bear the stamps of all parties that reviewed submittals.
 - 3. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.
 - 4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of mechanical system.
- D. Provide brochures bound in three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:
 - 1. Project name and address.
 - 2. Section of work covered by brochure, i.e., "Plumbing", etc.

3.5. RECORD DOCUMENTS

- A. A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
- B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.
- C. Provide one copy of on high quality heavy weight presentation type paper. Blueprints or other media which fade shall not be used.
- D. Provide one electronic scanned version of record documents in Adobe PDF format on a DVD. Transmit DVD in conjunction with hard copy documents.

3.6. CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of

his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.

- B. Contractor shall clean up all ductwork and equipment at the completion of the project.
- C. All equipment, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.7. WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.8. CUTTING AND PATCHING

- A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Remove walls, ceilings and floors (or portions thereof) necessary to accomplish scope of work. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's and Structural Engineer's approval and in a manner approved by them.
- B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
- C. Patching shall be by the contractors of the particular trade involved, shall match the existing construction type, quality, finish and texture, and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of mechanical work shall be repaired at Contractor's expense to approval of Architect-Engineer.

3.9. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

- A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundation and provide proper anchor bolts and isolation as shown, specified or required by manufacturers in installation instructions. Level, shim and grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instructions.
- B. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.
- C. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.
- D. Provide floor or slab mounted equipment with 3-1/2" high concrete bases unless specified otherwise. Mechanical contractor shall form all pads; General contractor shall provide and place all concrete and reinforcing for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.
- E. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best-recognized practice. Verify that structural members of buildings are adequate to support equipment and unless otherwise indicated on plans or specified, arrange for their inclusion and attachment to building structure. Provide hangers with vibration isolators.
- F. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect-Engineer for review before proceeding with fabrication or installation.

3.10. START-UP, CHANGEOVER, TRAINING AND OPERATIONAL CHECK

- A. Contractor shall perform the initial start-up of the systems and equipment and shall provide necessary supervision and labor to make the first seasonal changeover of systems. Personnel qualified to start-up and service this equipment, including manufacturer's technicians, and the Owner's operating personnel shall be present during these operations.
- B. Contractor shall be responsible for training Owner's operating personnel to operate and maintain the systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructors name, names of Owner's personnel attending and total hours of instruction given each individual.
- C. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall become property of the owner.

3.11. FINAL CONSTRUCTION REVIEW

- A. At final construction review, each respective Contractor and major subcontractors shall be present or shall be

represented by a person of authority. Each Contractor shall demonstrate, as directed by the Architect-Engineer, that the work complies with the purpose and intent of the contract documents. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 230500

SECTION 230505 – PROJECT COORDINATION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

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

1.3. COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

1.4. SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 40 inches. Format shall be PDF or other electronic format to facilitate multiple user commenting and sharing easily.
 - 3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including project managers, superintendent and other personnel in attendance at Project site to the General Contractor and other major subcontractors. Identify individuals and their duties and responsibilities; list email addresses and telephone numbers. Update the list as required during the project if personnel change.

1.5. COORDINATION

- A. Certain materials will be provided by other trades. Examine the Contract Documents and reviewed record Submittals to ascertain these general requirements. Contract Documents reflect a basis of design and may not reflect actual equipment or items being utilized.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
- E. Obtain equipment submittal information for all pieces of equipment to be connected to from other trades that clearly indicates all connection requirements, locations, sizes, and similar requirements. Obtain this information in ample time to coordinate other trade submittals and equipment coordination. Where requirements differ from that on plans or differs from provisions made in the work, immediately notify the Architect/Engineer. Do not proceed with work that is incompatible with equipment provided.
- F. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- G. The Drawings show only the general run of piping and ductwork and approximate location of outlets. Any significant changes in location of items necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.
- H. Adjust location of piping, ductwork, etc. to prevent interferences, both anticipated and encountered. Determine the exact route and location of each item prior to fabrication.

1. Right-of-Way:

- a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
- b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.
- I. Wherever the work is of sufficient complexity, prepare additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field.
- J. Coordinate with the local Utility Companies to their requirements for service connections and provide all necessary materials, labor and testing.
- K. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
- L. Conduct a coordination meeting after reviewing all other trade coordination drawings with other relevant trades. This meeting shall be held to prevent conflicts during construction. Each major relevant subcontractor shall attend this meeting. Report any potential conflicts or clearance problems to Architect/Engineer after meeting.

1.6. PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated. Organize meeting with agenda and invite all pertinent attendees. Notify Architect and owner of relevant meetings. Record all decisions made and distribute minutes within 3 days of meeting.
- B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.
 - c. Related RFIs.

- d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Manufacturer's written recommendations.
 - l. Warranty requirements.
 - m. Compatibility of materials.
 - n. Space and access limitations.
 - o. Regulations of authorities having jurisdiction.
 - p. Testing and inspecting requirements.
 - q. Installation procedures.
 - r. Coordination with other work.
 - s. Required performance results.
 - t. Protection of adjacent work.
3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
1. Attendees: Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work. Notify Architect of meeting.
 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contractor is on time, ahead or behind schedule, in relation to Construction Schedule. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Discuss impact of various contractor schedules upon other contractors and how to remedy impacts.
 - b. Review present and future needs of each contractor present, including the following:
 - i. Interface requirements.
 - ii. Sequence of operations.
 - iii. Status of submittals.
 - iv. Deliveries.
 - v. Off-site fabrication.
 - vi. Access.
 - vii. Quality and work standards.
 - viii. Change Orders.
 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.
- 1.7. REQUESTS FOR INTERPRETATION (RFIs)
- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.
1. Submit Contractor's suggested solution(s) to RFI. If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 2. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 220505

SECTION 230520 – BASIC MECHANICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. MOTORS

PART 3 - EXECUTION

3.1. TESTING PROCEDURES FOR PIPING SYSTEMS

- A. Test all lines and systems before they are insulated, painted or concealed by construction or backfilling. Provide fuel, water, electricity, materials, labor and equipment required for tests.
- B. Where entire system cannot be tested before concealment, test system in sections. Verify that system components are rated for maximum test pressures to be applied. Where specified test pressures exceed component ratings, remove or isolate components from system during tests. Upon completion, each system shall be tested as an entire system.
- C. Repair or replace defects, leaks and material failures revealed by tests and then retest until satisfactory. Make repairs with new materials.
- D. All systems shall hold scheduled test pressures for specified time without loss of initial test pressure.
- E. Upon completion of testing submit five copies of a typewritten report to A/E. Report shall list systems tested, test methods, test pressures, holding time and all failures with corrective action taken.
- F. For test pressure schedules see piping material schedules.

3.2. TEST METHODS AND PRESSURES

- A. Test methods and pressures shall be as follows:
 - 1. Hydrostatic Test (Closed Systems):
 - a. Hydrostatic test shall be performed using clean unused domestic water. Test pressures shall be as scheduled for system or 150% of operating pressure where not specified.
 - 2. Hydrostatic Test (Open System):
 - a. Test entire system with 10-foot head of water. Where system is tested in sections each joint in building except uppermost 10 feet of system shall be submitted to at least 10-foot head of water. Water shall be held in system for 15 minutes before inspection starts. System shall hold test pressure without leaks.
 - 3. Pneumatic Test:
 - a. Test entire system with compressed air. Systems operating above 25 PSI shall be tested at 75 PSI or 15% of operating pressure or whichever is greater.
 - b. Allow at least 1 hour after test pressure has been applied before making initial test.
 - c. Curing test, completely isolate entire system from compressor or other sources of air pressure.
 - 4. Pressure Relief and Safety Valve:
 - a. Before installation, test pressure temperature, and safety relief valves to confirm relief settings comply with specifications.
 - b. Tag items that pass test with date of test, observed relief pressure setting and inspector's signature.
 - c. Items installed in systems without test tag attached will be rejected.

3.3. TESTING OF REFRIGERANT LINES

- A. After the system is installed and before any piping is insulated, the entire refrigeration circuit must be thoroughly leak tested. Test all pipe joints for leaks. Make certain that all joints are inspected thoroughly. Mark carefully any spots where leaks occur.
- B. Leaks are repaired by disassembling the connection, cleaning the fitting and remaking. No attempt should be made to repair a leak by simply adding brazing material.

3.4. CLEANING OF SYSTEMS AND EQUIPMENT

- A. After pressure testing of systems and equipment and before operational test thoroughly clean interiors of piping and equipment. Clean equipment as recommended by equipment manufacturers. Where specific instructions are not provided clean equipment systems as follows:
 - 1. Air Handling Systems:
 - a. Before starting any air system clean all debris, foreign matter and construction dirt from air system and fan. Provide equipment requiring filters, such as air handling units, fan coil units, blower, etc., with throw-away filters. After cleaning air system install temporary filters and run continuously for a minimum of eight hours at full volume before installing permanent filters. Provide temporary throw-away filters in all permanent heating and air conditioning equipment systems being utilized during construction. Prior to testing and balancing systems remove temporary filter media and install clean unused filters of the type specified. Clean filters shall be installed in equipment by mechanical contractor before final acceptance inspection by Architect and Engineer.

3.5. MAINTENANCE OF SYSTEMS

- A. Contractor shall be responsible for operation, maintenance and lubrication of equipment installed under this contract.
- B. Keep a complete record of equipment maintenance and lubrication and submit two copies with request for final construction review.
- C. Records shall indicate types of lubricants used and date or time when next maintenance or lubrication will need to be performed by Owner. Where special lubricants are required, Contractor shall provide Owner with a one year supply as determine by Equipment Manufacturer's recommendations.

3.6. PAINTING OF MATERIALS AND EQUIPMENT

- A. Touch-up painting and refinishing of factory applied finishes shall be by Mechanical Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
- B. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
- C. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.
- D. Where extensive refinishing is required equipment shall be completely repainted.

3.7. FIRE BARRIERS

- A. General
 - 1. For penetrations through fire-resistance-rated constructions, including both empty openings and openings containing penetrating items, provide through-penetration firestop systems that are 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.
- B. Submittals
 - 1. Product Data: For Each Type Of Product Indicated.
 - 2. Shop Drawings: For Each Through-Penetration Firestop System, Show Each Type Of Construction Condition Penetrated, Relationships To Adjoining Construction, And Type Of Penetrating Item. Include Firestop Design Designation Of Qualified Testing And Inspecting Agency That Evidences Compliance With Requirements For Each Condition Indicated.
 - a. Submit Documentation, Including Illustrations, From A Qualified Testing And Inspecting Agency That Is Applicable To Each Through-Penetration Firestop System Configuration For Construction And Penetrating Items.
 - b. Where Project Conditions Require Modification To A Qualified Testing And Inspecting Agency's Illustration For A Particular Through-Penetration Firestop Condition, Submit Illustration, With Modifications Marked, Approved By Through-Penetration Firestop System Manufacturer's Fire-Protection Engineer As An Engineering Judgment Or Equivalent Fire-Resistance-Rated Assembly.
 - 3. Through-Penetration Firestop System Schedule: Indicate Locations Of Each Through-Penetration Firestop System, Along With The Following Information:
 - a. Types Of Penetrating Items.

- b. Types Of Constructions Penetrated, Including Fire-Resistance Ratings And, Where Applicable, Thicknesses Of Construction Penetrated.
- c. Through-Penetration Firestop Systems For Each Location Identified By Firestop Design Designation Of Qualified Testing And Inspecting Agency.
- C. Product Certificates: For through-penetration firestop system products, signed by product manufacturer.
- D. Coordinate construction of openings and penetrating items to ensure that through-penetration firestop systems are installed according to specified requirements.
- E. Coordinate sizing of sleeves, openings, core-drilled holes, or cut openings to accommodate through-penetration firestop systems.
- F. Do not cover up through-penetration firestop system installations that will become concealed behind other construction until each installation has been examined by building inspector, if required by authorities having jurisdiction.
- G. Product Test Reports: From a qualified testing agency indicating through-penetration firestop system complies with requirements, based on comprehensive testing of current products.
- H. Compatibility: Provide through-penetration firestop systems that are compatible with one another; with the substrates forming openings; and with the items, if any, penetrating through-penetration firestop systems, under conditions of service and application, as demonstrated by through-penetration firestop system manufacturer based on testing and field experience.
- I. Accessories: Provide components for each through-penetration firestop system that are needed to install fill materials. Use only components specified by through-penetration firestop system manufacturer and approved by qualified testing and inspecting agency for firestop systems indicated.
- J. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
- K. Equivalent by Hilti, Inc., Johns Manville, Nelson Firestop Products, NUCO Inc., RectorSeal Corporation, Specified Technologies Inc., 3M, Tremco, USG, Dow, Chemelex.

3.8. EQUIPMENT ANCHORS

- A. Provide floor or foundation mounted equipment such as pumps, boilers, air handling units, etc. with Decatur Engineering Company concrete anchors.
- B. Where equipment anchors cannot be installed during forming of floors or foundations anchor equipment with McCulloch Kwik-Bolt concrete anchors.
- C. Anchors shall be proper type and size recommended by manufacturer for equipment to be anchored.

END OF SECTION 230513

SECTION 230530 – MOTOR CONTROL AND EQUIPMENT DISCONNECTS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230500.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. DISCONNECT SWITCHES

- A. General
 - 1. Provide heavy-duty horsepower rated Safety Switches rated in accordance with NEMA enclosed Switch Standard KS 1-1969 and L98 Standard.
 - 2. Equivalents by: G.E., Cutler Hammer, or I.T.E. Siemens, or Square D.
- B. Product
 - 1. Enclosure shall be NEMA type and material required by switch location and environment. Enclosure door shall latch with means for padlocking and cover interlock with defeater to prevent opening door when switch is energized or closing switch with door open. Switch shall have an embossed nameplate permanently attached to door front with switch rating, short circuit interrupting capacity and application information.
 - 2. Line terminals shall be permanently marked and shielded. Contact shall be tin plated, equipped with arch chutes and have movable contacts visible in off position with door open. Wiring terminals shall be pressure type suitable for copper or aluminum wire. Switching mechanism shall be quick-make, quick-break spring driven anti-tease mechanism and shall be integral part of box. All current carrying parts shall be plated.
 - 3. Fuse holders shall be high pressure suitable for use with dual element fuses or rejection type current limiting fuses where required. Fuse holders shall be completely accessible from front of switch and fuses shall be installed so that the label may be easily read from the front and without removing the fuse.
- C. Execution
 - 1. All fuse holders shall have rejection clips installed.
 - 2. Mount switch enclosure rigidly and with proper alignment on building structure or steel supports with centerline of operating handle not more than 6 feet above finished floor unless otherwise required. Use steel supports fabricated from standard rolled structural steel shapes or framing channel to provide one-inch separation between enclosure and building wall for vertical flow of air.
 - 3. Furnish and install a nameplate for each disconnect switch engraved with the equipment designation which the disconnect serves.
 - 4. All disconnect switches as specified shall be installed in strict accordance with rules set forth by NEC.

END OF SECTION 230530

SECTION 230553 – IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1. SUMMARY

- A. Section Includes:
 - 1. Equipment labels.
 - 2. Warning signs and labels.
 - 3. Pipe labels.

1.2. SUBMITTAL

- A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1. EQUIPMENT LABELS

- A. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch thick, and having predrilled holes for attachment hardware. Black letters on white background.
- B. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch.
- C. Minimum Letter Size: 1/4 inch for name of units if viewing distance is less than 24 inches, 1/2 inch for viewing distances up to 72 inches, and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
- D. Fasteners: Stainless-steel rivets or self-tapping screws.
- E. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.
- F. Label Content: Include equipment's Drawing designation or unique equipment number, Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.
- G. Install or permanently fasten labels on each major item of mechanical equipment.
- H. Locate equipment labels where accessible and visible.

2.2. PIPING IDENTIFICATION

- A. Colors and wording shall be of standard pipe markers as available from Seaton or equal. Submit for approval list of colors and wording prior to purchase of pipe markers.
- B. Pipe marker nomenclature/colors shall meet applicable ANSI Standard and OSHA requirements. Pipe markers with letters and flow direction arrows
- C. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:
 - 1. Near each valve and control device.
 - 2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
 - 3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
 - 4. At access doors, manholes, and similar access points that permit view of concealed piping.
 - 5. Near major equipment items and other points of origination and termination.
 - 6. Spaced at maximum intervals of 50 feet along each run. Reduce intervals to 25 feet in areas of congested piping and equipment.
 - 7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

END OF SECTION 230553

SECTION 230593 – SYSTEM TESTING & BALANCING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. TESTING AND BALANCING CONTRACTORS

- A. Testing and balancing (TAB) of the building air and hydronic systems will be to be completed near the end of construction. The Mechanical Contractor has responsibility to cooperate with, make adjustments for, and provide any equipment necessary for the TAB contractor to complete the job.

PART 2 - PRODUCTS

- A. Not Used

PART 3 - EXECUTION

3.1. SCOPE OF WORK

- A. The Contractor shall procure the services of an independent air balance and testing contractor, approved by the A/E, which specializes in the balancing and testing of heating, ventilating and air conditioning systems, to balance, adjust, and test air moving equipment and air distribution and exhaust systems and all water flow circuits. All work by this contractor shall be done under engineer employed by them. All instruments used by this contractor shall be accurately calibrated and maintained in good working order. If requested the tests shall be conducted in the presence of the A/E responsible for the project and/or his representative. The testing and balancing contractor shall be certified by NEBB or AABC and all work shall be performed in accordance with these organizations' published procedure manuals.
- B. The balancing contractor shall prepare a certified report of all tests performed. The report shall be written on standard forms prepared by NEBB or AABC or facsimiles thereof. The balancing contractor shall submit 3 copies of this report to the Mechanical Contractor who shall submit them to the A/E for review and distribution.
- C. Air balance and testing shall not begin until systems have been completed and are in full working order. All heating, ventilation, and air conditioning systems and equipment shall be in full operation during each working day of testing and balancing.

3.2. SYSTEM PREPARATION FOR TESTING AND BALANCING

- A. Prior to requesting testing and balancing contractor to perform their work the installing contractor shall make all necessary inspections and adjustments to insure that systems are completely installed and operating in accordance with the manufacturer's recommendations and the contract documents.
- B. The following checks shall be performed on each system installed under this contract. A report sheet shall be prepared for each system indicating checks made, corrective action taken where required, date, and name of person making inspection. Submit one copy to testing and balancing contractor and two to A/E. Testing and balancing contractor will not begin until checklist has been received and reviewed.

3.3. TEMPERATURE CONTROLS CONTRACTOR COORDINATION

- A. The temperature control contractor shall have a technical representative present with the balancing contractor on the first day of balancing for a minimum of four hours of active balancing and temperature controls coordination.
- B. For the remainder of the balancing the temperature contractor may either have a technical representative present, or may furnish the balancer with the latest DDC software and all required interface devices. This includes instructions and coordination in the use of all interface devices, including laptop computers. There shall be no charge to the balancing contractor for the use of these interface devices and they shall be returned to the temperature controls contractor at the end of the balancing process.

3.4. AIR HANDLING SYSTEMS:

- A. Clear system of all foreign objects and clean system.
- B. Verify fan rotation.
- C. Check bearing condition and lubrication.
- D. Check fan wheel clearances and fan alignment.
- E. Check motor security to mounting base.
- F. Check alignment of drive.

- G. Check vibration isolator adjustment.
- H. Verify that proper filter media is installed.
- I. Verify that all control dampers are installed and operable without binding or sticking.
- J. Confirm that all fire, smoke and volume dampers are installed and in full open position.
- K. Verify that all air terminal units are installed.
- L. Confirm that all air openings in walls above ceilings have been provided.
- M. Check for and repair all excessive air leaks in duct systems, at equipment connections and at coils.
- N. Air leaks shall not exceed SMACNA parameters for system pressure.
- O. Verify that ductwork is constructed and installed in accordance with contract drawings and/or approved ductwork shop drawings.
- P. Inspect and clean all coils (including evaporator and condenser) and correct fin damage.

3.5. AIR SIDE TESTING AND BALANCING

A. GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

- 1. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.
- 2. Prepare schematic diagrams of systems' "as-built" duct layouts.
- 3. For variable-air-volume systems, develop a plan to simulate diversity.
- 4. The TAB contractor shall cycle each air handling unit through its control sequence of operation to verify proper operation. Any inconsistency with contract documents shall be reported to A/E and temperature control contractor. Temperature control contractor shall take prompt action to correct any control inconsistency as reported by the TAB contractor.
- 5. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.
- 6. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.
- 7. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.
- 8. Verify that motor starters are equipped with properly sized thermal protection.
- 9. Check dampers for proper position to achieve desired airflow path.
- 10. Check for airflow blockages.
- 11. Check condensate drains for proper connections and functioning.
- 12. Check for proper sealing of air-handling-unit components.
- 13. Verify that air duct system is sealed as specified in Division 23 Section "Metal Ducts."

3.6. TOLERANCES

- A. Set HVAC system's air flow rates and water flow rates within the following tolerances:
 - 1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus or minus 10% percent.
 - 2. Air Outlets and Inlets: Plus or minus 10 percent.
 - 3. Heating-Water Flow Rate: Plus or minus 10 percent.
 - 4. Cooling-Water Flow Rate: Plus or minus 10 percent.

3.7. REPORTING

- A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.
- B. Status Reports: Prepare biweekly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

3.8. FINAL REPORT

- A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.
 - 1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
 - 2. Include a list of instruments used for procedures, along with proof of calibration.
- B. Final Report Contents: In addition to certified field-report data, include the following:
 - 1. Pump curves.

2. Fan curves.
 3. Manufacturers' test data.
 4. Field test reports prepared by system and equipment installers.
 5. Other information relative to equipment performance; do not include Shop Drawings and product data.
- C. General Report Data: In addition to form titles and entries, include the following data:
1. Title page.
 2. Name and address of the TAB contractor.
 3. Project name.
 4. Project location.
 5. Architect's name and address.
 6. Engineer's name and address.
 7. Contractor's name and address.
 8. Report date.
 9. Signature of TAB supervisor who certifies the report.
 10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
 11. Summary of contents including the following:
 - a. Indicated versus final performance.
 - b. Notable characteristics of systems.
 - c. Description of system operation sequence if it varies from the Contract Documents.
 12. Nomenclature sheets for each item of equipment.
 13. Data for terminal units, including manufacturer's name, type, size, and fittings.
 14. Notes to explain why certain final data in the body of reports vary from indicated values.
 15. Test conditions for fans and pump performance forms including the following:
 - a. Settings for outdoor-, return-, and exhaust-air dampers.
 - b. Conditions of filters.
 - c. Cooling coil, wet- and dry-bulb conditions.
 - d. Face and bypass damper settings at coils.
 - e. Fan drive settings including settings and percentage of maximum pitch diameter.
 - f. Inlet vane settings for variable-air-volume systems.
 - g. Settings for supply-air, static-pressure controller.
 - h. Other system operating conditions that affect performance.
- D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:
1. Quantities of outdoor, supply, return, and exhaust airflows.
 2. Water and steam flow rates.
 3. Duct, outlet, and inlet sizes.
 4. Pipe and valve sizes and locations.
 5. Terminal units.
 6. Balancing stations.
 7. Position of balancing devices.
- 3.9. ADDITIONAL TESTS
- A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.
 - B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION 230593

SECTION 230900 – AUTOMATIC TEMPERATURE CONTROLS

PART 1 GENERAL

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2. CONTROL SYSTEM

- A. Manufacturers:
1. Staefa Control System Inc.
- B. Control system and components shall be backward compatible and utilize and support open protocols. Control system shall consist of sensors, indicators, actuators, final control elements, interface equipment, other apparatus, and accessories to control mechanical systems.

2.3. ELECTRONIC SENSORS

- A. Description: Vibration and corrosion resistant; for wall, immersion, or duct mounting as required.
- B. Accuracy: Plus or minus 0.5 deg F at calibration point.
- C. Wire: Twisted, shielded-pair cable.
- D. RTDs and Transmitters:
1. Accuracy: Plus or minus 0.2 percent at calibration point.
 2. Wire: Twisted, shielded-pair cable.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Verify location of thermostats, humidistats, and other exposed control sensors with Drawings and room details before installation. Install adjustable devices 48 inches above the floor.
- B. Install guards on thermostats in the following locations:
1. Entrances.
 2. Public areas.
 3. Where indicated.
- C. Install electronic and fiber-optic cables according to Division 27 Section "Communications Horizontal Cabling."

3.2. PANEL AND DEVICE LOCATIONS

- A. Coordinate all control cabinets and other wall mounted controllers with other trades.

3.3. ELECTRICAL WIRING AND CONNECTION INSTALLATION

- A. Install raceways, boxes, and cabinets according to Division 26 Section "Raceway and Boxes for Electrical Systems."
- B. Install building wire and cable according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Install signal and communication cable according to Division 27 Section "Communications Horizontal Cabling."
1. Install exposed cable in raceway, including mechanical rooms, at wall mounted control cabinets and any location control wiring would be exposed to view or damage. Exposed raceway in finished spaces shall be wiremold or similar appearing material and painted if required by the finish of the room.
 2. Install concealed cable in walls and other non-accessible spaces in raceway. Wall mounted devices shall be provided with backbox and conduit.
 3. Install cable in accessible plenums as plenum rated and properly supported.
 4. Bundle and harness multiconductor instrument cable in place of single cables where several cables follow a common path.
 5. Fasten flexible conductors, bridging cabinets and doors, along hinge side; protect against abrasion. Tie and support conductors.
 6. Number-code or color-code conductors for future identification and service of control system, except

- local individual room control cables.
7. Install wire and cable with sufficient slack and flexible connections to allow for vibration of piping and equipment.

3.4. 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. Report results in writing.

3.5. DDC Verification:

1. Verify that instruments are installed before calibration, testing, and loop or leak checks.
2. Check instruments for proper location and accessibility.
3. Check instrument installation for direction of flow, elevation, orientation, insertion depth, and other applicable considerations.
4. Check instrument tubing for proper fittings, slope, material, and support.
5. Check pressure instruments, piping slope, installation of valve manifold, and self-contained pressure regulators.
6. Check temperature instruments and material and length of sensing elements.
7. Check DDC system as follows:
 - a. Verify that DDC controller power supply is from emergency power supply, if applicable.
 - b. Verify that wires at control panels are tagged with their service designation and approved tagging system.
 - c. Verify that spare I/O capacity has been provided.
 - d. Verify that DDC controllers are protected from power supply surges.
8. Replace damaged or malfunctioning controls and equipment and repeat testing procedures.

END OF SECTION 230900

SECTION 231000 – PIPING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

2.1. PIPING MATERIALS

- A. Piping used throughout project shall conform to the following specifications. Piping shall be plainly marked with manufacturers name and weight. See piping material schedule on the drawings for materials to be used for each piping system.
 - 1. Copper Tube Type ACR:
 - a. Provide hard temper nitrogenized copper refrigerant tube conforming to requirements of current ASTM B-88. Tubes shall be Type L or K as listed in schedule.
 - b. Tubing joints shall be brazed.
 - c. Pipe by Anaconda, Cerro, or Mueller.

2.2. PIPING FITTINGS

- A. Piping fitting used throughout project shall be proper type for installation method used and shall be compatible with piping system material. Fittings listed in piping material schedule shall conform to the following specifications:
 - 1. Wrought Copper Fittings:
 - a. Provide wrought solder joint copper tube fitting conforming to ANSI Standard B16.22
 - b. Fittings by Anaconda, Chase or Nibco.

PART 3 - EXECUTION

3.1. PIPING INSTALLATION

- A. Piping systems materials and installation shall conform to the following standards and codes.
 - 1. System: Heating and Air Conditioning Piping
 - a. Code: ANSI Standard B31.1.0 "Power Piping"
- B. No piping containing water shall be located in areas subject to freezing temperatures, including: unheated attics, unheated plenums, chases wall spaces or cavities within exterior walls, under slabs, or in concrete.
- C. Pipe sizes indicated on plans and as specified refer to nominal size in inches, unless otherwise indicated. Pipes are sized to nearest ½". In no case shall piping smaller than size specified be used.
- D. Contractor shall provide and be responsible for proper location of pipe sleeves, hangers, supports, and inserts. Install hangers, supports, inserts, etc., as recommended by manufacturer and as specified and detailed on drawings.
- E. Verify construction types and provide proper hangers, inserts and supports for construction used. Install inserts, hangers and supports in accordance with manufacturers load ratings and provide for thermal expansion of piping without exceeding allowable stress on piping or supports. Provide solid type hangers and supports where pipe travel exceeds manufacturer's recommendations for fixed hanger and supports.
- F. Install piping parallel with building lines and parallel with other piping to obtain a neat and orderly appearance of piping system. Secure piping with approved anchors and provide guides where required to insure proper direction of piping expansion. Piping shall be installed so that allowable stress for piping, valves and fittings used are not exceeded during normal operation or testing of piping system.
- G. Install piping so that systems can be completely drained. Provide piping systems with valve drain connections at all low pipe and ahead of all sectionalizing valves whether shown on plans or not. Drain lines shall be ¾".
- H. Pitch all piping and where possible make connections from horizontal piping so that air can be properly vented from system. Provide air vents as specified at all system high points and at drop in piping in direction of flow. Use eccentric reducers where necessary to avoid air pockets in horizontal piping.
- I. Provide unions or flanged joints in each pipe line preceding connections to equipment to allow removal for repair or replacement. Provide all screwed and control valves with unions adjacent to each piping connection. Provide screwed end valves with union adjacent to valve unless valve can be otherwise easily removed from line.

- J. Fittings pressures and temperature ratings shall be equal to or exceed maximum operating temperature and working pressure of piping system. No mitered or field fabricated pipe fittings will be permitted.
- K. All pipe threads shall meet ANSI Standard B2.1 for taper pipe threads. Lubricate pipe threads with Teflon thread sealant and lubricating compound applied full strength. Powdered or made-up compound will not be permitted. Pipe thread compound shall be applied only to male pipe threads.
- L. Brazed socket type joints shall be made with suitable brazing alloys. Minimum socket depth shall be sufficient for intended service. Brazing alloy shall be end fed into socket, and shall fill completely annular clearance between socket and pipe or tube. Brazed joints depending solely upon a fillet rather than a socket type joint will not be acceptable.
- M. Soft soldered socket type joints shall be made with sill-floss or 95-5 tin-antimony solder as required by temperature and pressure rating of piping system. Soldered socket-type joints shall be limited to systems containing non-flammable and non-toxic fluids. Soldered socket-type joints shall not be used on piping systems subject to shock vibration. Soldered joints depending solely upon a fillet rather than a socket-type joint will not be acceptable.
- N. Make changes in piping size and direction with approved factory made fittings. Provide fittings suitable for at least 125 PSI working pressure or of pressure rating required for maximum working pressure of system whichever is greater.

3.2. PIPING SUPPORTS, ANCHORS, SLEEVES AND SEALS

- A. Furnish proper type and size pipe sleeves to General Contractor for installation in concrete or masonry walls or floors. Sleeves are not required for supply and waste piping through wall supporting plumbing fixtures or for cast iron soil pipe passing through concrete slab or grade except where penetrating a membrane waterproof floor.
- B. Mechanical Contractor shall supervise installation of sleeves to insure proper location and installation.
- C. Each sleeve shall be continuous through wall floor or roof and shall be cut flush on each side except where indicated otherwise. Sleeves shall not be installed in structural member except where indicated or approved.
- D. Sleeves passing through above grade floors subject to flooding such as toilet rooms, bathrooms, equipment rooms and kitchens shall be cast iron with integral flanges and shall extend 1 inch above finished floor. Size sleeves for and seal space between pipe sleeve with Thunderline Link-Seal.
- E. Provide steel pipe sleeves in bearing walls and masonry walls. Opening in non-bearing walls, floors and ceilings may be 20 gauge galvanized pipe sleeves or openings cut with concrete core drill.
- F. Pipe insulation shall run continuous through pipe sleeves with 1/4" minimum clearance between insulation and pipe sleeve. Provide metal jackets over insulated pipes passing through fire walls, floors and smoke partitions. Jacket shall be 0.018 stainless steel extending 12 inches on either side of barrier and secured to insulation with 3/8" wide band. Seal annular space between jacket and pipe sleeves with Thunderline High Temperature Link Seal.
- G. Pipe wall penetrations exposed to view shall have tight fitting escutcheons or flanges to cover all voids around openings.
- H. All below grade and exterior wall penetrations shall be installed in a pipe sleeve and sealed between the pipe and pipe sleeve with Thunderline High Temperature Link Seal or similar compressed link type system.
- I. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around cables with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
- J. Equivalent by Dow, Chemelex, 3M.

3.3. PIPE HANGERS AND SUPPORTS

- A. Provide and be responsible for locations of piping hangers, supports and inserts, etc., required for installation of piping under this contract. Design of hangers and supports shall conform to current issue of Manufacturers Standardization Society Specification (MSS) SP-58.
- B. Pipe hangers shall be capable of supporting piping in all conditions of operation. They shall allow free expansion and contraction of piping, and prevent excessive stress resulting from transferred weight being induced into pipe or connected equipment. Support horizontal or vertical pipes at locations of least vertical movement.
- C. Where horizontal piping movements are such that hanger rod angularity from vertical is greater than 4 degrees from cold to hot position of pipe, offset hanger, pipe, and structural attachments to that rod is vertical in hot position.
- D. Hangers shall not become disengaged by movements of supported pipe.
- E. Provide sufficient hangers to adequately support piping system at specified spacing, at changes in piping direction and at concentrated loads. Hangers shall provide for vertical adjustment to maintain pitch required for proper drainage, and for longitudinal travel due to expansion and contraction of piping. Fasten hangers to building structural members wherever practicable.
- F. Unless indicated otherwise on drawings support horizontal steel piping as follows:

PIPE SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1-1/4"	3/8"	8 Ft.
1-1/2" to 2"	3/8"	10 Ft.

- G. Unless indicated otherwise on drawings support horizontal copper tubing as follows:

NOM. TUBING SIZE	ROD DIAMETER	MAXIMUM SPACING
Up to 1"	3/8"	6 Ft.
1-1/4" to 1-1/2"	3/8"	8 Ft.
2"	3/8"	9 Ft.

- H. Provide continuous threaded hanger rods wherever possible. No chain, wire, or perforated straps shall be used.
 I. Hanger rods shall be subject to tensile loading only, where lateral or axial pipe movement occurs provide suitable linkage to permit swing. Provide pipe support channels with galvanized finish for concealed locations and painted finish for exposed locations. Submit design for multiple pipe supports indicating pipe sizes, service and support detail to Architect-Engineer for review prior to fabrication.
 J. Provide Grinnell Fig. 194, 195 or 199 steel wall brackets for piping suspended or supported from walls. Brackets shall be prime coated carbon steel.
 K. Mount hangers for insulated piping on outside of pipe insulation sized to allow for full thickness of pipe insulation.
 L. Provide Grinnell Fig. 167 insulation protection shields sized so that line compressive load does not exceed one-third of insulation compressive strength. Shield shall be galvanized steel and support lower 180 degrees of pipe insulation on copper tubing. Provide wood block at each pipe hanger in thickness of insulation. Insulation vapor barrier jacket shall overlap wood block to maintain vapor barrier.
 M. Structural attachments for pipe hangers shall be as follows:
 N. Concrete Structure: Provide Grinnell Fig. No. 285 cast in concrete insert for loads up to 400 lbs. and Grinnell Fig. 281 wedge cast in type concrete insert for loads up to 1200 lbs.
 O. Provide Grinnell pipe hangers for horizontal single pipe runs as follows:

PIPE MATERIALS	PIPE SIZE	HANGER FIG. NO.
Copper	1/2" thru 4"	CT-65
Steel	3/8" thru 4"	65
Steel	5" thru 30"	260

- P. Provide Fee and Mason Fig. 600 channel trapeze pipe hangers for horizontal multiple pipe runs with pipe clamps or pipe rollers as follows:

PIPE MATERIALS	PIPE SIZE	CLAMP NO.	ROLLER NO.
Copper	3/8" thru 4"	8600 CP*	8010 CP*
Steel	3/8" thru 6"	8500	8010

*Copper Plated

- Q. Pipe supports for horizontal piping mounted on pipe racks or stanchions shall be Advanced Thermal Systems low friction graphite slide supports or equivalent by Elcen or Grinnell. Where racks and supports are not detailed on drawings submit detailed support drawings to Architect-Engineer for review prior to fabrication.
 R. Provide Fee and Mason Fig. 404 vibration control hangers at locations where piping vibrations would be transmitted to building structure by conventional hangers. Apply hangers within their load supporting range.
 S. Provide Elcen Fig. 50 pipe saddle with adjuster to support piping from floor. Provide complete with pedestal type floor stand.
 T. Provide necessary structural steel and attachment accessories for installations of pipe hangers and supports. Where heavy piping loads are to be attached to building structure verify structural loading with Architect-Engineer prior to installations.
 U. Equivalent hangers and supports by Auto-Grip, Basic Engineer, Bee Line, Elcen, Fee & Mason, Fluorocarbon Company, Unistrut or Super Strut Inc.
 V. Provide engineered pipe supports for piping located on flat roofs. Wood blocking is not acceptable. Support

will be of modular stackable design with a nylon roller bearing directly supporting pipe and a preformed saddle to keep piping on roller bearing. Maximum pipe support spacing shall be 10'. Provide pipe supports from Miro Industries, Unistrut, Bee Line, or approved equivalent.

END OF SECTION 231000

SECTION 231700 – PIPING INSULATION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230500.
- B. 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. Insulation Materials:
 - a. Flexible elastomeric.
- 2. Insulating cements.
- 3. Adhesives.
- 4. Mastics.
- 5. Sealants.
- 6. Factory-applied jackets.
- 7. Field-applied jackets.
- 8. Tapes.

B. SUBMITTALS

- 1. Product Data: For each type of product indicated. Include thermal conductivity, thickness, and jackets (both factory and field applied, if any).
- 2. Shop Drawings:
 - a. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - b. Detail attachment and covering of heat tracing inside insulation.
 - c. Detail insulation application at pipe expansion joints for each type of insulation.
 - d. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
 - e. Detail removable insulation at piping specialties, equipment connections, and access panels.
 - f. Detail application of field-applied jackets.
 - g. Detail application at linkages of control devices.
 - h. Detail field application for each equipment type.
- 3. Qualification Data: For qualified Installer.
- 4. Material Test Reports: From a qualified testing agency acceptable to authorities having jurisdiction indicating, interpreting, and certifying test results for compliance of insulation materials, sealers, attachments, cements, and jackets, with requirements indicated. Include dates of tests and test methods employed.

C. QUALITY ASSURANCE

- 1. Installer Qualifications: Skilled mechanics who have successfully completed an apprenticeship program or another craft training program certified by the Department of Labor, Bureau of Apprenticeship and Training.
- 2. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.
 - a. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
 - b. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.3. DELIVERY, STORAGE, AND HANDLING

- A. Packaging: Insulation material containers shall be marked by manufacturer with appropriate ASTM standard

designation, type and grade, and maximum use temperature.

1.4. COORDINATION

- A. Coordinate size and location of supports, hangers, and insulation shields specified in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment."
- B. Coordinate clearance requirements with piping Installer for piping insulation application and equipment Installer for equipment insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.
- C. Coordinate installation and testing of heat tracing.

1.5. SCHEDULING

- A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.
- B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 PRODUCTS

2.1. INSULATION MATERIALS

- A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
- B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
- C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.
- D. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

2.2. PIPING AND EQUIPMENT INSULATION

- A. Flexible Elastomeric: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials and Type II for sheet materials.
 - 1. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - a. Aeroflex USA Inc.; Aerocel.
 - b. Armacell LLC; AP Armaflex.
 - c. RBX Corporation; Insul-Sheet 1800 and Insul-Tube 180.

2.3. ADHESIVES

- A. Military Specification referenced in this article is the only standard available when this Section was updated. MIL-A-3316C was last updated in October 1987.
- B. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated, unless otherwise indicated.
 - 1. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4. MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-C-19565C, Type II.
- B. Vapor-Barrier Mastic: Water based; suitable for indoor and outdoor use on below ambient services.
 - 1. Water-Vapor Permeance: ASTM E 96, Procedure B, 0.013 perm at 43-mil dry film thickness.
 - 2. Service Temperature Range: Minus 20 to plus 180 deg F.
 - 3. Solids Content: ASTM D 1644, 59 percent by volume and 71 percent by weight.
 - 4. Color: White.

2.5. SEALANTS

- A. Joint Sealants:
 - 1. Materials shall be compatible with insulation materials, jackets, and substrates.
 - 2. Permanently flexible, elastomeric sealant.
 - 3. Service Temperature Range: Minus 100 to plus 300 deg F.
 - 4. Color: White or gray.

5. For indoor applications, use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.6. FACTORY-APPLIED JACKETS

- A. Insulation system schedules indicate factory-applied jackets on various applications. When factory-applied jackets are indicated, comply with the following:
 1. ASJ: White, kraft-paper, fiberglass-reinforced scrim with aluminum-foil backing; complying with ASTM C 1136, Type I.
 2. ASJ-SSL: ASJ with self-sealing, pressure-sensitive, acrylic-based adhesive covered by a removable protective strip; complying with ASTM C 1136, Type I.
 3. FSK Jacket: Aluminum-foil, fiberglass-reinforced scrim with kraft-paper backing; complying with ASTM C 1136, Type II.
 4. PVDC Jacket for Indoor Applications: 4-mil- thick, white PVDC biaxially oriented barrier film with a permeance at 0.02 perms when tested according to ASTM E 96 and with a flame-spread index of 5 and a smoke-developed index of 20 when tested according to ASTM E 84.

2.7. FIELD-APPLIED FABRIC-REINFORCING MESH

- A. Woven Polyester Fabric: Approximately 1 oz./sq. yd. with a thread count of 10 strands by 10 strands/sq. inch, in a Leno weave, for equipment and pipe.

2.8. FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. Although other thicknesses for PVC jackets are available, a flame-spread index of 25 and a smoke-developed index of 50 apply only to thicknesses of 30 mils (0.8 mm) and less.
- C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.
 1. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."
 2. Adhesive: As recommended by jacket material manufacturer.
 3. Color: White
 4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.
 - a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.
 5. Factory-fabricated tank heads and tank side panels.
- D. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105 or 5005, Temper H-14.
 1. See Editing Instruction No. 1 in the Evaluations for cautions about naming manufacturers and products. See Division 01 Section "Product Requirements."
 2. Factory cut and rolled to size.
 3. Finish and thickness are indicated in field-applied jacket schedules.
 4. Among the three moisture barriers in first subparagraph below, 1-mil (0.025-mm) barrier provides the least protection against galvanic corrosion, 3-mil (0.075-mm) barrier offers better protection, and Polysurlyn barrier offers the best protection. For most indoor applications, 1-mil (0.025-mm) barrier is adequate. For outdoor applications, select either 3-mil (0.075-mm) or Polysurlyn barrier.
 5. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.
 6. Moisture Barrier for Outdoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper].
 7. Factory-Fabricated Fitting Covers:
 - a. Same material, finish, and thickness as jacket.
 - b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
 - c. Tee covers.
 - d. Flange and union covers.
 - e. End caps.
 - f. Beveled collars.
 - g. Valve covers.
 - h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

2.9. TAPES

- A. PVC Tape: White vapor-retarder tape matching field-applied PVC jacket with acrylic adhesive. Suitable for indoor and outdoor applications.
1. Width: 2 inches.
 2. Thickness: 6 mils.
 3. Adhesion: 64 ounces force/inch in width.
 4. Elongation: 500 percent.
 5. Tensile Strength: 18 lbf/inch in width.
- B. Aluminum-Foil Tape: Vapor-retarder tape with acrylic adhesive.
1. Width: 2 inches.
 2. Thickness: 3.7 mils.
 3. Adhesion: 100 ounces force/inch in width.
 4. Elongation: 5 percent.
 5. Tensile Strength: 34 lbf/inch in width.

2.10. SECUREMENTS

- A. Aluminum Bands: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing or closed seal.
- B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

2.11. INSULATION SCHEDULE

INSULATION SERVICE		SIZE	TYPE	THICKNESS	JACKET
*Refrigerant Suction		All Sizes	FE	1"	
MF - Mineral-Fiber	CG - Cellular Glass	FE - Flexible Elastomeric			

*Provide a minimum of .016" thick aluminum jacket with band clamps and aluminum fitting covers over all pipe insulation located on the exterior of the building.

PART 3 – EXECUTION

3.1. EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation and other conditions affecting performance of insulation application.
1. Verify that systems and equipment to be insulated have been tested and are free of defects.
 2. Verify that surfaces to be insulated are clean and dry.
 3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2. PREPARATION

- A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.
- B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.
- C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3. GENERAL INSTALLATION REQUIREMENTS

- A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.
- B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.
- C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.
- D. Install insulation with longitudinal seams at top and bottom of horizontal runs.
- E. Install multiple layers of insulation with longitudinal and end seams staggered.
- F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.
- G. Keep insulation materials dry during application and finishing.
- H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

- I. Install insulation with least number of joints practical.
- J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.
 - 1. Install insulation continuously through hangers and around anchor attachments.
 - 2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
 - 3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
 - 4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.
- K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- L. Install insulation with factory-applied jackets as follows:
 - 1. Draw jacket tight and smooth.
 - 2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
 - 3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at [2 inches] [4 inches] o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 - 4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
 - 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.
- M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.
- P. For above ambient services, do not install insulation to the following:
 - 1. Vibration-control devices.
 - 2. Testing agency labels and stamps.
 - 3. Nameplates and data plates.
 - 4. Manholes.
 - 5. Handholes.
 - 6. Cleanouts.
- Q. Undamaged insulation systems on cold surface piping and equipment shall perform their intended functions as vapor barriers and thermal insulation without premature deterioration of insulation or vapor barrier. Contractor shall take every reasonable precaution to provide insulation systems with continuous unbroken vapor barriers.

3.4. PENETRATIONS

- A. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- B. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.
 - 1. Comply with requirements in Penetration Firestopping and fire-resistive joint sealers.
- C. Insulation Installation at Floor Penetrations:
 - 1. Pipe: Install insulation continuously through floor penetrations.
 - 2. Seal penetrations through fire-rated assemblies. Comply with requirements in Penetration Firestopping."

3.5. GENERAL PIPE INSULATION INSTALLATION

- A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.
- B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
 2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
 3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
 4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
 5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
 6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
 7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
 8. For services not specified to receive a field-applied jacket except for flexible elastomeric and polyolefin, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
 9. Stencil or label the outside insulation jacket of each union with the word "UNION." Match size and color of pipe labels.
- C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.
- D. Install removable insulation covers at locations indicated. Installation shall conform to the following:
1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
 2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
 3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.
 4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
 5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6. FLEXIBLE ELASTOMERIC INSULATION INSTALLATION

- A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- B. Insulation Installation on Pipe Flanges:
1. Install pipe insulation to outer diameter of pipe flange.
 2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of

- pipe insulation.
- 3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
- 4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.
- C. Insulation Installation on Pipe Fittings and Elbows:
 - 1. Install mitered sections of pipe insulation.
 - 2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.7. FINISHES

- A. Equipment and Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 09 painting Sections.
 - 1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.
 - a. Finish Coat Material: Interior, flat, latex-emulsion size.
- B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.
- C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.
- D. Do not field paint aluminum or stainless-steel jackets.

3.8. FIELD QUALITY CONTROL

- A. Testing Agency: Engage a qualified testing agency to perform tests and inspections.
- B. Perform tests and inspections.
- C. Tests and Inspections:
 - 1. Inspect field-insulated equipment, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
 - 2. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.
- E. Insulation failing to meet workmanship and appearance standards shall be replaced with an acceptable installation before final acceptance of project will be given. Insulation failing to meet performance requirements of this specification for a period of one year after date of final acceptance or through one heating season and one cooling season, whichever is longer shall be replaced with an acceptable installation. All costs to correct insulation deficiencies and costs to repair damages to other work shall be at Mechanical Contractors expense at no cost to owner.

END OF SECTION 231700

SECTION 238130 – MINI-SPLIT SYSTEMS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 PRODUCTS

2.1. GENERAL

A. MANUFACTURERS:

- 1. Approved equivalent manufacturers: Daikin, Mitsubishi, LG

B. QUALITY ASSURANCE

- 1. The units shall be listed by Electrical Laboratories (ETL) and bear the cETL label.
- 2. All wiring shall be in accordance with the National Electric Code (NEC).
- 3. The system will be produced in an ISO 9001 and ISO 14001 facility, which are standards set by the International Standard Organization (ISO). The system shall be factory tested for safety and function.
- 4. The outdoor unit will be factory charged with R-410A.

C. DELIVERY, STORAGE AND HANDLING

- 1. Unit shall be stored and handled according to the manufacturer's recommendations.

D. WARRANTY

- 1. The units shall have a manufacturer's warranty for a period of one (1) year from date of installation. The units shall have a limited labor warranty for a period of one (1) year from date of installation. The compressors shall have a warranty of six (6) years from date of installation. During the stated period, should any part fail due to defects in material and workmanship, it shall be repaired or replaced at factory by trained service professional.

E. SHOP DRAWING / SUBMITTAL

- 1. The manufacturer shall produce full shop drawings showing the complete design and layout of the system that includes the piping, fittings, controls, equipment and accessories for a complete two or three pipe heat recovery air conditioning system.

2.2. UNITS

A. GENERAL

1. REQUIREMENTS

- a. Units shall be operable with refrigerant R-410A, equipped with an electronic expansion valve, for installation within a conditioned space. The unit shall be equipped with a programmed drying mechanism that dehumidifies while inhibiting changes in room temperature when used with remote control. A mold-resistant, resin net air filter shall be included as standard equipment.
 - b. Indoor units shall be completely factory assembled and tested. Included in the unit is factory wiring, piping, electronic proportional expansion valve, control circuit board, fan motor thermal protector, flare connections, condensate drain pan, condensate drain pump, self-diagnostics, auto-restart function, 3-minute fused time delay, and test run switch.
 - c. Indoor unit and refrigerant pipes will be charged with dehydrated air prior to shipment from the factory.
 - d. Both refrigerant lines shall be insulated from the outdoor unit.
 - e. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21" of lift.
 - f. The indoor units shall be equipped with a return air thermistor.
 - g. The voltage range will be 253 volts maximum and 187 volts minimum.
- 2. Fan: The fan shall be statically and dynamically balanced impeller with high and low fan speeds available. The airflow rate shall be available in high and low settings. The fan motor shall be thermally protected.

3. Coil:
 - a. Coils shall be of the direct expansion type constructed from copper tubes expanded into aluminum fins to form a mechanical bond.
 - b. The coil shall be of a waffle louver fin and high heat exchange, rifled bore tube design to ensure highly efficient performance.
 - c. The coil shall be a 2 or 3-row cross fin copper evaporator coil with design completely factory tested.
 - d. The refrigerant connections shall be flare connections.
 - e. A condensate pan shall be located under the coil.
 - f. A condensate pump shall be located below the coil in the condensate pan with a built in safety alarm.
 - g. A thermistor will be located on the liquid and gas line.
 4. Filter: The return air shall be filtered by means of a washable long-life filter with mildew proof resin.
 5. Electrical: A separate power supply will be required of 208/230 volts, 1 phase, 60 hertz. The acceptable voltage range shall be 187 to 253 volts.
 6. Control: The unit shall have controls provided by manufacturer to perform input functions necessary to operate the system. The unit shall be compatible with interfacing with connection to LonWorks networks or interfacing with connection to BMS system. Consult with manufacturer prior to applying controls and provide all necessary interface materials and labor.
- B. 4 WAY CEILING CASSETTE UNIT
1. General: Indoor unit shall be a ceiling cassette fan coil unit for installation into the ceiling cavity equipped with an air panel grill. It shall be available from 7,500 Btu/h to 36,000 Btu/h. It shall be a four-way air distribution type, ivory white, impact resistant with a washable decoration panel.
 2. Indoor Unit:
 - a. The 4-way supply air flow can be field modified to 3-way and 2-way airflow to accommodate various installation configurations including corner installations.
 - b. Return air shall be through the concentric panel, which includes a resin net mold resistant filter.
 - c. The indoor units shall be equipped with a condensate pan and condensate pump. The condensate pump provides up to 21" of lift.
 3. Unit Cabinet:
 - a. The cabinet shall be space saving and shall be located into the ceiling.
 - b. Three auto-swing positions shall be available to choose, which include standard, draft prevention and ceiling stain prevention.
 - c. The airflow of the unit shall have the ability to shut down one or two sides allowing for simpler corner installation.
 - d. Fresh air intake shall be possible by way of optional fresh air intake kit.
 - e. A branch duct knockout shall exist for branch ducting supply air.
 - f. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
 - g. Optional high efficiency air filters are available for each model unit.
 4. Fan: The fan shall be direct-drive turbo fan type.
 5. Filter Optional high efficiency filters shall be available.
 6. Accessories: Fresh air intake and supply air duct connections. Remote "in-room" sensor kit.
- C. CONCEALED CEILING DUCTED UNIT
1. General: Indoor unit shall be a built-in ceiling concealed fan coil unit for installation into the ceiling cavity. The unit shall be constructed of a galvanized steel casing. It shall be available from 9,500 Btu/h to 48,000 Btu/h capacities. It shall be a horizontal discharge air with horizontal return air or bottom return air configuration.
 2. Unit Cabinet: The cabinet shall be located into the ceiling and ducted to the supply and return openings. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
 3. Fan: The fan shall be direct-drive Sirocco type fan.
 4. Accessories: Remote "in-room" sensor kit, Suction panel and air suction canvas.
- D. CEILING SUSPENDED CASSETTE UNIT
1. General: Indoor unit shall be a ceiling suspended fan coil unit for installation onto a wall or ceiling within

a conditioned space. This compact design with finished white casing shall be available from 12,000 Btu/h to 36,000 Btu/h capacities.

2. Unit Cabinet: The cabinet shall be affixed to a factory supplied wall/ceiling hanging brackets and located in the conditioned space. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
3. Fan: The fan shall be a direct-drive cross-flow fan.
4. Accessories: Remote "in-room" sensor kit, condensate pump.

E. WALL MOUNTED UNIT

1. General: Indoor unit shall be a wall mounted fan coil unit for installation onto a wall within a conditioned space. This compact design with finished white casing shall be available from 7,500 Btu/h to 24,000 Btu/h capacities.
2. Unit Cabinet: The cabinet shall be affixed to a factory supplied wall mounting template and located in the conditioned space. The cabinet shall be constructed with sound absorbing foamed polystyrene and polyethylene insulation.
3. Fan: The fan shall be a direct-drive cross-flow fan.
4. Accessories: Remote "in-room" sensor kit, condensate pump.

2.3. OUTDOOR UNIT

A. General

1. The outdoor unit is designed specifically for use with series components.
2. The outdoor unit shall be factory assembled and pre-wired with all necessary electronic and refrigerant controls. The refrigeration circuit of the condensing unit shall consist of scroll compressors, motors, fans, condenser coil, electronic expansion valves, solenoid valves, 4-way valve, distribution headers, capillaries, filters, shut off valves, oil separators, service ports and refrigerant regulator.
 - a. High/low pressure gas line, liquid and suction lines must be individually insulated between the outdoor and indoor units.
3. The system will automatically restart operation after a power failure and will not cause any settings to be lost, thus eliminating the need for reprogramming.
4. The unit shall incorporate an auto-charging feature and a refrigerant charge check function.
5. Oil recovery cycle shall be automatic occurring 2 hours after start of operation and then every 8 hours of operation.
6. The outdoor unit shall be capable of heating operation at 0°F dry bulb ambient temperature without additional low ambient controls.
7. The system shall continue to provide heat to the indoor units in heating operation while in the defrost mode.

B. Unit Cabinet:

1. The outdoor unit shall be completely weatherproof and corrosion resistant. The unit shall be constructed from rust-proofed mild steel panels coated with a baked enamel finish.
2. The outdoor unit shall have factory installed hail guards or field installed Permatron model # Hailguard 54 black polypropylene netting.

C. Fan: The condensing unit shall consist of one or more propeller type, direct-drive 350 and 750 W fan motors that have multiple speed operation via a DC (digitally commutating) inverter. The fan motor shall have inherent protection and permanently lubricated bearings and be mounted.

D. Condenser Coil:

1. The condenser coil shall be manufactured from copper tubes expanded into aluminum fins to form a mechanical bond.
2. The heat exchanger coil shall be of a waffle louver fin and rifled bore tube design to ensure high efficiency performance.
3. The heat exchanger on the condensing units shall be manufactured from Hi-X seamless copper tube with N-shape internal grooves mechanically bonded on to aluminum fins to an e-Pass Design.
4. The fins are to be covered with an anti-corrosion acrylic resin and hydrophilic film type E1.
5. The pipe plates shall be treated with powdered polyester resin for corrosion prevention. The thickness of the coating must be between 2.0 to 3.0 microns.

E. Compressor:

1. The inverter driven compressor in each condensing unit shall be of highly efficient reluctance DC (digitally

- commutating), hermetically sealed scroll "G-type" with a maximum speed of 7,980 rpm.
2. Neodymium magnets shall be adopted in the rotor construction to yield a higher torque and efficiency in the compressor instead of the normal ferrite magnet type. At complete stop of the compressor, the neodymium magnets will position the rotor into the optimum position for a low torque start.
 3. The capacity control range shall be as low as 6% to 100%.
 4. Each non-inverter compressor shall also be of the hermetically sealed scroll type.
 5. Each compressor shall be equipped with a crankcase heater, high pressure safety switch, and internal thermal overload protector.
 6. Oil separators shall be standard with the equipment together with an intelligent oil management system.
 7. The compressor shall be spring mounted to avoid the transmission of vibration.
 8. In the case of multiple condenser modules, conjoined operation hours of the compressors shall be balanced by means of the Duty Cycling Function, ensuring sequential starting of each module at each start/stop cycle, completion of oil return, completion of defrost or every 8 hours.

F. Electrical:

1. The control voltage between the indoor and outdoor unit shall be 16VDC non-shielded, stranded 2 conductor cable.

PART 3 EXECUTION

3.1. COORDINATION

- A. Provide approved submittals to other parties or verify G/C has provided record submittals for use in coordination of connections between other trades well in advance to coordinate other submittals and construction rough-ins.

3.2. UNIT INSTALLATION

- A. Suspended Units: Suspend from structure using threaded rods, spring hangers, and building attachments. Secure rods to unit hanger attachments. Adjust hangers so unit is level and plumb.
- B. Controls: Install thermostats and humidistats at mounting height of 60 inches above floor.
- C. Identify according to Division 23 Section Mechanical Identification.
- D. Manufacturer to final size all refrigerant lines. Provide all valves, fittings and any other components as required for refrigerant line lengths indicated by drawings. Provide all refrigerant and oil required for each refrigerant circuit.

3.3. AIR HANDLER CONNECTIONS

- A. Piping installation requirements are specified in other Division 23 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.
- B. Connect condensate drain pans. Extend to nearest equipment or floor drain. Construct deep trap at connection to drain pan and install cleanouts at changes in direction.
- C. Connect ducts according to Division 23 Section Ductwork.
- D. Install piping adjacent to machine to allow service and maintenance.
- E. Ground equipment according to Division 26 Section "Grounding and Bonding."
- F. 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.

3.4. AIR HANDLER ADJUSTING

- A. Adjust initial temperature and humidity set points.
- B. Set controls, and other adjustments for optimum heating performance and efficiency. Adjust heat-distribution features, including shutters, dampers, and relays, to provide optimum heating performance and system efficiency.

3.5. SYSTEM AND EQUIPMENT IDENTIFICATION

- A. Provide engraved equipment labels for all pieces of equipment including indoor units and outdoor units.

3.6. COMMISSIONING

- A. Verify that units are installed and connected according to the Contract Documents.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
- C. Inspect for physical damage to unit casing.
- D. Verify that access doors move freely and are weathertight.
- E. Clean units and inspect for construction debris.
- F. Check that all bolts and screws are tight.
- G. Adjust vibration isolation and flexible connections.

- H. Verify that controls are connected and operational.
- I. Lubricate bearings on fans.
- J. Verify that fan wheel is rotating in the correct direction and is not vibrating or binding.
- K. Adjust fan belts to proper alignment and tension.
- L. Start unit according to manufacturer's written instructions.
- M. Complete manufacturer's starting checklist.
- N. Measure and record airflow over coils.
- O. Verify that vibration isolation and flexible connections properly dampen vibration transmission to structure.
- P. After startup and performance test lubricate bearings.

3.7. UNIT DEMONSTRATION

- A. Startup Services: Engage a factory-authorized service representative to train Owner's maintenance personnel as specified below:
- B. Train Owner's maintenance personnel on procedures and schedules related to startup and shutdown, troubleshooting, servicing, and preventive maintenance.
- C. Schedule training with Owner, through Architect, with at least 7 days' advance notice.

3.8. AIR HANDLER CLEANING

- A. After completing installation, clean units internally according to manufacturer's written instructions.
- B. Install new filters in each unit within 14 days after Substantial Completion.

3.9. COORDINATION

- A. Provide approved submittals to other parties or verify G/C has provided record submittals for use in coordination of connections between other trades well in advance to coordinate other submittals and construction rough-ins.
- B. Review other trades submittals for coordination of connections and related installation clearances, appurtenances and related equipment.
- C. Conduct coordination meeting with all related trades prior to installation of equipment. Bring all apparent conflicts to the attention of the Architect/Engineer.

3.10. CONDENSING UNIT INSTALLATION

- A. Install condensing units according to manufacturer's written instructions.
- B. Install units level and plumb, firmly anchored in locations indicated; maintain manufacturer's recommended clearances.
- C. Install ground-mounted units on 4-inch-thick, reinforced concrete base, 4 inches larger than condensing unit on each side. Coordinate installation of anchoring devices.
- D. Install roof-mounted units on manufactured equipment supports. Anchor unit to supports with removable fasteners.
- E. Install hailguards on outdoor units. Permatron model # Hailguard 54 black polypropylene netting.
- F. Install units on spring isolators specified in Division 23 Section "Mechanical Vibration Controls and Seismic Restraints."

3.11. CONDENSING UNIT CONNECTIONS

- A. Connect precharged refrigerant tubing to unit's quick-connect fittings. Install tubing so it does not interfere with access to unit. Install furnished accessories.
- B. Connect refrigerant piping to air-cooled condensing units; maintain required access to unit. Install furnished field-mounted accessories.
- C. Ground equipment.
- D. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. Where manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.

3.12. CONDENSING UNIT FIELD QUALITY CONTROL

- A. Leak Test: After installation, charge systems with refrigerant and oil and test for leaks. Repair leaks and replace lost refrigerant and oil.
- B. Operational Test: After electrical circuitry has been energized, start units to confirm proper operation, product capability, and compliance with requirements.
- C. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units with new units and retest.

3.13. CONDENSING UNIT CLEANING

- A. After completing system installation, including outlet fittings and devices, inspect exposed finish. Clean units to

remove dirt and construction debris and repair damaged finishes.

3.14. CONDENSING COMMISSIONING

END OF SECTION 238130

SECTION 238239 – ELECTRIC HEATERS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 230500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: Include rated capacities, operating characteristics, furnished specialties, and accessories for each product indicated.
- B. Shop Drawings: Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
 - 1. Plans, elevations, sections, and details.
 - 2. Location and size of each field connection.
 - 3. Equipment schedules to include rated capacities, furnished specialties, and accessories.
- C. Field quality-control test reports.
- D. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. 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.
- B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1-2004 Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6 - "Heating, Ventilating, and Air-Conditioning."

PART 2 PRODUCTS

2.1. WALL AND CEILING HEATERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Berko Electric Heating; a division of Marley Engineered Products.
 - 2. Chromalox, Inc.; a division of Emerson Electric Company.
 - 3. Indeeco.
 - 4. Markel Products; a division of TPI Corporation.
 - 5. Marley Electric Heating; a division of Marley Engineered Products.
 - 6. QMark Electric Heating; a division of Marley Engineered Products.
- B. Description: An assembly including chassis, electric heating coil, fan, motor, and controls. Comply with UL 2021.
- C. Cabinet:
 - 1. Front Panel: Stamped-steel louver, with removable panels fastened with tamperproof fasteners.
 - 2. Finish: Baked enamel over baked-on primer with manufacturer's standard color selected by Architect, applied to factory-assembled and -tested wall and ceiling heaters before shipping.
 - 3. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2004.
- D. Surface-Mounting Cabinet Enclosure: Steel with finish to match cabinet.
- E. Electric-Resistance Heating Coil: Nickel-chromium heating wire, free from expansion noise and hum, embedded in magnesium oxide refractory and sealed in corrosion-resistant metallic sheath. Terminate elements in stainless-steel, machine-staked terminals secured with stainless-steel hardware, and limit controls for high temperature protection. Provide integral circuit breaker for overcurrent protection.
- F. Fan: Aluminum propeller directly connected to motor.
 - 1. Motor: Permanently lubricated, multispeed. Comply with requirements in Division 23 Section "Common Motor Requirements for HVAC Equipment."
- G. Controls: Unit-mounted thermostat. Low-voltage relay with transformer kit.
- H. Electrical Connection: Factory wire motors and controls for a single field connection with disconnect switch.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install unit heaters to comply with NFPA 90A.
- B. Suspend cabinet unit heaters from structure with elastomeric hangers.
- C. Suspend propeller unit heaters from structure with all-thread hanger rods and elastomeric hangers.
- D. Install wall-mounting thermostats and switch controls in electrical outlet boxes at heights to match lighting controls. Verify location of thermostats and other exposed control sensors with Drawings and room details before installation.
- E. Install new filters in each fan-coil unit within two weeks of Substantial Completion.
- F. Connect supply and return ducts to cabinet unit heaters with flexible duct connectors specified in Division 23 Section "Air Duct Accessories."
- G. Ground equipment according to Division 26.
- H. Connect wiring according to Division 26.

3.2. FIELD QUALITY CONTROL

- A. 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 motor rotation and unit operation.
 - 2. Operate electric heating elements through each stage to verify proper operation and electrical connections.
 - 3. Test and adjust controls and safety devices. Replace damaged and malfunctioning controls and equipment.
- B. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 238239

END OF DIVISION 230000

END OF DIVISION 230000

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SECTION 260500 – ELECTRICAL PROVISIONS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. All contract documents including drawings, alternates, addenda and modifications and general provisions of the Contract, including General and Supplementary Conditions and all other Division Specification Sections, apply to work of this section. All preceding and following sections of this specification division are applicable to the Electrical Contractor, all sub-contractors, and all material suppliers.

1.2. SCOPE OF WORK

- A. This DIVISION requires the furnishing and installing of complete functioning Electrical systems, and each element thereof, as specified or indicated on Drawings or reasonably inferred, including every article, device or accessory reasonably necessary to facilitate each system's functioning as indicated by the design and the equipment specified. Elements of the Work include materials, labor, supervision, supplies, equipment, transportation, and utilities.
- B. Refer to Architectural, Structural and Mechanical Drawings and all other contract documents and to relevant equipment drawings and shop drawings to determine the extent of clear spaces and make all offsets required to clear equipment, beams and other structural members to facilitate concealing conduit in the manner anticipated in the design.

1.3. SPECIFICATION FORM AND DEFINITIONS

- A. The Engineer indicated in these specifications is Pearson Kent McKinley Raaf Engineers LLC. 13300 W 98th Street, Lenexa, KS 66215, PHONE 913-492-2400, EMAIL admin@pkmreng.com.
- B. Contractor, wherever used in these specifications, shall mean the Company that enters into contract with the Owner to perform this section of work.
- C. When a word, such as "proper", "satisfactory", "equivalent", and "as directed", is used, it requires the Architect-Engineer's review.
- D. "PROVIDE" means to supply, purchase, transport, place, erect, connect, test, and turn over to Owner, complete and ready for regular operation, the particular Work referred to.
- E. "INSTALL" means to join, unite, fasten, link, attach, set up, or otherwise connect together before testing and turning over to Owner, complete and ready for regular operation, the particular Work referred to.
- F. "FURNISH" means to supply all materials, labor, equipment, testing apparatus, controls, tests, accessories, and all other items customarily required for the proper and complete application for the particular Work referred to.
- G. "WIRING" means the inclusion of all raceways, fittings, conductors, connectors, tape, junction and outlet boxes, connections, splices, and all other items necessary and/or required in connection with such Work.
- H. "CONDUIT" means the inclusion of all fittings, hangers, supports, sleeves, etc.
- I. "AS DIRECTED" means as directed by the Architect/Engineer, or his representative.
- J. "CONCEALED" means embedded in masonry or other construction, installed behind wall furring or within double partitions, or installed above hung ceilings.

1.4. QUALIFICATIONS

- A. The contractors responsible for work under this section shall have completed a job of similar scope and magnitude within the last 3 years. The contractors shall employ an experienced, competent and adequate work force licensed in their specific trade and properly supervised at all times. Unlicensed workers and general laborers shall be adequately supervised to insure competent and quality work and workmanship required by this contract and all other regulations, codes and practices. At all times the contractors shall comply with all applicable local, state and federal guidelines, practices and regulations. Contractor may be required to submit a statement of qualifications upon request before any final approval and selection. Failure to be able to comply with these requirements is suitable reason for rejection of a bid.

1.5. LOCAL CONDITIONS

- A. The contractor shall visit the site and determine the existing local conditions affecting the work required. Failure to determine site conditions or nature of existing or new construction will not be considered a basis for granting additional compensation.

1.6. CONTRACT CHANGES

- A. Changes or deviations from the contract documents; including those for extra or additional work must be submitted in writing for review of Architect-Engineer. No verbal change orders will be recognized.

1.7. LOCATIONS AND INTERFERENCES

- A. Locations of equipment, conduit and other electrical work are indicated diagrammatically by electrical drawings. Layout work from dimensions on Architectural and Structural Drawings. Verify equipment size from manufacturers shop drawings.
- B. Study and become familiar with contract drawings of other trades and in particular general construction drawings and details in order to obtain necessary information for figuring installation. Cooperate with other workmen and install work in such a way to avoid interference with their Work. Minor deviations, not affecting design characteristics, performance or space limitation may be permitted if reviewed prior to installation by Architect-Engineer.
- C. Any conduit, apparatus, appliance or other electrical item interfering with proper placement of other work as indicated on drawings, specified, or required, shall be removed, relocated and reconnected without extra cost. Damage to other Work caused by this contractor, subcontractor, workers or any cause whatsoever, shall be restored as specified for new work.
- D. Do not scale electrical drawings for dimensions. Accurately layout work from dimensions indicated on Architectural drawings unless they are found to be in error.

1.8. PERFORMANCE

- A. Final acceptance of work shall be subject to the condition that all systems, equipment, apparatus and appliances operate satisfactorily as designed and intended. Work shall include required adjustment of systems and control equipment installed under this specification division.
- B. The Contractor warrants to the Owner and Architect-Engineer the quality of materials, equipment, workmanship and operation of equipment provided under this specification division for a period of one year from and after completion of building and acceptance of mechanical systems by Owner.

1.9. WARRANTY

- A. The Contractor warrants to the Owner and Architect-Engineer that upon notice from them within a one year warranty period following date of acceptance, that all defects that have appeared in materials and/or workmanship, will be promptly corrected to original condition required by contract documents at Contractor's expense.
- B. The above warranty shall not supersede any separately stated warranty or other requirements required by law or by these specifications.

1.10. ALTERNATES

- A. Refer to General Requirements for descriptions of any alternates that may be included.

1.11. MATERIALS, EQUIPMENT AND SUBSTITUTIONS

- A. The intent of these specifications is to allow ample opportunity for the Contractor to use their ingenuity and abilities to perform the work to their and the Owner's best advantage, and to permit maximum competition in bidding on standards of materials and equipment required.
- B. Material and equipment installed under this contract shall be first class quality, new, unused and without damage.
- C. In general, these specifications identify required materials and equipment by naming one or more manufacturer's brand, model, catalog number and/or other identification. The first named manufacturer or product is used as the basis for design; other manufacturers named must furnish products consistent with specifications of first named product as determined by Engineer. Base bid proposal shall be based only on materials and equipment by manufacturers named, except as hereinafter provided.
- D. Where materials or equipment are described but not named, provide required items of first quality, adequate in every respect for intended use. Such items shall be submitted to Architect-Engineer for review prior to procurement.
- E. Materials and equipment proposed for substitutions shall be equal to or superior to that specified in construction, efficiency, utility, aesthetic design, and color as determined by Architect-Engineer whose decision shall be final and without further recourse. Physical size of substitute brand shall be no larger than space provided including allowances for access for installation and maintenance. Requests must be accompanied by two copies of complete descriptive and technical data including manufacturer's name, model and catalog number, photographs or cuts, physical dimensions, operating characteristics and any other information needed for comparison.
- F. If the Contractor wishes to incorporate products other than those named in the Base Bid Specifications they shall submit a request for approval of equivalency in writing no later than (10) ten calendar days prior to bid date. Substitutions after this may be refused at Engineers option. Equivalents will ONLY be considered approved when listed by addendum.

- G. In proposing a substitution prior to or subsequent to receipt of bids, include in such bid the cost of altering other elements of this project, including adjustments in mechanical or electrical service requirements necessary to accommodate such substitution.
- H. Within 10 working days after bids are received, the apparent low bidder shall submit to the Architect-Engineer for approval, three copies of a list of all major items of equipment they intend to provide. Within 30 working days after award of Contract, Contractor shall submit shop drawings for equipment and materials to be incorporated in work, for Architect-Engineer review. Where 30-day limit is insufficient for preparation of detailed shop drawings on major equipment or assemblies, Contractor shall submit manufacturer's descriptive catalog data and indicate date such detailed shop drawings will be submitted along with manufacturer's certification that order was placed within 30 working day limit.

1.12. OPENINGS, ACCESS PANELS AND SLEEVES

- A. This Contractor shall include the installation of all boxes, access panels and sleeves for openings required to install this work, except structural openings incorporated in the structural drawings. Sleeves shall be installed for all conduits passing through structural slabs and walls. Contractor shall set and verify the location of sleeves that pass through beams, as shown on structural plans. All floor and wall penetrations shall be sealed to meet fire-rating requirements.
- B. All penetrations through interior or exterior and rated or non-rated walls and floors shall be appropriately sealed prevent entry and movement of rodents and insects. Contractor shall coordinate their work with all other trades.

1.13. ARCHITECTURAL VERIFICATION AND RELATED DOCUMENTS

- A. Contractor shall consult all Architectural Drawings and specifications in their entirety incorporating and certifying all millwork, furniture, and equipment rough-in including utility characteristics such as voltage, phase, amperage, pipe sizes, duct sizes, including height, location and orientation. Shop drawings incorporating these requirements should be submitted to the Architect for approval prior to installation or rough in.

1.14. EXTENT OF CONTRACT WORK

- A. Provide electrical systems indicated on drawings, specified or reasonably implied. Provide every device and accessory necessary for proper operation and completion of electrical systems. In no case will claims for "Extra Work" be allowed for work about which Electrical Contractor could have been informed before bids were taken.
- B. Where specific information for devices, lights or equipment shown on the plans is missing, provide an allowance in the contract amount for furnishing a product reasonably implied by the level of other devices, lights and equipment provided in the contract documents.
- C. Electrical Contractor shall be familiar with equipment provided by other Contractors that require electrical connections and control. Follow circuiting shown on drawings for lighting, power and equipment connections.
- D. Make required electrical connections to equipment provided under Architectural and Mechanical divisions of this project. Receive and install electric control devices requiring field installation, wiring, and service connection. Equipment supplied by the automatic temperature control contractor shall be installed by the mechanical or automatic temperature control subcontractor. Make required internal field wiring modifications indicated on wiring diagrams of factory installed control systems for control sequence specified. These field modifications shall be limited to jumper connections and connection of internal wiring to alternate terminal block lugs. The cost for field modifications requiring rewiring of factory installed control systems for equipment provided by General or Mechanical Contractors shall be included in base bid of the respective contractor. All temperature control wiring shall be by a licensed electrician under the supervision of temperature control contractor.
- E. Check electrical data and wiring diagrams received from Mechanical Contractor of compliance with project voltages, wiring, controls and protective devices shown on electrical drawings. Promptly bring discrepancies found to attention of Architect-Engineer for a decision.
- F. Provide safety disconnect switches, contactors, and manual and magnetic motor starters for mechanical and electrical equipment requiring such devices. Omit these devices where included as part of factory installed prewired control systems provided with mechanical equipment. With exception of factory installed devices, provide safety disconnect switches, contacts and motor starters by one manufacturer to allow maximum interchangeability of repair parts and accessories for these devices.
- G. To maximum extent possible electrical controls in boiler rooms, equipment rooms, and control rooms shall be grouped in accessible locations and arranged according to function. Where possible use group control panels and combination starters in lieu of individually enclosed devices.

1.15. CODES, ORDINANCES, RULES AND REGULATIONS

- A. Provide work in accordance with applicable rules, codes, ordinances and regulations of Local, State, Federal

- Governments, and other authorities having lawful jurisdiction.
- B. Conform to latest editions and supplements of following codes, standards or recommended practices.

1.16. BUILDING CODES:

- A. International Building Codes

1.17. SAFETY CODES:

- A. National Electrical Safety Code Handbook H30 - National Bureau of Standards
B. Occupational Safety and Health Standard (OSHA) Department of Labor
C. Safety Code for Elevators ANSI A17.1

1.18. NATIONAL FIRE CODES AND STANDARDS:

- A. NFPA No. 70 National Electrical Code
B. NFPA No. 72 National Fire Alarm and Signaling Code
C. NFPA No. 101 Life Safety Code

1.19. UNDERWRITERS LABORATORIES INC.:

- A. All materials, equipment and component parts of equipment shall bear UL labels whenever such devices are listed by UL.

1.20. MISCELLANEOUS CODES:

- A. ANSI A117.1 - Handicapped Accessibility
B. Americans with Disabilities Act (ADA)

1.21. STANDARDS

- A. Drawings and specifications indicate minimum construction standard, should any work indicated be sub-standard to any ordinances, laws, codes, rules or regulations bearing on work, Contractor shall promptly notify Architect/Engineer in writing before proceeding with work so that necessary changes can be made. However, if Electrical Contractor proceeds with work knowing it to be contrary to any ordinances, laws, rules, and regulations he shall thereby have assumed full responsibility for and shall bear all costs required to correct non-complying work.

1.22. PERMITS/FEEES

- A. Electrical Contractor shall secure and pay for necessary permits and certificates of inspection required by governmental ordinances, laws, rules or regulations. Keep a written record of all permits and inspection certificates and submit two copies to Architect/Engineer with request for final review.
B. Contractor shall include in bid any charges by local utility providers to establish new services to the structure. Coordinate with the utility suppliers to verify exact which part of the work is to be performed by whom.

PART 2 - PRODUCTS

- A. Not Used

PART 3 - EXECUTION

3.1. SHOP DRAWINGS

- A. Contractor shall furnish shop drawings of all materials and equipment in an Adobe PDF format.
B. Contractor shall submit Adobe PDF sets of all fabrication drawings. Cost of drawing preparation, printing and distribution shall be paid for by the contractor and included in his base bid.
C. Where catalog cuts are submitted for review, conspicuously mark or provide schedule of equipment, capacities, controls, fitting sizes, etc. that are to be provided. Mark each submitted item with applicable section and sheet number of these specifications, or plan sheet number when item does not appear in the specifications. Where equipment submitted does not appear in base specifications or specified equivalent, mark submittals with applicable alternate numbers, change order number or letters of authorization. Each catalog sheet shall bear the equipment manufacturer's name and address. All shop drawings on materials and equipment listed by UL shall indicate UL approval on submittal.
D. Contractor shall check all shop drawings to verify that they meet specifications and/or drawings requirements before forwarding submittals to the Architect-Engineer for their review. All shop drawings submitted to Architect-Engineer shall bear contractor's approval stamp that shall indicate that Contractor has reviewed submittals and that they meet specification and/or drawing requirements. Contractor's submittal review shall specifically check for but not be limited to the following: equipment capacities, physical size in relation to

- space allowed; electrical characteristics, provisions for supply, return and drainage connections to building systems. All shop drawings not meeting Contractor's approval shall be returned to their supplier for re-submittal.
- E. No shop drawing submittals will be considered for review by the Architect-Engineer without Contractor's approval stamp, or that have extensive changes made on the original submittal as a result of the Contractor's review.
 - F. The shop drawing submittal dates shall be at least as early as required to support the project schedule and shall also allow for two weeks Architect-Engineer review time plus a duplication of this time for re-submittal if required. Submittal of all shop drawings as soon as possible before construction starts is preferred. All shop drawings submitted shall contain the following: The project name, the applicable specification section and paragraph, the submittal date, the Contractor's stamp which shall certify that the stamped drawings have been checked by the Contractor, comply with the drawings and specifications and have been coordinated with other trades. Submittals not so identified will be returned without action for re-submittal.
 - G. The Architect's-Engineer's checking and subsequent review of such drawings, schedules, literature, or illustrations shall not relieve the Contractor from responsibility for deviations from Drawings or Specifications unless he has, in writing, called the Architect's-Engineer's attention to such deviations at the time of submission, and secured their written approval; nor shall it relieve the contractor from responsibility for errors in dimensions, details, size of members, or omissions of components for fittings; or for coordinating items with actual building conditions and adjacent work.
 - H. Any corrections or modifications made by the Architect-Engineer shall be deemed acceptable to the Contractor at no change in price unless written notice is received by the Architect-Engineer prior to the performance of any work incorporating such corrections or modifications.
 - I. Shop drawings that require re-submission shall have the items that were revised "flagged" or in some other manner marked to call attention to what has been changed.
 - J. Before submitting shop drawings and material lists, verify that all equipment submitted is mutually compatible and suitable for the intended use. Verify that all equipment will fit the available space and allow ample room for maintenance. If the size of equipment furnished makes necessary any change in location, or configuration, submit a shop drawing showing the proposed layout.
 - K. Electrical equipment location and conduit coordination shop drawings for conduit fabrication and electrical equipment clearances shall be a minimum of 1/4" scale. Shop drawings shall not be a reproduction of the contract document and shall show details of the following: Fabrication, assembly, and installation, including plans, elevations above finished floor, sections, components, and attachments to other work.
 - L. Architect-Engineer's review of shop drawings will not relieve Contractor of responsibility for deviations from drawings and specifications unless the Architect-Engineer has specifically approved such deviations in writing, nor shall it relieve the Contractor of responsibility for errors in shop drawings. No work shall be fabricated until Architect-Engineer's review has been obtained. Any time delay caused by correcting and re-submitting shop drawings will be the Contractor's responsibility.

3.2. SHOP DRAWING COORDINATION

- A. After shop drawings have been reviewed and approved by all parties, transmit a set of submittals to each other trade (eg Plumbing, Mechanical, Electrical, Controls, etc) that will interface with installation. Each other contractor shall review the submittal for coordination and return a stamped submittal indicating they have reviewed the submittal for coordination purposes.

3.3. SUBMITTALS

- A. Contractor shall provide submittals as required by the specifications.
- B. Refer to each specification section for the submittals (if any) required for that section.

3.4. OPERATING AND MAINTENANCE INSTRUCTIONS (O & M MANUALS)

- A. Submit with shop drawings of equipment, three sets of operating and maintenance instructions and parts lists for all items of equipment provided. Instructions shall be prepared by equipment manufacturer.
- B. Keep in safe place, keys and wrenches furnished with equipment under this contract. Present to Owner and obtain receipt for same upon completion of project.
- C. Prepare a complete brochure, covering systems and equipment provided and installed under his contract. Submit brochures to Architect/Engineer for review before delivery to Owner. Contractor at his option may prepare this brochure or retain an individual to prepare it for him. Include cost of this service in bid. Brochures shall contain following:
 - 1. Certified equipment drawings/or catalog data with equipment provided clearly marked as outlined under Section this specification.
 - 2. Complete installation, operating, maintenance instructions and parts lists for each item of equipment.

3. Record copy of all submittals indicating actual equipment installed indicating options, characteristics. Copies of submittals shall bear the stamps of all parties that reviewed submittals.
4. Special emergency operating instructions with a list of service organizations (including addresses and telephone numbers) capable of rendering emergency service to various parts of system.
5. Record Set Drawings: The Contractor shall mark up a set of contract documents during construction noting all changes and deviations including change orders. These will be delivered to Architect at end of the project. After the originals are changed to reflect the blue line set, a copy shall be included in the brochure.
6. Provide brochure bound in black vinyl three-ring binders with metal hinge. Reinforce binding edge of each sheet of loose-leaf type brochure to prevent tearing from continued usage. Clearly print on label insert of each brochure:
 - a. Project name and address.
 - b. Section of work covered by brochure, i.e., Electrical.

3.5. RECORD DOCUMENTS

- A. During construction, keep an accurate record of all deviations between the work as shown on Drawings and that which is actually installed. Keep this record set of prints at the job site for review by the Architect/Engineer.
- B. Upon completion of the installation and acceptance by the owner, transfer all record drawing information to one neat and legible set of prints. Then deliver them to the Architect/Engineer for transmittal to the Owner.

3.6. PREMIUM TIME WORK

- A. The following Work shall be performed at night or weekend other than holiday weekends as directed and coordinated with the Owner.
 1. All tie-in, cut-over and modifications to the existing electrical system and other existing system requiring tie-ins or modifications shall be arranged and scheduled with the Owner to be done at a time as to maintain continuity of the service and not interfere with normal building operations.

3.7. CLEANING UP

- A. Contractor shall take care to avoid accumulation of debris, boxes, crates, etc., resulting from the installation of his work. Contractor shall remove from the premises each day all debris, boxes, etc., and keep the premises clean.
- B. Contractor shall clean up all fixtures and equipment at the completion of the project.
- C. All switchboards, panelboards, wireways, trench ducts, cabinets and enclosures shall be thoroughly vacuumed clean prior to energizing equipment and at the completion of the project. Equipment shall be opened for observation by the Architect/Engineer as required.

3.8. WATERPROOFING

- A. Avoid, if possible, the penetration of any waterproof membranes such as roofs, machine room floors, basement walls, and the like. If such penetration is necessary, perform it prior to the waterproofing and furnish all sleeves or pitch-pockets required. Advise the Architect/Engineer and obtain written permission before penetrating any waterproof membrane, even where such penetration is shown on the Drawings.
- B. If Contractor penetrates any walls or surfaces after they have been waterproofed, he shall restore the waterproof integrity of that surface as directed by the Architect/Engineer at his own expense

3.9. CUTTING AND PATCHING

- A. Contractor shall do cutting and patching of building materials required for installation of work herein specified. Remove walls, ceilings and floors (or portions thereof) necessary to accomplish scope of work. Do not cut or drill through structural members including wall, floors, roofs, and supporting structure, without the Architect's and Structural Engineer's approval and in a manner approved by them.
- B. Make openings in concrete with concrete hole saw or concrete drill. Use of star drill or air hammer for this work will not be permitted.
- C. Patching shall be by the contractors of the particular trade involved, shall match the existing construction type, quality, finish and texture, and shall meet approval of Architect-Engineer. Damage to building finishes, caused by installation of electrical work shall be repaired at Contractor's expense to approval of Architect-Engineer.

3.10. SETTING, ADJUSTMENT AND EQUIPMENT SUPPORTS

- A. Work shall include mounting, alignment and adjustment of systems and equipment. Set equipment level on adequate foundations and provide proper anchor bolts and isolation as shown or specified. Level, shim, and

grout equipment bases as recommended by manufacturer. Mount motors, align and adjust drive shafts and belts according to manufacturer's instruction. Equipment failures resulting from improper installation or field alignment shall be repaired or replaced by Contractor at no cost to Owner.

- B. Floor or pad mounted equipment shall not be held in place solely by its own dead weight. Include anchor fastening in all cases.
- C. Provide electrical floor mounted equipment with 3-1/2" high concrete bases unless shown or specified otherwise. Electrical contractor shall size all pads. General contractor shall form all pads, provide and place all concrete for said pads. Individual concrete pad shall be no less than 4" wider and 4" longer than equipment, and shall extend no less than 2" from each side of equipment.
- D. Provide each piece of equipment or apparatus suspended from ceiling or mounted above floor level with suitable structural support, platform or carrier in accordance with best recognized practice. Electrical contractor shall arrange for attachment to building structure, unless otherwise indicated on drawings or as specified. Provide hangers with vibration eliminators where required. Contractor shall verify that structural members of building are adequate to support equipment. Submit details of hangers, platforms and supports together with total weights of mounted equipment to Architect/Engineer for review before proceeding with fabrication or installation.

3.11. START-UP, CHANGEOVER, TRAINING AND OPERATION CHECK

- A. Electrical Contractor shall be responsible for training Owner's operating personnel to operate and maintain systems and equipment installed. Keep a record of training provided to Owner's personnel listing the date, subject covered, instructor's name, names of Owner's personnel attending and total hours of instruction given each individual.
- B. All owner-training sessions shall be orderly and well organized and shall be video recorded digitally. At the end of the owner training, the "training" session recording shall be transmitted to the owner via DVD and shall become property of the owner.

3.12. FINAL CONSTRUCTION REVIEW

- A. At final construction review, Electrical Contractor and the major sub-contractors shall be present or shall be represented by a person of authority. Each Contractor shall demonstrate, as directed by Architect/Engineer, that the work complies with purpose and intent of plans and specifications. Respective Contractor shall provide labor, services, instruments or tools necessary for such demonstrations and tests.

END OF SECTION 260500

SECTION 260505 – PROJECT COORDINATION

PART 1 GENERAL

1.1. RELATED DOCUMENTS

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

1.2. SUMMARY

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

1.3. COORDINATION

- A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
- B. Coordination: Each contractor shall coordinate its construction operations with those of other contractors and entities to ensure efficient and orderly installation of each part of the Work. Each contractor shall coordinate its operations with operations, included in different Sections, that depend on each other for proper installation, connection, and operation.
 - 1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
 - 2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
 - 3. Make adequate provisions to accommodate items scheduled for later installation.
 - 4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all components, including mechanical and electrical.

1.4. SUBMITTALS

- A. Coordination Drawings: Prepare Coordination Drawings if limited space availability necessitates maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.
 - 1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:
 - a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.
 - b. Indicate required installation sequences.
 - c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.
 - 2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 42 inches. Format shall be PDF or other electronic format to facilitate multiple user commenting and sharing easily.
 - 3. Refer to individual Sections for Coordination Drawing requirements for Work in those Sections.
- B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including project managers, superintendent and other personnel in attendance at Project site to the General Contractor and other major subcontractors. Identify individuals and their duties and responsibilities; list email addresses and telephone numbers. Update the list as required during the project if personnel change.

1.5. COORDINATION

- A. Certain materials will be provided by other trades. Examine the Contract Documents and reviewed record Submittals to ascertain these general requirements. Contract Documents reflect a basis of design and may not reflect actual equipment or items being utilized.
- B. Carefully check space requirements with other trades and the physical confines of the area to insure that all material can be installed in the spaces allotted thereto including finished suspended ceilings and the spaces within the existing building. Make modifications thereto as required and approved.
- C. Transmit to other trades all information required for work to be provided under their respective Sections in ample time for installation.
- D. Wherever work interconnects with work of other trades, coordinate with other trades to insure that all trades have the information necessary so that they may properly install all the necessary connections and equipment. Identify all items of work that require access so that the ceiling trade will know where to install access doors and panels.
- E. Obtain equipment submittal information for all pieces of equipment to be connected to from other trades that clearly indicates all connection requirements, locations, sizes, and similar requirements. Obtain this information in ample time to coordinate other trade submittals and equipment coordination. Where requirements differ from that on plans or differs from provisions made in the work, immediately notify the Architect/Engineer. Do not proceed with work that is incompatible with equipment provided.
- F. Coordinate, project and schedule work with other trades in accordance with the construction sequence.
- G. The Drawings show only the general run of piping and ductwork and approximate location of outlets. Any significant changes in location of items necessary in order to meet field conditions shall be brought to the immediate attention of the Architect/Engineer and receive his approval before such alterations are made. All such modifications shall be made without additional cost to the Owner.
- H. Adjust location of piping, ductwork, etc. to prevent interferences, both anticipated and encountered. Determine the exact route and location of each item prior to fabrication.

1. Right-of-Way:

- a. Lines that pitch have the right-of-way over those that do not pitch. For example: steam, condensate, and plumbing drains normally have right-of way. Lines whose elevations cannot be changed to have right-of-way over lines whose elevations can be changed.
- b. Make offsets, transitions and changes in direction in raceways as required to maintain proper headroom in pitch of sloping lines whether or not indicated on the Drawings.
- I. Wherever the work is of sufficient complexity, prepare additional Detail Drawings to scale similar to that of the bidding Drawings, prepared on tracing medium of the same size as Contract Drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the Drawings as to the area to which it applies. Submit for review Drawings clearly showing the work and its relation to the work of other trades before commencing shop fabrication or erection in the field.
- J. Coordinate with the local Utility Companies to their requirements for service connections and provide all necessary materials, labor and testing.
- K. Coordinate with contractors for work under other Divisions of this specification for all work necessary to accomplish this contractor's work.
- L. Conduct a coordination meeting after reviewing all other trade coordination drawings with other relevant trades. This meeting shall be held to prevent conflicts during construction. Each major relevant subcontractor shall attend this meeting. Report any potential conflicts or clearance problems to Architect/Engineer after meeting.

1.6. PROJECT MEETINGS

- A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated. Organize meeting with agenda and invite all pertinent attendees. Notify Architect and owner of relevant meetings. Record all decisions made and distribute minutes within 3 days of meeting.
- B. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.
 - 1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.
 - 2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
 - a. The Contract Documents.
 - b. Options.

- c. Related RFIs.
 - d. Related Change Orders.
 - e. Purchases.
 - f. Deliveries.
 - g. Submittals.
 - h. Possible conflicts.
 - i. Compatibility problems.
 - j. Time schedules.
 - k. Manufacturer's written recommendations.
 - l. Warranty requirements.
 - m. Compatibility of materials.
 - n. Space and access limitations.
 - o. Regulations of authorities having jurisdiction.
 - p. Testing and inspecting requirements.
 - q. Installation procedures.
 - r. Coordination with other work.
 - s. Required performance results.
 - t. Protection of adjacent work.
- 3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.
 - 4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.
 - 5. Do not proceed with installation if the conference cannot be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the Work and reconvene the conference at earliest feasible date.
- C. Coordination Meetings: Conduct Project coordination meetings at regular intervals. Project coordination meetings are in addition to specific meetings held for other purposes, such as progress meetings and preinstallation conferences.
- 1. Attendees: Each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work. Notify Architect of meeting.
 - 2. Agenda: Review and correct or approve minutes of the previous coordination meeting. Review other items of significance that could affect progress.
 - a. Combined Contractor's Construction Schedule: Review progress since the last coordination meeting. Determine whether each contractor is on time, ahead or behind schedule, in relation to Construction Schedule. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time. Discuss impact of various contractor schedules upon other contractors and how to remedy impacts.
 - b. Review present and future needs of each contractor present, including the following:
 - i. Interface requirements.
 - ii. Sequence of operations.
 - iii. Status of submittals.
 - iv. Deliveries.
 - v. Off-site fabrication.
 - vi. Access.
 - vii. Quality and work standards.
 - viii. Change Orders.
 - 3. Reporting: Record meeting results and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

1.7. REQUESTS FOR INTERPRETATION (RFIs)

- A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI.
 - 1. Submit Contractor's suggested solution(s) to RFI. If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
 - 2. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings,

and other information necessary to fully describe items needing interpretation.

PART 2 PRODUCTS (Not Used)

PART 3 EXECUTION (Not Used)

END OF SECTION 260505

SECTION 260519 – WIRE AND CABLE

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. Building wires and cables rated 600 V and less.
 - 2. Connectors, splices, and terminations rated 600 V and less.

1.3. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Qualification Data: For testing agency.
- C. Field quality-control test reports.

1.4. QUALITY ASSURANCE

- A. 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.
- B. Comply with NFPA 70.

1.5. COORDINATION

- A. Set sleeves in cast-in-place concrete, masonry walls, and other structural components as they are constructed.

PART 2 - PRODUCTS

2.1. CONDUCTORS AND CABLES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. General Cable Corporation.
 - 2. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
 - 1. Provide consistent color coding of all circuits as follows:

Phase	120/208	277/480
A	Black	Brown
B	Red	Orange
C	Blue	Yellow
N	White	Gray
Ground	Green w/ White Stripe	Green w/ Yellow Stripe

- D. Multiconductor Cable: Comply with NEMA WC 70 for metal-clad cable, Type MC with ground wire.

2.2. CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 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. Feeders: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Branch Circuits: Copper. Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.

3.2. CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Exposed Feeders: Type THHN-THWN, single conductors in raceway.
- C. Feeders Concealed in Ceilings, Walls, Partitions, and Crawlspace: Type THHN-THWN, single conductors in raceway.
- D. Feeders Concealed in Concrete, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- E. Exposed Branch Circuits, Including in Crawlspace: Type THHN-THWN, single conductors in raceway.
- F. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Type THHN-THWN, single conductors in raceway.
- G. Branch Circuits Concealed in Concrete, Block walls, below Slabs-on-Grade, and Underground: Type THHN-THWN, single conductors in raceway.
- H. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- I. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- J. Class 2 Control Circuits: Type THHN-THWN, in raceway or Power-limited cable, concealed in building finishes.
- K. Metal Clad (MC) cable installations shall be in accordance with the following:
 - 1. MC cable shall not be used for homeruns.
 - 2. MC cable may be used for light fixture and equipment whips in lengths no longer than 6'-0". The use of MC cable from lighting fixture to lighting fixture shall not be allowed.
 - 3. MC cable shall not be installed in exposed locations for lighting purposes. MC cable may be exposed in mechanical spaces for equipment whips.

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.
 - 1. Use oxide inhibitor in each splice and tap conductor for aluminum conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5. FIELD QUALITY CONTROL

- A. Perform tests and inspections and prepare test reports.
- B. Tests and Inspections:
 - 1. After installing conductors and cables and before electrical circuitry has been energized, test service entrance and feeder conductors for compliance with requirements.
 - 2. Test Reports: Prepare a written report to record the following:
 - a. Test procedures used.

- b. Test results that comply with requirements.
 - c. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements.
- C. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260520 – BASIC ELECTRICAL MATERIALS AND METHODS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS

Not Used

PART 3 - EXECUTION

3.1. NEUTRAL AND GROUND WIRES

- A. Where individual circuit homeruns (hots, neutral, and ground as part of a single circuit) are indicated on the plans serving lighting and branch circuit receptacle loads, these shall be individual circuits with individual neutrals (no sharing of neutrals and/or grounds).
- B. Where shared circuit homeruns (hots, neutral, and ground as part of separate circuits) are indicated on the plans, these shall be allowed to share one (common) ground for three (3) circuits from different phases occurring in one (1) conduit run. When additional circuits occur in conduit run, additional ground wires shall be installed. Conduit shall be upsized and conductors shall be de-rated based on NEC current carrying conductor tables, counting all hots and neutrals as current carrying conductors.
 - 1. No sharing of neutral conductors is allowed in multi-wire branch circuit homeruns, unless the installation meets the requirements of 2014 NEC 210.4(B), and is specifically approved by the engineer of record.

3.2. TESTS RECORDING, REPORTING TESTS AND DATA

- A. Record nameplate horsepower, amperes, volts, phase service factor and other necessary data on motors and other electrical equipment furnished and/or connected under this contract.
- B. Record motor starter catalog number, size and rating and/or catalog number of thermal-overload units installed in all motor starters furnished and/or connected under this contract. See motor starter specification for instructions for proper sizing of thermal-overload units.
- C. Record amperes-per-phase at normal or near-normal loading of each item of equipment furnished and/or connected.
- D. Record correct readings of each feeder conductor after energized and normally loaded, and again after balancing of feeder loads as required by current readings.
- E. Record voltage and ampere-per-phase readings taken at service entrance equipment after completion of project with building operating at normal electrical load.
- F. Short-Circuit Calculations
 - 1. Contractor shall contact utility company after utility company design is complete and determine exact available fault current in amperes at the point of utility connection (Service Point).
 - 2. Contractor shall utilize the above available fault current to calculate the available fault current in amperes (RMS-SYM) at the service equipment.
 - 3. The available fault current shall be labeled on the service equipment – refer to Section 260553.
- G. Submit at least two (2) typewritten copies of data noted above to Architect-Engineer for review prior to final inspection.
- H. Keep a record of all deviations made from routes, locations, circuiting, etc. shown on contract drawings. Prior to final inspection submit one new set of project drawings with all deviations and changes clearly indicated.

3.3. CLEANING AND PAINTING OF MATERIALS AND EQUIPMENT

- A. Before energizing switchboards, transformers, panelboards, starters, variable frequency drive and other similar electrical equipment, Contractor shall thoroughly vacuum out all dirt, dust and debris from inside of equipment and shall thoroughly clean outside and inside of equipment.
- B. Touch-up painting and refinishing of factory applied finishes shall be by Electrical Contractor. Contractor shall be responsible for obtaining proper type of painting materials and color from equipment manufacturer.
- C. Unless specified otherwise factory built equipment shall be factory painted. Paint shall be applied over surfaces only after they have been properly cleaned and coated with a corrosion resistant primer.
- D. After installation, damage to painted surfaces shall be properly prepared and primed with primers equal to factory materials. Finish coating shall be same color and type as factory finish.

- E. Where extensive refinishing is required equipment shall be completely repainted.

3.4. EXCAVATION AND BACKFILL

- A. Perform necessary excavation to receive work. Provide necessary sheathing, shoring, cribbing, tarpaulins, etc. for this operation, and remove at completion of work. Perform excavation in accordance with appropriate section of these specifications, and in compliance with OSHA Safety Standards.
- B. Excavate trenches of sufficient width to allow ample working space, and no deeper than necessary for installation work.
- C. Conduct excavations so no walls or footings are disturbed or injured.
- D. Backfill excavations made under or adjacent to footing with selected earth or sand and tamp to compaction required by A/E.
- E. Mechanically tamp backfill under concrete and pavings in 6" layers to 95% standard density, Reference Division 2.
- F. Backfill trenches and excavations to required heights with allowance made for settlement.
- G. Tamp fill material thoroughly and moistened as required for specified compaction density.
- H. Dispose of excess earth, rubble and debris as directed by Architect.
- I. When available, refer to test hole information on architectural drawings or specifications for types of soil to be encountered in excavations.

3.5. FIRE BARRIERS

- A. Provide sleeves through all fire-rated walls and fill voids surrounding sleeves and interior to sleeves around piping with Nelson "Flameseal" fire stop putty with U.L. listed 3 hour rating installed as per manufacturers recommendations.
- B. Equivalent by Dow, Chemelex, 3M.
- C. All holes or voids created by the electrical contractor to extend conduit or wiring through fire rated floors and walls shall be sealed with an intumescent material capable of expanding up to 8 to 10 times when exposed to temperatures of 250 degrees F. It shall have ICBO, BOCAI and SBCCI (NRB 243) approved ratings to 3 hours per ASTM E-814 (UL 1479). Acceptable Material: 3M Fire Barrier Caulk, Putty, Strip and sheet forms.

3.6. TEMPORARY COVERINGS

- A. Provide temporary covering over all electrical panels, distribution panelboards, outlet boxes and other equipment as required to keep same free from damage due to moisture, plaster, paint, concrete or other foreign materials. Any equipment with finish damaged by moisture, paint, plaster or other foreign materials shall be cleaned and refinished as directed by the Architect without additional cost to the Owner.
- B. All temporary openings in conduits shall be covered with metal or plastic caps.

3.7. PROTECTIVE COVERS

- A. Provide protective wire guards over all wall mounted and ceiling mounted devices subject to damage in areas such as gymnasiums, shops and similar occupancies.
- B. Provide lockable covers over thermostats and similar wall mounted devices where items are located in public spaces but should not be operable by the general public.

3.8. SLEEVES

- A. Provide proper type and size sleeves to General Contractor for electrical ducts, busses, conduits, etc. passing through building construction. Supervise installation to insure proper sleeve location. Unless indicated or approved install no sleeves in structural members.
- B. Unless specified otherwise provide 18 gauge galvanized sheet metal sleeves through floors and non-bearing walls. Where piping passes through exterior walls, equipment room walls, air plenum walls and walls between areas that must be isolated from occupied areas, seal space between sleeves and piping, air or water tight are required with Thunderline Corp. Link Seal.
- C. Provide O-Z Electrical Manufacturing Co., Inc. Type "FSK" or "WSK" or equivalent thruwall and floor seals where conduits pass through concrete foundation walls below grade.
- D. Provide Zurn Z-195 or equivalent flashing sleeve through walls and floors with waterproof membrane. Seal annular space between conduit and sleeve with Thunderline Link Seal or O-Z type CSM sealing bushing.

END OF SECTION 260520

SECTION 260526 – GROUNDING

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DESCRIPTION OF WORK

- A. Provide grounding electrodes, conductors, connections and equipment to provide a solidly grounded electrical system.

1.3. STANDARDS

- A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:
 - 1. Underwriters Laboratory Standard No. U.L. 467.
 - 2. ANSI C-1 1978.
 - 3. IEEE Standards No. 142-1982, 1100-1992 and No. 80.
 - 4. National Electrical Safety Code.
 - 5. NFPA.

1.4. SUBMITTALS

- A. Submit test reports certifying resistance values for buried or driven grounds and water pipe grounds.

PART 2 - PRODUCTS

2.1. MATERIALS

- A. Ground Cables: green color coded, insulated, annealed stranded tinned copper wire as indicated on Drawings; insulated wire to conform with requirements of Section 16120.
- B. Mechanical Connectors: Tin-plated aluminum alloy, UL approved and stamped for use with aluminum or copper conductors.
- C. Ground Rods:
 - 1. Copper-clad steel fabricated by molten welding process.
 - 2. Diameter: 5/8 Inch. Use 3/4" for rocky soil.
 - 3. Length: 8 feet.
- D. Ground Lugs and Connectors for Cable Tray: Tin-plated aluminum alloy suitable for use with aluminum or copper conductors.

2.2. GENERAL

- A. Grounding systems shall be installed in accordance with the requirements of the local authorities, and subject to the approval of the Architect/Engineer.
- B. All ground wires and bonding jumpers shall be stranded copper installed in conduit. All ground wires shall be without joints and splices over its entire length.
- C. The system neutral shall be grounded at the service entrance only, and kept isolated for grounding systems throughout the building.
- D. Each system of continuous metallic piping and ductwork shall be grounded in accordance with the requirements of the National Electrical Code.
- E. Mechanical equipment shall be bonded to the building equipment grounding system. This shall include but is not limited to, fans, pumps, chillers, etc.
- F. PVC conduits and portions of metallic piping and duct systems which are isolated by flexible connections, insulated couplings, etc., shall be bonded to the equipment ground with a flexible bonding jumper, or separate grounding conductor.
- G. Metal raceways, cable trays, cable armor, cable sheath, enclosures, frames, fittings and other metal noncurrent-carrying parts that are to serve as grounding conductors shall be effectively bonded where necessary to assure electrical continuity and the capacity to conduct safely any fault current likely to be imposed on them. Any nonconductive paint, enamel, or similar coating shall be removed at threads, contact points, and contact surfaces or be connected by means of fittings so designed as to make such removal unnecessary.

2.3. RECEPTACLES

- A. Receptacles shall be grounded to the outlet box by means of a bonding jumper between the outlet box and the receptacle grounding terminal.

2.4. CONCENTRIC KNOCKOUTS

- A. Provide grounding type bushings for conduits terminated through multiple concentric knockouts not fully knocked out, on inside of electrical enclosures. Install bonding jumper between ground bushing and enclosure

2.5. TOGGLE SWITCHES

- A. Provide grounding clip on each toggle switch. Mount over device mounting strap such that contact is made between mounting strap, screw, faceplate and outlet box.
- B. Provide devices with ground screw and bond to switch box.

2.6. GROUNDING METHODS

- A. The metal frame of the building, where effectively grounded.
- B. A metal underground water piping system used for grounding shall be in direct contact with the earth for ten feet or more and shall be electrically continuous. Provide bonding jumpers at water meter and at insulated joints.
- C. Steel reinforcing bars used for grounding shall be encased by at least two inches of concrete, located within and near the bottom of a concrete foundation or footing that is in direct contact with the earth. Reinforcing bars shall be minimum 1/2 inch diameter and consisting of twenty feet of one or more steel reinforcing bars.
- D. All bonding jumpers for the above grounding systems shall be sized in accordance with National Electrical Code.

PART 3 - EXECUTION

3.1. INSTALLATION

A. Ground Conductors:

- 1. Size as shown on Drawings or as required by National Electrical Code. Grounding conductors shall be as shown on plans or if not specifically shown shall be no smaller than that required by the NEC.
- 2. Where ground cables are required, install insulated copper ground conductors in steel conduit, or as indicated.
- 3. Where ground cable is installed in metallic conduit, bond cable to conduit at both ends.
- 4. Connect ground conductors in cables and in conduit to appropriate ground buses (as in switchgear, motor control centers, and distribution panelboards) or directly to metallic enclosure if no ground bus is provided.

B. Conduit Attachment to Electrical Equipment:

- 1. Ground conduits to metal framework of electrical equipment with double locknuts or grounding bushings and bonding jumpers unless otherwise noted.
- 2. Install bonding jumpers at all electrical equipment to provide continuous ground return path through conduit.
- 3. Install bonding jumpers across expansion fittings between conduit sections for ground path continuity.
- 4. Bond conduits to cable tray where conduit enters or exits tray.
- 5. Equipment grounding conductors for branch circuit home runs shown on the drawings shall indicate an individual and separate ground conductor for that branch circuit which shall be terminated at the branch circuit panelboard, switchboard, or other distribution equipment. No sharing of equipment grounding conductors sized according to the size of the overcurrent device and NEC Table 250-95 shall be allowed.
- 6. Required equipment grounding conductors and straps shall be sized in compliance with N.E.C. Table 250-95.
- 7. Equipment grounding conductors shall be provided with green type TW 600 volt insulation. Related feeder and branch circuit grounding conductors shall be connected to ground bus with approved pressure connectors.
- 8. Provide feeder servicing several panelboards with a continuous grounding conductor connected to each related panelboard ground bus. Installation shall include necessary precautions regarding terminations with dissimilar metals.

C. Circuiting

- 1. Provide low voltage distribution system with a separate green insulated equipment grounding

- conductor for each single or three-phase feeder.
 2. Single phase 120 volt branch circuits for lighting and power shall consist of phase and neutral conductors and a green ground conductor installed in common metallic conduit which shall serve as grounding conductor.
 3. Provide flexible metallic conduit utilized in conjunction with above single phase branch circuits with suitable green insulated grounding conductors connected to approved grounding terminals at each end of flexible conduit.
 4. Single phase branch circuit installed in nonmetallic conduits shall be provided with separate grounding conductor.
 5. Install grounding conductor in common conduit with related phase and/or neutral conductors.
 6. Where parallel feeders are installed in more than one raceway, each raceway shall have a green insulated equipment grounding conductor.
- D. Receptacles and Switches:
1. Install bonding jumpers between outlet box and receptacle grounding terminal except where contact device or yoke is provided for grounding purposes.
- E. Pull Boxes, Junction Boxes and Enclosures:
1. Connect all equipment grounding conductors together and connect to the box.

END OF SECTION 260526

SECTION 260550 – RACEWAYS AND BOXES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DESCRIPTION OF WORK

- A. Provide complete raceways systems, boxes and fittings for all required electrical systems.

1.3. STANDARDS

- A. Except as modified by governing codes and by the Contract Documents, comply with the latest applicable provisions and latest recommendations of the following:
 - 1. Rigid Steel Conduit
 - a. U.L. Standard UL-6
 - b. A.N.S.I. C80-1
 - c. Federal Specification WW-C-581E
 - 2. Intermediate Metallic Conduit
 - a. U.L. Standard UL-1242
 - b. Federal Specification WW-C-581E
 - 3. Electrical Metallic Tubing
 - a. U.L. Standard UL-797
 - b. A.N.S.I. C80-3
 - c. Federal Specification WW-C-563
 - 4. Flexible Steel Conduit
 - a. U.L. Standard UL-1
 - 5. Liquid Tight Flexible Conduit
 - a. U.L. Standard UL-360
 - 6. Non-Metallic Conduit
 - a. U.L. Standard UL-651
 - b. A.N.S.I. Standard F512
 - c. N.E.M.A. Standard TC-2
 - d. Federal Specifications GSA-FSS and W-C-1094-A
 - 7. Wireways and Auxiliary Gutters
 - a. U.L. Standard UL-870
 - 8. Rigid Aluminum Conduit
 - a. A.N.S.I. C80.5

1.4. SUBMITTALS

- A. Provide manufacturer's catalog cuts of fittings.
- B. Where wireways and/or auxiliary gutters are employed full erection drawings must be submitted. Drawings to include plan views, elevations, size of wireways, type and quantity of conductors proposed to be installed therein, etc.
- C. Submit shop drawings or catalog descriptive data on boxes exceeding twenty-four (24") inches for any one dimension.
- D. Submit shop drawings or catalog descriptive for floor boxes and accessories.

PART 2 - PRODUCTS

2.1. RACEWAY TYPES

A. Electrical Metallic Tubing

1. Continuous, seamless tubing, galvanized or sheradized on the exterior, coated on the interior with a smooth hard finish of lacquer, varnish, or enamel.
2. Couplings and connectors:
 - a. Indoor and two (2") inches in size and smaller, shall be steel set-screw type fittings.
 - b. 2-1/2 inch size and larger must employ steel compression gland fittings.
 - c. Outdoor shall be raintight steel compression gland fittings.
3. Indent type fittings shall not be used.
4. All connectors shall have insulated throat.
5. Where installed in slab or concrete work, provide approved concrete tight fittings.

B. Flexible Steel Conduit

1. Single strip, continuous, flexible interlocked, double-wrapped steel, galvanized inside and outside, forming smooth internal wiring channel.
2. Maximum length: (six 6) feet.
3. Each section of raceway must contain an equipment grounding wire bonded at each end and sized as required. Provide connectors with insulating bushings.
4. Steel squeeze-type or steel set screw type fittings.

C. Liquid Tight Flexible Electrical Conduit

1. Same as flexible steel conduit except with tough, insert water-tight plastic outer jacket.
2. Cast malleable iron body and gland nut, cadmium plated with one-piece brass grounding bushings which thread to interior of conduit. Spiral molded vinyl sealing ring between gland nut and bushing and nylon insulated throat.

D. Non-Metallic Raceway

1. Composed of polyvinyl chloride suitable for 90 degrees C. Provide rigid polyvinyl chloride (PVC) type EPC 40 heavy wall plastic conduit meeting current NEMA Standard TC-2. Conduit shall be listed UL 651 for underground and exposed use.
2. Raceway, fittings, and cement must be produced by the same manufacturer who must have had a minimum of ten (10) years experience in manufacturing the products.
3. Materials must have a tensile strength of 7,000-7,200 psi at 73.4 degrees F., flexural strength of 12,000 psi and compressive strength of 9,000 psi.
4. All joints shall be solvent cemented in accordance with the recommendations of the manufacturer.

E. Wireways and Auxiliary Gutters

1. Painted steel or galvanized steel.
2. Of sizes and shapes indicated on the Drawings and as required.
3. Provide all necessary elbows, tees, connectors, adapters, etc.
4. Wire retainers not less than twelve (12") inches on center.

F. Aluminum Conduit

1. Do not use aluminum conduit unless specifically indicated on the drawings for special purposes.

2.2. LOCKNUTS AND BUSHINGS

- A. Locknuts shall be steel. Die cast locknuts shall not be used.
- B. All bushings shall be insulated. Use nylon insulated metallic bushings for sizes 1" and larger. Plastic bushings may be used in 1/2" and 3/4" sizes.

2.3. OUTLET, JUNCTION, AND PULL BOXES

A. Cast Type Conduit Boxes, Outlet Bodies and Fittings

1. Provide surface mounted outlet and junction boxes, in indoor locations, where exposed to moisture and in outdoor locations.
2. Use Ferrous Alloy boxes and conduit bodies with Rigid Steel or IMC.
3. Use Ferrous Alloy or cast aluminum boxes and conduit bodies with Electrical Metallic Tubing.

4. Covers: Cast or sheet metal unless otherwise required.
 5. Tapered threads for hubs.
- B. Galvanized Pressed Steel Outlet Boxes
1. General
 - a. Pressed steel, galvanized or cadmium-plated, minimum of four (4") inches, octagonal or square, with galvanized cover or extension ring as required.
 2. Concrete Box
 - a. Four (4") inch octagon with a removable backplate and 3/8" fixture stud, if required. Depth of box shall allow for a minimum of one (1") inch of concrete to be poured above the backplate.
 3. Switch and Receptacle Box, Indoors
 - a. Nominal four (4") inches square, 1-1/2" or 2-1/2" deep as required, with raised cover unless otherwise indicated on drawings. Gangable boxes shall not be used.
 4. Data/Telephone outlet box, Indoors
 - a. Nominal four (4") inches square, 2-1/2" deep, with raised cover unless otherwise indicated on drawings. Gangable boxes shall not be used.
 5. Lighting Fixture Box
 - a. Four (4") inch octagon with 3/8" fixture stud.
 - b. For suspended ceiling work, four (4") inch octagon with removable backplate where required, and two (2) parallel bars for securing to the cross-furring channels and extend flexible conduit to each fixture.
 6. Plug any open knockouts not utilized.
- C. Sheet Steel Boxes Indoors
1. No. 12 USS gauge sheet steel for boxes with maximum side less than forty (40") inches, and maximum area not exceeding 1,000 square inches; riveted or welded 3/4 inch flanges at exterior corners.
 2. No. 10 USS gauge sheet steel for boxes with maximum side forty (40") to sixty (60") inches, and maximum area 1,000 to 1,500 square inches; riveted or welded 3/4 inch flanges at exterior corners.
 3. No. 10 USS gauge sheet steel riveted or welded to 1-1/2 by 1-1/2 by 1/4" welded angle iron framework for boxes with a maximum side exceeding sixty (60") inches and more than 1,500 square inches in area.
 4. Covers
 - a. Same gauge steel as box.
 - b. Subdivided single covers so no section of cover exceeds fifty (50) pounds.
 - c. Machine bolts, machine screws threaded into tapped holes, or sheet metal screws as required; maximum spacing twelve (12") inches.
 5. Paint
 - a. Rust inhibiting primer; ANSI No. 61 light gray finish coat.
 6. Where size of box is not indicated, size to permit pulling, racking and splicing of cables.
 7. For Boxes over 600 Volts
 - a. Provide insulated cable supports and removable steel barriers to isolate each feeder. Stencil cable voltage class in red letters on the front cover of the box.
 - b. Braze a ground connector suitable for copper cables to the inside of the box.
- D. Pull and Splice Boxes, Outdoors
1. Aluminum reinforced, with removable covers secured by brass machine screws.
 2. Where size of box is not indicated, size to permit pulling, racking, and splicing of the cables.
 3. Braze a ground connector suitable for copper cables to the inside of the box.

PART 3 - EXECUTION

3.1. APPLICATION OF RACEWAYS

- A. The following applications must be adhered to except as otherwise required by Code. Raceways not conforming to this listing must be removed by this Contractor and replaced with the specified material at this Contractors expense.
1. Rigid Steel - Application: Where exposed to mechanical injury, where specifically required, exterior exposed locations, and where required by codes and for all circuits in excess of 600 volts.
 2. I.M.C. - Application: Same as standard threaded rigid steel conduit.
 3. E.M.T. - Applications: Use in every instance except where another material is specified. EMT shall not be used underground or in slab on grade.
 4. Flexible Steel - Applications: Use in dry areas for connections to lighting fixtures in hung ceilings, connections to equipment installed in removable panels of hung ceilings at bus duct takeoffs, at all transformer or equipment raceway connections where sound and vibration isolation is required.
 5. Liquid-Tight Flexible Conduit - Applications: Use in areas subject to moisture where flexible steel is unacceptable at connections to all motors, and all raised floor areas.
 6. Non-Metallic Conduit - Application: Schedule 40 - Where specifically indicated on the drawings and for raceways in slab or below grade. All bends shall be made with steel elbows and wrapped unless the bend is encased in concrete.
 7. Wireways and Auxiliary Gutters - Application: Where indicated on the Drawings and as otherwise specifically approved.

3.2. RACEWAY SYSTEMS IN GENERAL

- A. Provide raceways for all wiring systems, including security, data transmission, paging, low voltage et. al. 277/480 volt wiring shall be kept independent of 120/208 volt wiring. Emergency system wiring shall be kept independent of the normal system wiring. Where non-metallic raceways are utilized, provide sizes as required with the grounding conductor considered as an insulated additional conductor. Wiring of each type and system must be installed in separate raceways.
- B. Install capped bushings on raceways as soon as installed and remove only when wires are pulled. Securely tie embedded raceway in place prior to embedment. Lay out the work in advance to avoid excessive concentrations of multiple raceway runs.
- C. Locate raceways so that the strength of structural members is unaffected and they do not conflict with the services of other trades. Install one (1") inch or larger raceways, in or through structural members (beams, slabs, etc.) only when and in the manner accepted by the Architect/Engineer. Draw up couplings and fittings full and tight.
- D. Install no conduits or other raceways sized smaller than permitted in applicable NEC Tables. Where conduit sizes shown on drawings are smaller than permitted by code, Contractor shall include cost for proper size conduit in his base bid. In no case reduce conduit sizes indicated on drawings or specified without written approval of Architect-Engineer. Minimum conduit size shall be 3/4".
- E. Above-grade raceways to comply with the following:
1. Install raceways concealed except at surface cabinets and for motor and equipment connection in electrical and mechanical rooms. Install a minimum of six (6") inches from flues, steam pipes, or other heated lines. Provide flashing and counter-flashing for waterproofing of raceways, outlets, fittings, etc., which penetrate the roof. Route exposed raceways parallel or perpendicular to building lines with right-angle turns and symmetrical bends. Run concealed raceways in a direct line and, where possible, with long sweep bends and offsets. Provide sleeves in forms for new concrete walls, floor slabs, and partitions for passage of raceways. Waterproof sleeved raceways where required.
 2. Raceways shall not be run on roofs or exposed on the outside of the buildings unless specifically noted as exposed on the drawings or approved by the Architect/Engineer.
 3. Provide raceway expansion joints for exposed and concealed raceways with necessary bonding conductor at building expansion joints and between buildings or structures and where required to compensate for raceway or building thermal expansion and contraction. Provide expansion fittings every 200 feet on outdoor conduit.
 4. Provide one (1) empty 3/4 inch raceway for each three (3) spare unused poles or spaces of each flush-mounted panelboard. Terminate empty 3/4 inch conduit in a junction box, which after completion, is accessible to facilitate future branch circuit extension.
 5. Provide raceway installation (with appropriate seal-offs, explosion-proof fittings, etc.) in special occupancy area, as required. Provide conduit seal-offs where portions of an interior raceway system pass through walls, ceiling, or floors which separate adjacent rooms having substantially different maintained temperatures, as in refrigeration or cold storage rooms.

6. Provide pull string in spare or empty raceways. Allow five (5) feet of slack at each end and in each pull box. Tie each end of the string to a washer or equivalent that does not fit into the conduit. Tag both ends of string denoting opposite end termination location.
- F. Below Grade
1. Below grade raceways to comply to the following:
 - a. Do not penetrate waterproof membranes unless proper seal is provided.
 2. Protect steel raceway in earth or fill with two (2) coats of asphalt base paint. Touch up abrasions and wrench marks after conduit is in place.
 3. In lieu of the above, protect steel raceways with a minimum of ten (10) mil tape approved for the purpose and overlapped a minimum of one-half tape width to provide a minimum twenty (20) mil thickness.
- G. No raceway may be installed in a concrete slab or members except with the permission of the Structural Engineer and with the written consent of the Owner.
1. Conduits embedded in structural concrete slabs shall have an outside diameter less than one third of the thickness of the concrete slab and shall be installed entirely within the center one third of the concrete slab.
 2. Raceways embedded in concrete slabs shall be spaced not less than eight (8") inches on centers and as widely spaced as possible where they converge at panels or junction boxes.
 3. In no case will installation of raceways be permitted to interfere with the proper placement of principal reinforcement.
 4. Raceways running parallel to slab supports, such as beams, columns, and structural walls, shall be installed not less than twelve (12") inches from such supporting elements.
 5. To prevent displacement during concrete pour of lift slab, saddle supports for conduit, outlet boxes, junction boxes, inserts, etc., shall be secured with suitable adhesives.
- H. Non-metallic raceway installation shall conform to the following:
1. All joints are to be made by the solvent cementing method using the material recommended by the raceway manufacturer. To insure good joints, components shall be cleaned prior to assembly.
 2. Raceway cut-offs shall be square and made by handsaw or other approved means which does not deform the conduit. Raceway shall be reamed prior to solvent cementing to couplings, adapters, or fittings.
 3. Electrical devices which are served by PVC raceways shall be grounded by means of a ground wire pulled in the raceway.
 4. Bends shall be made by methods that do not deform or damage the conduit. The radii of field bends shall not be less than those established by the N.E.C.
 5. Raceway expansion fittings shall be provided where necessary. The position of the expansion fitting shall be adjusted proportional to the temperature at installation.
 6. Raceway supports shall be installed, in such a manner, to allow the PVC conduit to slide through the supports as the temperature changes.
 7. Elbows must be galvanized rigid steel, intermediate metallic conduit or concrete encased. Plastic conduit may only be used for exterior underground applications or circuits beneath slabs on grade. Provide galvanized rigid steel (GRS) radius bends and risers as conduits rise above grade or above floor slab.
 8. Provide exterior underground conduit with metal detection strip.
 9. Provide matching plastic fittings. Fittings shall meet the same standards and specifications as the conduit on which it is installed.
 10. Joining and bending of conduit and installation of fittings shall be done only by methods recommended.
 11. Provide conduit support spacing as recommended for the highest ambient temperature expected.
 12. Provide interlocking conduit spacers for multiple runs of underground conduits installed in same trench.
 13. Provide expansion couplings on long runs regardless of ambient temperatures. Determine amount of conduit expansion and contraction from published charts or tables.
- I. Raceways in hung ceiling shall be run on and secured to slab or primary structural members of ceiling, not to lathing channels or T-bars, Z-bars, or other elements which are the direct supports of the ceiling panels. Secure conduit firmly to steel by clips and fittings designed for that purpose. Install as high as possible, but not less than 1'-0" above hung ceilings.
- J. Exposed raceways shall be run parallel or at right angles with building lines. Secure raceway clamps or supports to masonry materials by toggle bolts, expansion bolts, or steel inserts. Install raceway on steel

construction with approved clamps which do not depend on friction or set screw pressure alone.

- K. Clear raceway of all obstructions and dirt prior to pulling in wires or cables. This shall be done with ball mandrel (diameter approximately 85% of conduit inside diameter) followed by close fitting wire brush and wad of felt, or similar material. This assembly may be pulled in together with, but ahead of, the cable being installed. All empty raceways shall be similarly cleaned. Clear any raceway which rejects ball mandrel.
- L. Support raceways at intervals no greater than ten (10) feet and with one support within three (3) feet of each coupling, box, fitting, or outlet box. Provide one support within three (3) feet of each elbow or bend.

3.3. OUTLET, JUNCTION, AND PULLBOXES

- A. Provide outlet, junction, and pullboxes as indicated on the drawings and as required for the complete installation of the various electrical systems, and to facilitate proper pulling of wires and cables. J-boxes and pullboxes shall be sized per electrical code minimum. Boxes on empty conduit systems shall be sized as if containing conductors of #4 AWG.
- B. Install boxes and covers for wiring devices so that the wiring devices will be installed with a vertical orientation unless otherwise noted on the drawings.
- C. The exact location of outlets and equipment is governed by structural conditions and obstructions, or other equipment items. When necessary, relocate outlets so that when fixtures or equipment are installed, they will be symmetrically located according to the room layout and will not interfere with other work or equipment. Verify final location of outlets, panels equipment, etc., with Architect.
- D. Provide twenty four (24") inch (minimum) horizontal spacing for outlets shown on opposite sides of a fire rated wall and provide listed fire putty pads around the each box to maintain fire rating.
- E. Fit outlet boxes in finished ceilings or walls with appropriate covers, set flush with the finished surface. Where more than one switch or device is located at one point, use gang boxes and covers unless otherwise indicated. Sectional switch boxes or utility boxes will not be permitted. Provide Series "GW" (Steel City) tile box, or as accepted, or a four (4") inch square box with tile ring in masonry walls, which will not be plastered or furred. Where drywall material is utilized, provide plaster ring. Provide outlet boxes of the type and size suitable for the specific application. Where outlet boxes contain two (2) or more 277 volt devices, or where devices occur of different applied voltages, or where normal and emergency devices occur in same box, provide suitable barrier.
- F. Install top of switch outlet boxes 48" above floor unless otherwise called for or required by wainscot, counter, etc. Install bottom of receptacle outlet boxes 16" above floor unless otherwise called for on drawings. Adjust mounting heights to nearest masonry joint for minimum cutting in case of flush outlets.
- G. Install all wall mounted switch and receptacle boxes with bracing between two adjacent studs where rigid conduit is not used for circuiting. Box and receptacle shall not deflect on operation or insertion of plugs.
- H. Pull Box Spacing
 - 1. Provide pull boxes so no individual conduit run contains more than the equivalent of four (4) quarter bends (360 degrees total).
 - 2. Conduit Sizes 1-1/4" and Larger.
 - a. Provide boxes to prevent cable or wire from being excessively twisted, stretched, or flexed during installation.
 - b. Provide boxes for medium voltage cables so that maximum pulling tensions do not exceed cable manufacturer's recommendations.
 - c. Provide support racks for boxes with multiple sets of conductors do not rest on any metal work inside box.
 - 3. Conduit Sizes one (1") inch and smaller, low voltage wire and cable (maximum distances)
 - a. 200 feet straight runs.
 - b. 150 feet runs with one 90 degree bend or equivalent.
 - c. 125 feet runs with two 90 degree bends or equivalent.
 - d. 100 feet runs with three or four 90 degree bends or equivalent.

END OF SECTION 260533

SECTION 260553 – ELECTRICAL IDENTIFICATION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. DESCRIPTION OF WORK

- A. A. Provide identification on all equipment, raceways, boxes and conductors.

PART 2 - PRODUCTS

2.1. NAMEPLATES

- A. Nameplates shall be lamacoid plates with engraved upper-case letters and beveled edges.
- B. Color:
 - 1. Normal-power equipment shall have white nameplates with black letters, enclosed by a black border.
 - 2. Equipment fed from the emergency electrical system, or otherwise designated on the plans for emergency use, shall have red nameplates with white letters, enclosed by a white border.
 - 3. Equipment designated as clean/isolated ground power shall have orange nameplates with black letters, enclosed by black border.
 - 4. Nameplates for short circuit ratings and calculations shall be yellow with black letters, enclosed by black border.
- C. All nameplates shall be engraved and must be secured with rivets, brass or cadmium plate screws. The use of Dymo tape or the like is unacceptable.
- D. Nameplate inscriptions shall bear the name and number of equipment to which they are attached as indicated on the Drawings. The engineer reserves the right to make modifications in the inscriptions as necessary.

2.2. CABLE TAGS AND WIRE IDENTIFICATION LABELS

- A. Cable tags shall be flameproof secured with nylon ties.
- B. Wire markers shall be preprinted cloth tape type or approved equivalent.

2.3. IDENTIFICATION LABELS

- A. Acceptable Manufacturers
 - 1. W.H. Brady Company (Style A)
 - 2. Thomas & Betts Company (T&B), Style A.
 - 3. Seaton
- B. Plasticized Cloth
 - 1. Non-conductive.
 - 2. Waterproof.
 - 3. Capable of withstanding continuous temperatures of 235 degrees F and intermittent temperatures to 300 degrees F.
 - 4. Overcoating for protection against oil, solvents, chemicals, moisture, abrasion and dirt.
- C. Heavy, thermo-resistant industrial grade adhesive, for adhesion of label to any surface without curling, peeling or falling off.
- D. Label Designations, Nominal System Voltages Applied to the covers of all medium and low voltage pull, splice and junction boxes.
- E. Machine printed.

PART 3 - EXECUTION

3.1. INSTALLATION

- A. Panelboards and Load Centers.
 - 1. Furnish and install a nameplate for each panelboard and load center. Nameplate shall be engraved with the following information:
 - a. Top Line: Equipment identification as indicated on the Drawings.

- b. Middle Line: Specific device or equipment where feeder originates.
- c. Bottom Line: Equipment voltage, size, and phase as indicated on the drawings.
- d. Example:

PANELBOARD LN1
FED FROM SWITCHBOARD SWDP1 IN ROOM #332
208/120V, 200A, 3-PHASE

- 2. Nameplate shall be mounted at the top of the panel.
- 3. After installations are complete, provide and mount under sturdy transparent shield in the directory frame of each panel door, a neat, accurate, and carefully typed directory properly identifying the lighting, receptacles, outlets, and equipment each overcurrent device controls.
 - a. Include on directory the panel or load center identification, the cable and raceway size of panel feeder, and the feeder origination point.
- B. Disconnect Switches.
 - 1. Furnish and install a nameplate for each disconnect switch engraved with the equipment designation which the disconnect serves.
- C. Feeder Switches.
 - 1. Furnish and install for each feeder switch including, but not limited to those in switchboards, switch and fuse panelboards, take-offs at bus ducts, motor control centers, multiple meter centers, etc., two (2) nameplates as follows:
 - a. The first nameplate must be white background with red lettering. Engrave with the words "REPLACE ONLY WITH _____ FUSE." Engrave with proper fuse trade name and ampere rating (i.e. Bussman LPS-R 100).
 - b. The second nameplate shall indicate the load served, the size and type of cable and raceway example:
 - i. LP-4, LP-5, LP-6
 - ii. 4#500 KCMILS-THW-CU-3-1/2"C
- D. Pullboxes, Enclosures, and Cable Terminations.
 - 1. Circuits rated over 40 Amp and all cables over 600V:
- E. Provide identification label with circuit numbers on enclosure cover.
 - a. Furnish and install cable tags on each cable that enters a pullbox, enclosure, switchboard, and at terminations. Mark tags with type written inscription noting the load served, type and size of cable, and the overcurrent device protecting the cable.
- F. Branch circuits:
 - 1. Provide identification label with panel and circuit numbers on enclosure cover.
 - 2. Identify each circuit with wire markers when enclosure label and wire colors do not provide enough information to identify each circuit without tracing.
 - 3. Provide feeders and branch circuit home runs with plasticized wire marker indicating circuit number and power source. Provide feeders phase identification letter at each terminal point in addition to its circuit number.
 - 4. 4 square box covers hidden above lay-in ceilings may be marked with indelible ink marker in lieu of using printed labels.
- G. Fire Alarm Terminal Cabinets.
 - 1. Furnish and install an approved nameplate on each fire alarm terminal cabinet.
 - 2. Nameplates shall indicate floor and where multiple terminal cabinets are installed a prime designation for each cabinet (e.g. FATC-1A, FATC-1B).
 - 3. Terminals shall be permanently identified in an approved manner.
 - 4. Label all wiring.
- H. Telecommunications System.
 - 1. Each horizontal cable from a termination block or patch panel to a telecommunications outlet shall be

labeled at both ends. Tags shall be consecutively numbered so that no two (2) cables have the same identification. In addition cable tag shall note the room number in which the data transmission outlet is located.

2. Each backbone cable shall have a flameproof tag attached at both ends of the tag. Tags shall be consecutively numbered so that no two (2) cables have the same identification. Additional inscriptions shall be provided as directed by the Owner.
3. Patch panel ports shall be consecutively numbered so that no two (2) ports have the same number.

I. Warning Signs

1. Provide electrical equipment and accessible wiring enclosures operating at voltage above 240 volts with self-sticking polyester sign with wording and size conforming to ANSI Standard Z35.1-1964 and OSHA 19.0.144iii(2) Specifications "Danger High Voltage" warning sign and voltage marker applied to front door or cover of device or enclosure.
2. Provide large equipment such as transformers and main distribution equipment with self-sticking polyester sign with wording and size conforming to ANSI Standard Z35.1-1964 and OSHA 19.0.144iii(2) Specifications indicating all electrical characteristics.

J. Boxes

1. Provide identification labels for all low voltage and medium voltage pull, splice and junction boxes in main feeder and subfeeder runs, indicating nominal system voltage.
2. Apply labels after painting of boxes, conduits, and surrounding areas have been completed.
3. Clean surfaces before applying labels; clean aluminum surfaces with solvent wipe.
4. Apply labels on cover and minimum of one (1) fixed side; one (1) label visible from floor where boxes are installed exposed.

END OF SECTION 260553

SECTION 260923 – LIGHTING CONTROL DEVICES

PART 1 GENERAL

1.1. SUMMARY

- A. This Section includes the following lighting control devices:
 - 1. Time switches.
 - 2. Outdoor photoelectric switches.
 - 3. Indoor occupancy sensors.
 - 4. Lighting contactors.
 - 5. Emergency shunt relay.

1.2. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Field quality-control test reports.
- C. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. 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.

PART 2 PRODUCTS

2.1. TIME SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. GE
 - 2. Intermatic, Inc.
 - 3. Leviton.
 - 4. Lithonia Lighting.
 - 5. Paragon Electric Co.
 - 6. Square D.
 - 7. TORK.
 - 8. Watt Stopper.
- B. Electronic Time Switches: Electronic, solid-state programmable units with alphanumeric display; complying with UL 917.
 - 1. Contact Configuration: SPST.
 - 2. Contact Rating: 30-A inductive or resistive, 240-V ac.
 - 3. Retain one of first three subparagraphs below.
 - 4. Program: 8 on-off set points on a 24-hour schedule and an annual holiday schedule that overrides the weekly operation on holidays.
 - 5. Circuitry: Allow connection of a photoelectric relay as substitute for on-off function of a program.
 - 6. Astronomic Time: All channels.
 - 7. Battery Backup: For schedules and time clock.

2.2. INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper (Greengate)
 - 2. Hubbell Lighting.
 - 3. Leviton Mfg. Company Inc.
 - 4. Philips Controls
 - 5. Sensor Switch, Inc.
 - 6. Steinel
 - 7. Watt Stopper.
- B. General Description: Wall- or ceiling-mounting, solid-state units with a separate relay unit.
 - 1. Operation: Unless otherwise indicated, turn lights on when covered area is occupied and off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 15 minutes.

2. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor shall be powered from the relay unit.
 3. Relay Unit: Dry contacts rated for 20-A ballast load at 120- and 277-V ac, for 13-A tungsten at 120-V ac, and for 1 hp at 120-V ac. Power supply to sensor shall be 24-V dc, 150-mA, Class 2 power source as defined by NFPA 70.
 4. Mounting:
 - a. Sensor: Suitable for mounting in any position on a standard outlet box.
 - b. Relay: Externally mounted through a 1/2-inch knockout in a standard electrical enclosure.
 - c. Time-Delay and Sensitivity Adjustments: Recessed and concealed behind hinged door.
 5. Indicator: LED, to show when motion is being detected during testing and normal operation of the sensor.
 6. Bypass Switch: Override the on function in case of sensor failure.
 7. Automatic Light-Level Sensor: Adjustable from 2 to 200 fc; keep lighting off when selected lighting level is present.
- C. PIR Type: Ceiling mounting; detect occupancy by sensing a combination of heat and movement in area of coverage.
1. Detector Sensitivity: Detect occurrences of 6-inch- minimum movement of any portion of a human body that presents a target of not less than 36 sq. in..
 2. Detection Coverage (Room): Detect occupancy anywhere in a circular area of 1000 sq. ft. when mounted on a 96-inch- high ceiling.
 3. Detection Coverage (Corridor): Detect occupancy within 90 feet when mounted on a 10-foot- high ceiling.

PART 3 EXECUTION

3.1. SENSOR INSTALLATION

- A. Install and aim sensors in locations to achieve not less than 90 percent coverage of areas indicated. Do not exceed coverage limits specified in manufacturer's written instructions.
- B. When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting sensors to suit actual occupied conditions. Provide up to two visits to Project during other than normal occupancy hours for this purpose.

3.2. CONTACTOR INSTALLATION

- A. Mount electrically held lighting contactors with elastomeric isolator pads, to eliminate structure-borne vibration, unless contactors are installed in an enclosure with factory-installed vibration isolators.

3.3. IDENTIFICATION

- A. Identify components and power and control wiring according to Division 26 Section "Identification for Electrical Systems."
 1. Identify controlled circuits in lighting contactors.
 2. Identify circuits or luminaires controlled by photoelectric and occupancy sensors at each sensor.
- B. Label time switches and contactors with a unique designation.

3.4. FIELD QUALITY CONTROL

- A. Perform the following field tests and inspections and prepare test reports:
 1. After installing time switches and sensors, and after electrical circuitry has been energized, adjust and test for compliance with requirements.
 2. Operational Test: Verify operation of each lighting control device, and adjust time delays.
- B. Lighting control devices that fail tests and inspections are defective work.

END OF SECTION 260923

SECTION 262726 – WIRING DEVICES

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: List of legends and description of materials and process used for premarking wall plates.
- C. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.3. QUALITY ASSURANCE

- A. 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.
- B. Comply with NFPA 70.

PART 2 PRODUCTS

2.1. GENERAL

A. Manufacturers

- 1. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - a. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - b. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - c. Leviton Mfg. Company Inc. (Leviton).
 - d. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).
- 2. All devices shall be from the same manufacturer.

B. Finishes

- 1. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - a. Wiring Devices Connected to Normal Power System: Grey, unless otherwise indicated or required by NFPA 70 or device listing.
 - i. Color shall be coordinated and verified with Architect and owner.
 - b. Wiring Devices Connected to Emergency Power System: Red.

2.2. STRAIGHT BLADE RECEPTACLES

A. General Requirements for Convenience Receptacles

- 1. Unless otherwise modified below, all receptacles shall comply with the following:
- 2. Commercial / Common Areas: 125 V, 20 A
- 3. Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
- 4. Multiple types of receptacles may be required of a single device (Ex.: a Hospital-Grade GFCI receptacle), as indicated on the plans and in the execution section below. Where such a device is required, it shall meet the requirements of all applicable sections below.
- 5. 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).

B. Controlled Receptacles

- 1. Controlled outlet(s) shall be marked with a "power symbol" in accordance with NEC 406.3.
- 2. Receptacles shall be split-wired (half controlled, half 'hot').

3. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; 5362CH (controlled half duplex).
- b. Leviton; 5362-S1 (split duplex).
- c. Pass & Seymour; 5362CH (controlled half duplex).

C. GFCI Receptacles

1. Straight blade, feed or non-feed-through type.
2. Include indicator light that is lighted when device is tripped.
3. Where devices are shown labeled as GFI on drawings provide GFCI receptacle (feed-through devices are not acceptable unless otherwise noted, or with written permission from the engineer).
4. Devices labeled as GFIP on the drawings may be protected as a feed-through device.
5. Multiple GFCI receptacles within dwelling units, where shown on the plans to be on the same circuit, may be protected with a single GFCI receptacle.

D. Weather-Resistant Receptacles

1. Receptacles shall UL-listed as weather-resistant.
2. Receptacles shall be identified with an "WR" on the receptacle face.

2.3. SNAP SWITCHES

A. Comply with NEMA WD 1 and UL 20.

B. Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Catalog numbers in subparagraphs below are for 20-A devices; revise catalog numbers if 15-A devices are desired.
- b. Cooper; 2221 (single pole), 2222 (two pole), 2223 (three way), 2224 (four way).
- c. Hubbell; CS1221 (single pole), CS1222 (two pole), CS1223 (three way), CS1224 (four way).
- d. Leviton; 1221-2 (single pole), 1222-2 (two pole), 1223-2 (three way), 1224-2 (four way).
- e. Pass & Seymour; 20AC1 (single pole), 20AC2 (two pole), 20AC3 (three way), 20AC4 (four way).

C. Pilot Light Switches, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; 2221PL for 120 V and 277 V.
- b. Hubbell; HPL1221PL for 120 V and 277 V.
- c. Leviton; 1221-PLR for 120 V, 1221-7PLR for 277 V.
- d. Pass & Seymour; PS20AC1-PLR for 120 V.

2. Description: Single pole, with neon-lighted handle, illuminated when switch is "ON."

D. Key-Operated Switches, 120/277 V, 20 A:

1. Products: Subject to compliance with requirements, provide one of the following:

- a. Cooper; 2221L.
- b. Hubbell; HBL1221L.
- c. Leviton; 1221-2L.
- d. Pass & Seymour; PS20AC1-L.

2. Description: Single pole, with factory-supplied key in lieu of switch handle.

2.4. OCCUPANCY SENSORS

A. Wall-Switch Sensors:

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; 6111 for 120 V, 6117 for 277 V.
- b. Hubbell; WS1277.
- c. Leviton; ODS 10-ID.
- d. Pass & Seymour; WS3000.
- e. Steinel; IL WLS 1.

- f. Watt Stopper (The); PW-101.
 - 2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 180-degree field of view, with a minimum coverage area of 900 sq. ft..
- B. Long-Range Wall-Switch Sensors:
 - 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. Hubbell; ATP1600WRP.
 - b. Leviton; ODWWV-IRW.
 - c. Pass & Seymour; WA1001.
 - d. Steinel; IL WLS 1
 - e. Watt Stopper (The); CX-100.
 - 2. Description: Passive-infrared type, 120/277 V, adjustable time delay up to 30 minutes, 110-degree field of view, with a minimum coverage area of 1200 sq. ft..

2.5. 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 Finished Spaces: 0.035-inch-thick, satin-finished stainless steel.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. 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 weather-resistant, die-cast aluminum with lockable in-use cover.

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. Pigtail existing conductors is permitted provided the outlet box is large enough.
- D. Receptacle Types:
 - 1. The following receptacle types shall be furnished in lieu of "standard" 120V, 15 or 20 amp receptacles at all of the following locations, regardless of plan designation:
 - a. Refer to the National Electrical Code (NEC), for definitions of all locations listed below.
 - 2. GFCI Receptacles:

- a. Within the following locations in dwelling units:
 - i. Bathrooms
 - ii. Garages
 - iii. Crawl Spaces and Unfinished Areas of Basements
 - iv. Above-counter receptacles in Kitchens
 - v. Where located within 6'-0" of a sink.
 - vi. Laundry Areas
 - vii. Where installed to serve a dishwasher.
 - b. Bathrooms / Locker Rooms
 - c. Kitchens (unless circuit is provided with GFCI protection at the circuit breaker)
 - d. Rooftops
 - e. Outdoors
 - f. Where located within 6'-0" of a sink.
 - g. Garages, Service Bays, etc.
 - h. Unfinished areas.
3. Weather-Resistant Receptacles:
- a. In all damp or wet locations.
- E. 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.
 - 10. Wall plates shall not support wiring devices. Provide wiring device with accessories as required to properly install devices and wall plates.
 - 11. All devices shall be flush-mounted except as otherwise noted on the drawings.
 - 12. Locations
 - a. Comply with layout drawings for general location; contact Owner's Representative for questions about locations and mounting methods.
 - b. Relocate outlets obviously placed in a location or manner not suitable to the room finish.
 - c. Avoid placing outlets behind open doors.
 - d. Align devices vertically and horizontally. Device plates shall be aligned vertically with tolerance of 1/16". All four edges of device plates shall be in contact with the wall surface.
 - 13. Mounting Heights as indicated on the Drawings and according to ADA requirements.
 - 14. Ganging of Switches - provide barriers between ganged 277 volt switches of different phases.
 - 15. Power Outlets - install power outlets complete with back boxes, where installed in existing buildings or extensions of existing buildings. Coordinate phase connections for rotating equipment with connections in existing building.
 - 16. Install device plates on all outlet boxes. Provide blank plates for all empty, spare and boxes for future devices.
 - 17. Caulk around edges of outdoor device plates and boxes when rough wall surfaces prevent a raintight seal. Use caulking material as approved by the Architect/Engineer.
- F. Receptacle Orientation:
- 1. Install ground pin of vertically mounted receptacles up.
- G. Device Plates:

1. 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.
2. Provide matching blank wall plates to cover outlet or junction boxes intended for future devices.
3. Provide matching blank wall plates with 4 port knock outs at all telephone, data, and tele/data outlet locations. Also provide with matching blankouts in each port.
4. Where wall plates for special devices are available only from manufacturer of device, provide designs and finishes equivalent to above specification.
5. Verify with Architect finish of any plate where it may be apparent a special finish or color should have been specified.

H. Switches

1. Where switches are indicated to be installed near doors, corner walls, etc., mount same not less than 2 inches and not more than 18 inches from trim. Verify exact locations with the Architect.
2. Carefully coordinate the location of switches to insure locations at the strike side of doors.
3. Furnish and install an engraved legend for each switch that controls exhaust fans, motors, equipment systems, etc., not located within sight of the controlling switch.

I. Dimmers:

1. Install dimmers within terms of their listing.
2. Verify that dimmers used for fan speed control are listed for that application.
3. Install unshared neutral conductors on line and load side of dimmers according to manufacturers' device listing conditions in the written instructions.

- J. 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. IDENTIFICATION

A. Comply with Division 26 Section "Identification for Electrical Systems."

1. Receptacles: Identify panelboard and circuit number from which served. Use hot, stamped or engraved machine printing with black-filled lettering on face of plate, and durable wire markers or tags inside outlet boxes.

3.3. FIELD QUALITY CONTROL

A. Perform tests and inspections and prepare test reports.

1. Test Instruments: Use instruments that comply with UL 1436.

B. Tests for Convenience Receptacles:

1. Test for correct wire terminations (no open ground, neutral, or hot).
2. Test for correct polarity (no hot/ground reverse or hot/neutral reverse).
3. Verify GFCI devices are operating properly.
4. Using the test plug, verify that the device and its outlet box are securely mounted.

END OF SECTION 262726

SECTION 262813 – FUSES

PART 1 GENERAL

1.1. SUBMITTALS

- A. First paragraph below is defined in Division 01 Section "Submittal Procedures" as an "Action Submittal."
- B. Product Data: For each type of product indicated.
- C. Paragraph below is defined in Division 01 Section "Submittal Procedures" as an "Informational Submittal."
- D. Operation and maintenance data.

1.2. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NEMA FU 1 for cartridge fuses.
- C. Comply with NFPA 70.

PART 2 PRODUCTS

2.1. FUSES

A. PRODUCT

- 1. Provide fuses by Bussman or Gould Shawmut.
- 2. Provide fuses of same characteristics as scheduled to insure selective coordination of power system.
- 3. Fuses 601 amp and larger shall be U/L Class L with minimum four (4) seconds time delay at 500% rating.
- 4. Fuses 600 amp and below shall be U/L Class J, RK-1 or RK-5 as scheduled time delay sized as shown on drawings or schedules.
- 5. Special temperature conditions, motors, motor loads or other conditions requiring other types or sizes of fuses must be reviewed by the Contracting Officer. Fuse reducers are not permitted.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install fuses only after installation is complete and final tests and inspections have been made. Label fuses, switches and other fused devices with warning labels affixed in prominent location indicating type and size of fuse installed and fuse manufacturer's catalog number.
- B. Furnish Owner with spare fuses of each size and type installed on job as follows:
 - 1. 601 Amps or Larger - three (3) of each size and type
 - 2. 600 Amps or Less - 10% with minimum of three (3) of each size and type
- C. For fuse types and ampacities, see plans.
- D. Provide spare fuse cabinet with three shelves.
- E. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.

END OF SECTION 262813

SECTION 262816 – ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated.
- B. Shop Drawings: For enclosed switches and circuit breakers. Include plans, elevations, sections, details, and attachments to other work.
 - 1. Wiring Diagrams: For power, signal, and control wiring.
- C. Field quality-control reports.
- D. Operation and maintenance data.

1.3. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1. DISCONNECT SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton (Cutler-Hammer)
 - 2. General Electric Company
 - 3. Siemens
 - 4. Square D
- B. Type HD, Heavy Duty, Single Throw, 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: Suitable for number, size, and conductor material.
 - 4. Service-Rated Switches: Labeled for use as service equipment.

2.2. FUSIBLE SWITCHES

- A. Refer to disconnect switches for all requirements in addition to the following.
- B. Switches shall be furnished with clips or bolt pads to accommodate indicated fuses.
- C. Fuse holders shall be completely accessible from front of switch and fuses shall be installed so that the label may be easily read from the front and without removing the fuse.
- D. Accessories:
 - 1. Class R Fuse Kit: Provides rejection of other fuse types when Class R fuses are specified.

2.3. MOLDED-CASE CIRCUIT BREAKERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Eaton (Cutler-Hammer)
 - 2. General Electric Company
 - 3. Siemens
 - 4. Square D
- B. General Requirements: Comply with UL 489, NEMA AB 1, and NEMA AB 3, with interrupting capacity to comply with available fault currents.
- C. 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.

- D. Electronic Trip Circuit Breakers (where indicated on drawings or elsewhere in this specification): Field-replaceable rating plug, rms sensing, with the following field-adjustable settings:
 - 1. Instantaneous trip.
 - 2. Long- and short-time pickup levels.
 - 3. Long- and short-time time adjustments.
 - 4. Ground-fault pickup level, time delay, and I₂t response.
- E. Features and Accessories (where called for or required):
 - 1. Standard frame sizes, trip ratings, and number of poles.
 - 2. Lugs: Suitable for number, size, trip ratings, and conductor material.
 - 3. Application Listing: Appropriate for application; Type SWD for switching fluorescent lighting loads; Type HID for feeding fluorescent and high-intensity discharge lighting circuits.
 - 4. Ground-Fault Protection: Comply with UL 1053; integrally mounted, self-powered type with mechanical ground-fault indicator; relay with adjustable pickup and time-delay settings, push-to-test feature, internal memory, and shunt trip unit; and three-phase, zero-sequence current transformer/sensor.
 - 5. Shunt Trip: Trip coil energized from separate circuit, with coil-clearing contact.
 - 6. Auxiliary Contacts: Two SPDT switches with "a" and "b" contacts; "a" contacts mimic circuit-breaker contacts, "b" contacts operate in reverse of circuit-breaker contacts.

2.4. 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 and Wash-Down Areas: NEMA 250, Type 4X, stainless steel.
 - 4. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 - 5. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 EXECUTION

3.1. INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Comply with mounting and anchoring requirements specified in Division 26 Section "Vibration and Seismic Controls for Electrical Systems."
- C. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- D. Install fuses in fusible devices.
- E. Comply with NECA 1.

3.2. IDENTIFICATION

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems."
 - 1. Identify field-installed conductors, interconnecting wiring, and components; provide warning signs.
 - 2. Label each enclosure with engraved metal or laminated-plastic nameplate.

3.3. FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Acceptance Testing Preparation:
 - 1. Test insulation resistance for each enclosed switch and circuit breaker, component, connecting supply, feeder, and control circuit.
 - 2. Test continuity of each circuit.
- C. 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.

- D. Enclosed switches and circuit breakers will be considered defective if they do not pass tests and inspections.
- E. Prepare test and inspection reports, including a certified report that identifies enclosed switches and circuit breakers and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.

END OF SECTION 262816

SECTION 265100 – LUMINAIRES, LAMPS AND BALLASTS

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500.
- B. Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SUBMITTALS

- A. Product Data:
 - 1. Arrange in order of luminaire designation.
 - 2. Include data on features, accessories, and finishes.
 - 3. Include physical description and dimensions of luminaires.
 - 4. Include emergency lighting units, including batteries and chargers.
 - 5. Include life, output (lumens, CCT, and CRI), and energy efficiency data.
 - 6. Photometric data and adjustment factors based on laboratory tests
- B. Shop Drawings: Show details of nonstandard or custom lighting fixtures. Indicate dimensions, weights, methods of field assembly, components, features, and accessories.
- C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, signed by product manufacturer.
- D. Field quality-control test reports.
- E. Seismic Qualification Certificates: For luminaires, accessories, and components, from manufacturer.
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculation.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of gravity and locate and describe mounting and anchorage provisions.

PART 2 - PRODUCTS

2.1. INSPECTION

- A. Prior to installation of luminaires Electrical Contractor shall inspect luminaire and verify unit meets or exceeds specifications, is new and unused without damage or defect and is suitable for the intended service.
- B. See architectural and electrical plans for luminaire locations, coordinate installation with other trades. At the completion of the project all luminaires shall be aligned, level and cleaned to the satisfaction of the A/E.

2.2. EQUIVALENT MANUFACTURERS

- A. The following light fixture manufacturers are generally approved equals to those manufacturers listed in the Lighting Fixture Schedule on the drawings. The approval herein no way relieves the contractor of meeting all specification requirements. All light fixtures substituted for fixtures specified on drawings must conform in materials, dimensions, appearance, performance, and be of equal quality to the fixture specified and described in the Lighting Fixture Schedule. Fixture manufacturers not listed here must be submitted and approved a minimum of 10 days prior to bid.
- B. Provide luminaires by the following manufacturers:
- C. Downlights:
 - 1. Category 1: (Only Category 1 fixtures may be substituted for Category 1 fixtures specified on the drawings). Calculite, Edison Price, Focal Point, Kirlin, Kurt Versen, Rambusch, RSA, USA Lighting
 - 2. Category 2: (Category 1 or Category 2 fixtures may be substituted for Category 2 fixtures specified on the drawings). Elite, Halo, Hubbell, Indy, Intense, Lightolier, Lithonia, Marko, Nulite, Pathway, Prescolite, Portfolio, Spectrum, Williams, Zumtobel
- D. LED/Fluorescent Troffer Type: Columbia, Cooper (Metalux), Daybrite, Elite, Finelite, Focal Point, Lithonia, Williams
 - 1. Equivalent troffers shall be considered the following: Columbia (PS Series), Cooper (Metalux GC Series), Daybrite (SP Series), Elite (OT Series), Finelite (HPR Series), Lithonia (SP Series), Williams (50 Series)
- E. Undercounter: Columbia, Color Kinetics, Daybrite, Elite, Fail-Safe, Lithonia, Metalux, Nulite, WAC, Williams
- F. Strip Fluorescents: Birchwood, Columbia, Daybrite, Elite, Lithonia, Metalux, Paramount, Prudential, Williams

- G. Specialty Lights: Advent, Baselite, Bega, Beta Calco, Casey Architectural, Cole, Design Plan, Engineered Lighting Products, Focal Point, G Lighting, iGuzzini, Interlux, Juno, Justice Design, Kramer, Louis Poulson, Lighting Services Inc., Neoray, Prudential, Sharper, SPI, Manning, MP Lighting, Sistemalux, Sterner, Tivoli, Trend Lighting, Trimblehouse, Visa, Visual Lighting Technologies, WAC, Winona, Zaneen, Zumtobel
- H. Exit Signs and Emergency Lights: Beghelli, Chloride, Concealite, Devine, Dual-Lite, EELP, Elite, Emergi-Lite, Evenlite, Exitronix, Fail-Safe, Hubbell, Lithonia, Prescolite, Surelites, Williams.
- I. Outdoor: ABS Lighting, Antique Street Lights, Architectural Area Lighting, Bega, Beta Calco, Daybrite, Devine, Excelsior, Gardco, G.E., Hadco, Hubbell, Holophane, Hydrel, Invue, Kim, King Luminaire, Lithonia, LSI Lighting Systems, Lumark, Lumec, Lumiere, Lumenton, McGraw-Edison, McPhilben, Ruud, Sterner, Stonco, Sun Valley Lighting, US Architectural, Vista Pro, Williams.
- J. LED lamps and Modules: Philips, General Electric, Osram/Sylvania, Cree, Nichia.
- K. LED Power Supplies: Osram/Sylvania, General Electric, Philips.

2.3. LUMINAIRES

- A. Provide luminaires complete with lamps and accessories required for hanging. Contractor shall insure that lamps, reflector lens and trim are clean at time of final inspection. Mount recessed luminaires with trim flush to ceilings, free of gaps or cracks.
- B. Coordinate mounting of ceiling mounted luminaires with General Contractor. Where additional supports are required due to luminaire location or weight, electrical contractor shall provide supports, unless otherwise specified under ceiling specifications.
- C. Consult architectural plans and existing conditions where applicable for ceiling types and provide surface and recessed lighting fixtures with appropriate mounting components and accessories. Verify mounting requirements prior to ordering and shop drawing submission.
- D. Fixtures mounted in fire rated ceilings shall be provided and installed with fire rated enclosures to maintain ceiling integrity. Provide engineered products by EZ-Barrier, Tenmat or similar products or provide enclosures fabricated in accordance with building code and UL requirements. Maintain all fixture required heat sink and other clearances.
- E. Provide troffer luminaires with the following devices wherever possible and not specified otherwise on the luminaire schedule: cam latches, 100% door gasketing, post fabrication painted finish, t-bar clips, lens clips, suspension tabs, and a minimum of 0.125" lens.

2.4. LAMPS

- A. Lamps shall be lamp types recommended by luminaire manufacturer. Lamp no fixtures above manufacturers recommended maximum wattages.
- B. Incandescent lamps shall be inside frosted (IF) type unless otherwise called for in luminaire schedule.
- C. Low-Mercury Fluorescent Lamps: Comply with EPA's toxicity characteristic leaching procedure test; shall yield less than 0.2 mg of mercury per liter when tested according to NEMA LL 1.
- D. T8 Rapid-Start low-mercury Fluorescent Lamps: Rated 32 W maximum, nominal length 48 inches, 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 4100 K, and average rated life 20,000 hours, unless otherwise indicated.
- E. T5 rapid-start low-mercury lamps, rated 28 W maximum, nominal length of 45.2 inches, 2900 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life of 20,000 hours, unless otherwise indicated.
- F. T5HO rapid-start, high-output low-mercury lamps, rated 54 W maximum, nominal length of 45.2 inches, 5000 initial lumens (minimum), CRI 85 (minimum), color temperature 4100 K, and average rated life of 20,000 hours, unless otherwise indicated.
- G. Compact Fluorescent Lamps: 4-Pin, low mercury, CRI 80 (minimum), color temperature 4100 K, average rated life of 10,000 hours at 3 hours operation per start, and suitable for use with dimming ballasts, unless otherwise indicated.
- H. Equivalent lamps by General Electric, Venture, Phillips, Sylvania, or Eiko.

2.5. FLUORESCENT BALLASTS

A. BALLASTS FOR LINEAR FLUORESCENT LAMPS

- 1. Electronic Ballasts: Comply with ANSI C82.11; instant and programmed-start type, unless otherwise indicated, and designed for type and quantity of lamps served. Ballasts shall be designed for full light output unless dimmer or bi-level control is indicated. 120/277 dual rated.
 - a. Sound Rating: A.
 - b. See Evaluations for discussion of harmonic considerations.
 - c. Total Harmonic Distortion Rating: Less than 10 percent.
 - d. Transient Voltage Protection: IEEE C62.41, Category A or better.

- e. Consider specifying the higher frequency in subparagraph below if fixtures with default ballasts are used in proximity to infrared sensors.
 - f. BF: 0.88 or higher.
 - g. Power Factor: 0.98 or higher.
 - h. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C 82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.
2. Electronic Programmed-Start Ballasts for T5 and T5HO Lamps: Comply with ANSI C82.11 and the following:
- a. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
 - b. Automatic lamp starting after lamp replacement.
 - c. Sound Rating: A.
 - d. Total Harmonic Distortion Rating: Less than 20 percent.
 - e. Transient Voltage Protection: IEEE C62.41, Category A or better.
 - f. Operating Frequency: 42 kHz or higher.
 - g. Lamp Current Crest Factor: 1.7 or less.
 - h. BF: 0.95 or higher, unless otherwise indicated.
 - i. Power Factor: 0.95 or higher.

2.6. LED LIGHTING SYSTEMS

- A. LED components, lamps, drivers, and fixtures shall comply with: PCC 47 CFR Part 15; UL 8750; ANSI/NEMA Standards C78.377, NEMA SSL-1, C82.77, IESNA Standards TM-16-05, RP-16, LM-79, LM-80 and TM-21.
- B. The LED module itself and all its components must not be subject to mechanical stress.
- C. Assembly must not damage or destroy conducting paths on the circuit board.
- D. Installation of LED modules (with power supplies) shall adhere to all applicable electrical and safety standards.
- E. Correct polarity shall be clearly identified.
- F. LED module must be protected from unbalanced voltage drop, and/or overload.
- G. Ensure that the power supply is of adequate power to operate the load.
- H. Install system according to manufacturer's heat sinking parameters.
- I. For applications involving exposure to humidity and dust, the module shall be protected by a fixture or housing with a suitable protection glass. The module shall be protected against condensation water by treatment with an appropriate circuit board conformal coating. The conformal coating should have the following features.
 - 1. Optical transparency
 - 2. UV resistance
 - 3. Thermal expansion properties matching those of the module (15-30 x 10⁻⁶cm/cm/K)
 - 4. Low permeability of steam for all climate conditions
 - 5. Resistance against corrosive environments
- J. The LED module shall be operated with an electronically stabilized power supply offering protection against short circuits overload and overheating.
- K. All drivers used for supplying power to LED arrays in lighting fixtures shall be by the light fixture manufacturer.
- L. Drivers shall be integral to the fixture unless otherwise shown or specified.

2.7. EMERGENCY LED DRIVER

- A. Emergency LED driver specified herein is by Iota (CP Series). Approved equals by Bodine.
 - 1. The emergency driver shall accommodate an LED load with a forward voltage requirement ranging from 10 to 60 VDC.
 - 2. The output voltage sensing shall be automatic and instantaneous with a resulting, inversely-proportional current to maintain constant power to the LED array with an output tolerance of +/- 3%.
 - 3. The unit shall supply the rated load for a minimum of 1 1/2 hours or to 87 1/2% of rated battery terminal voltage.
 - 4. The output power to the LED load during emergency operation shall be held constant (refer to plans for wattage) from minute one throughout the entire emergency run time resulting in no loss or degradation of the light source during emergency operation.
 - 5. The unit shall be furnished with an electronic, AC-lockout circuit which will connect the battery when the AC circuit is activated, and an electronic brownout circuit which will enable a transfer to emergency operation when utility power dips below an acceptable level.
- B. Installation

1. Emergency drivers shall be UL-listed for use with respective LED array and/or UL-listed for field installation. Where drivers are only listed for use with a respective LED array, they shall be installed integral to the fixture by the fixture manufacturer.
 2. Maximum remote mounting distance of the emergency driver shall be 50-feet
- C. Driver: Constant Power emergency LED driver system as indicated on the plans. The emergency driver system shall be UL class 2 certified in accordance with UL 1310 and shall be UL listed for use in damp locations with a temperature range of 0° to 55° C.
- D. AC input: Two-wire, universal voltage capable 120 thru 277 VAC, 50/60 Hz and be UL Classified to Category Control Number (CCN) FTBR, Emergency Lighting and Power Equipment, and FTBV, Emergency Light-Emitting-Diode Drivers for field installation.
- E. Battery: Self-contained, high-temperature, sealed, maintenance-free nickel cadmium battery rated for a 10-year service life.
- F. Charger: two-stage charging system which samples the battery in relation to its temperature, state of charge and input voltage fluctuations. The charger shall be current limited, temperature compensated, short-circuit protected with reverse polarity protection. The unit shall achieve a full recharge in 24-hours.
- G. Protection: A low voltage battery disconnect (LVD) circuit shall be provided and will disconnect the load and circuitry from the battery when it reaches approximately 80 to 85% of its nominal terminal voltage, preventing a non-recoverable, deep-discharge condition as well as equipment initialization failure when utility power is restored.
- H. Housing: NEMA 250, Type 1 enclosure.
- I. Test Push Button: Illuminated push-to-test switch.
- J. Provide 5-year warranty.

PART 3 - EXECUTION

3.1. LUMINAIRES

- A. All light fixtures shall be cleaned and free of all construction debris. Install units as shown and detailed on the plans and per manufacturers' directions.
- B. Reference luminaire schedule on plans for specific luminaire, lamp, and ballast requirements.
- C. Reinstall any fixtures called out for relocation or remounting in renovation areas as though they are new fixtures. Make all provisions to properly mount and support existing fixtures being reused.
- D. Luminaires submitted must meet or exceed specified luminaire in performance and construction and appearance. Provide luminaires at each location shown on drawings. Luminaires shall be in accordance with type designation on drawings.
- E. Luminaire supports shall comply with the latest edition of the NEC Sections 410-30 and 410-36. Provide luminaire securing clips or otherwise securely fasten fixtures to ceiling grid. At least two support wires shall be connected from the structure above to each troffer style light fixture.

3.2. INSTALLATION

- A. Lighting fixtures: Set level, plumb, and square with ceilings and walls. Install lamps in each fixture.
- B. All light fixtures shall be cleaned and free of all construction debris. Install units as shown and detailed on the plans and per manufacturers' directions.
- C. Support for Lighting Fixtures in or on Grid-Type Suspended Ceilings: Use grid as a support element.
1. Install a minimum of four ceiling support system rods or wires for each fixture. Locate not more than 6 inches from lighting fixture corners.
 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 structure to a tab on lighting fixture. Wire or rod shall have breaking strength of the weight of fixture at a safety factor of 3.
- D. 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.
- E. Recessed luminaires installed in the building thermal envelope shall be sealed to limit air leakage between conditioned and unconditioned spaces. All recessed luminaires shall be IC-rated and labeled as having an air

leakage rate not more than 2.0 cfm (0.944 L/s) when tested in accordance with ASTM E 283 at a 1.57 psf (75 Pa) pressure differential. All recessed luminaires shall be sealed with a gasket or caulk between the housing and the interior wall or ceiling covering.

- F. Recessed luminaires installed in rated assemblies shall be installed per UL listing requirements to maintain the rating of the construction. Provide sheet rock enclosures or other UL listed manufactured assemblies to maintain rating of construction and listing of fixtures for heat dissipation and clearances.

3.3. ADJUSTMENTS

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting the direction of aim of luminaires to suit occupied conditions. Make up to two visits to Project during other-than-normal hours for this purpose. Some of this work may be required during hours of darkness.
- B. During adjustment visits, inspect all luminaires. Replace lamps or luminaires that are defective.
- C. Parts and supplies shall be manufacturer's authorized replacement parts and supplies.
- D. Adjust the aim of luminaires in the presence of the Architect.

3.4. 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. Prepare a written report of tests, inspections, observations, and verifications indicating and interpreting results. If adjustments are made to lighting system, retest to demonstrate compliance with standards.

END OF SECTION 265100

END OF DIVISION 260000

END OF DIVISION 260000

DIVISION 27
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SECTION 270500 – COMMON WORK FOR COMMUNICATIONS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

- A. Division 26 specifications govern the construction methods, materials and other aspects related to electrical work contained in these Division 27 specifications.
- B. Reference
 - 1. Section 260500 - Electrical Provisions
 - 2. Section 260505 - Project Coordination
 - 3. Section 260520 - Basic Electrical Materials And Methods
 - 4. As well as other Division 26 Sections for any other electrical requirements and provisions.
- C. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 270500

SECTION 270510 – COMMUNICATIONS DEMOLITION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500 for Electrical Provisions as well as Section 260510 and other Division 26 Sections for other electrical requirements and provisions.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 270510

SECTION 271300 – VOICE AND DATA COMMUNICATION CABLING

PART 1 - GENERAL

A. RELATED DOCUMENTS

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

B. SUMMARY

1. This Section includes wire, cable, connecting devices, installation, and testing for wiring systems to be used as signal pathways for voice and high-speed data transmission.
2. The voice and data cabling system specified is an EIA Category 5e system.
3. Installation shall follow district standards for labeling, running cabling, etc. Any item deemed inappropriate by district personnel or the engineer shall be corrected before the building is occupied by staff and students.

C. SUBMITTALS

1. Product Data: Include data on features, ratings, and performance for each component specified.
2. Submit Owner-approved numbering scheme.
3. Shop Drawings: Submit scaled layout drawings of Comm. rooms indicating outlets, main distribution frame, equipment racks, and cable routes. Provide installation details, rack elevations, and spatial configuration requirements.
4. As-Built Drawings: Submit scaled as-built drawings showing outlets denoted with ID number, main distribution frame, equipment racks, cable routes, and Owner-approved numbering scheme for each cable run and outlet. Provide as-built drawings on a labeled CD in AutoCad 2000 format as well. Electronic drawings shall have all drops and corresponding drop numbering for data and voice drops.
5. Submit test results for all runs on paper and disk.
6. Warranty documentation certified by factory.
7. Submit installer's qualifications.
8. Operation and Maintenance Data: For voice and data communication cabling to include in emergency, operation, and maintenance manuals.

D. QUALITY ASSURANCE

1. Source Limitations: Obtain all cables through one source from a single manufacturer. Obtain all fiber-optic and cables through one source from a single manufacturer.
2. Cabling System Manufacturer's Qualifications: All products shall be rated as indicated and each product shall have identification of the Category rating.
3. Installer Qualifications:
 - 3.1. Firm with at least 3 years of successful installation experience with projects utilizing systems similar to those required for this project.
 - 3.2. References: Provide a list of references for similar projects, including contact name, phone number, name of project, and type of project.
 - 3.3. Certification: Confirm that the installer of the data cabling system has been certified prior to bid date by the manufacturer of the proposed products. Include details of the terms and expiration date of the arrangement.
4. One certified BISC1 installer with 3 years minimum experience shall be on site at all times.
5. Comply with NFPA 70.

E. CODES AND STANDARDS

1. Electrical Code Compliance: Comply with applicable local electrical code requirements of the public authority having jurisdiction and NEC-ART 800.
2. UL Compliance: Provide system equipment that is UL listed and labeled. All Category 5e cabling shall be UL verified and shall be labeled as such every two feet on the cable jacket, as part of the cabling identification.
3. FCC Compliance: Comply with Parts 68 and 76, and Part 15, Subpart J.
4. TIA/EIA Compliance: Comply with applicable requirements of TIA/EIA 568-B, TIA/EIA 569, TIA/EIA 606, TIA/EIA 607 for Category 5e UTP networks.

F. DELIVERY, STORAGE, AND HANDLING

1. All components and equipment shall be new and delivered in manufacturer's original cartons and packaging.
2. Store/roll reels with appropriate underlayment.
3. Contractor shall be responsible for all delivery, movement, and inventory of all material, equipment, and tools needed to install and terminate cabling infrastructure and electronic equipment and hardware. All costs associated with the delivery, movement, and inventory of all material, equipment, and tools shall be the responsibility of the Contractor.

G. WARRANTY

1. Data Cabling Infrastructure Components: Fifteen (15) year replacement warranty provided by manufacturer of the components. Warranty shall include the replacement of any defective Category 5e cabling infrastructure component with the same, or most current replacement, part for a period of 15 years. Infrastructure components include information outlets, horizontal wiring, backbone cable, patch panels, and patch cords.
2. Application Performance: Fifteen (15) year assurance warranty provided by system manufacturer of cabling infrastructure components. Application Assurance Warranty shall provide for certification of the cabling infrastructure that the system will provide application support of all data standards including, but not limited to, 100 Base T, 1000 Base T, 155 Mbps ATM.

PART 2 - PRODUCTS

A. LOW VOLTAGE DATA CABLING SPECIFICATIONS

1. General Notes:
 - 1.1. It shall be the contractor's responsibility to restore any inadvertent demolition or damage of existing cabling or property. All costs, including labor and materials to reinstate said cabling or property to original condition shall be absorbed by the contractor or any subcontractor(s) responsible for the demolition or damage and not passed on to Unified School District #512 in any way.
 - 1.2. All cabling should be routed within walls where possible, unless specified otherwise. If cabling cannot reasonably be routed within the walls, surface mounted wiremold raceway may be used with prior approval of an authorized representative of the I.S. Department of Unified School District #512.
2. DATA MAIN DISTRIBUTION FRAME (DMDF)
 - 2.1. DMDF SPECIFICATION
 - 2.1.1. The MDF will be located in an area to be determined by Unified School District #512. This MDF will consist of the following items provided and installed by the Cabling Contractor or their sub-contractors:
 - a. Rack-mounted AMP fiber enclosure(s) to accommodate 12 strands of fiber optic cable from each IDF. Fiber enclosures should be sized according to the number of fiber strands terminated in the MDF and fitted with SC-style connectors. All unused adapter plate slots are to be filled with blank plates.
 - b. The following AMP rack mount fiber enclosures or approved equals are acceptable for use:

i	1U Drawer-Style Rack Mount Enclosure	1348876-4
ii	2U Rack Mount Enclosure	559542-2
iii	3U Rack Mount Enclosure	559614-2
 - c. The following AMP snap-in adapter plates for the rack mount enclosures or approved equals are acceptable for use:

i	Snap-in Adapter Plate, Six fiber, Duplex SC	559558-1
ii	Snap-in Adapter Plate, Twelve fiber, Duplex SC	559596-1
iii	Snap-in Adapter Plate, Blank	559523-1

- 2.1.2. All copper drops shall be terminated in an AMP 110-style patch panel(s) in 568B configuration in the MDF to accommodate data cable runs from end device data jacks as specified in Section 5.
 - a. The following AMP 110Connect copper patch panels or approved equals are acceptable for use:
 - i Category 5e 110 Patch Panel, 24 Port 406330-1
 - ii Category 5e 110 Patch Panel, 48 Port 406331-1
 - iii Category 5e 110 Patch Panel, 96 Port 406332-1
- 2.1.3. One copper patch cable is to be supplied per copper drop installed. Patch cable specifications are as follows:
 - i Made from stranded Enhanced Category 5e, unshielded twisted 4 pair cable.
 - ii Certified to meet Enhanced Category 5e specifications (ANSI/TIA/EIA 568-B.2.)
 - iii Certified UL/CSA approved, rated and tested.
 - iv Terminated with RJ45 male connectors at each end, no shorter than 6 (six) feet in length.
 - v Tested for proper termination and continuity between proper pairs with no split pairs.
- 2.2. Also located in the MDF area will be the following items provided and/or installed by Unified School District # 512's hardware vendors, subcontractors or district personnel:
 - 2.2.1. Network Hub equipment configured for copper and fiber connections.
 - 2.2.2. Floor-standing rack unit(s) to mount network hub equipment, copper patch panels and fiber enclosures.
- 3. DATA INTERMEDIATE DISTRIBUTION FRAME (DIDF)
 - 3.1. Each IDF will be located in an area to be determined by Unified School District #512. Each IDF will consist of the following items provided and installed by the Cabling Contractor or their sub-contractors:
 - 3.1.1. Rack-mounted AMP fiber enclosure(s) to accommodate 12 strands of fiber optic cable to the MDF. Fiber enclosures should be fitted with SC-style connectors. All unused adapter plate slots are to be filled with blank plates.
 - a. The following AMP rack mount fiber enclosure or approved equal is acceptable for use:
 - i 1U Drawer-Style Rack Mount Enclosure 1348876-4
 - b. The following AMP snap-in adapter plates for the rack mount enclosures or approved equals are acceptable for use:
 - i Snap-in Adapter Plate, Six fiber, Duplex SC 559558-1
 - ii Snap-in Adapter Plate, Twelve fiber, Duplex SC 559596-1
 - iii Snap-in Adapter Plate, Blank 559523-1
 - 3.1.2. All copper drops shall be terminated in an AMP 110-style patch panel(s) in 568B configuration in each IDF to accommodate data cable runs from end device data jacks as specified in Section 5.
 - a. The following AMP 110Connect copper patch panels or approved equals are acceptable for use:
 - i Category 5e 110 Patch Panel, 24 Port 406330-1
 - ii Category 5e 110 Patch Panel, 48 Port 406331-1
 - iii Category 5e 110 Patch Panel, 96 Port 406332-1
 - 3.1.3. One copper patch cable is to be supplied per copper drop installed. Patch cable specifications are as follows:
 - a. Made from stranded Enhanced Category 5e, unshielded twisted 4 pair cable.
 - b. Certified to meet Enhanced Category 5e specifications (ANSI/TIA/EIA 568-B.2.)
 - c. Certified UL/CSA approved, rated and tested.
 - d. Terminated with RJ45 male connectors at each end, no shorter than 6 (six) feet in length.
 - e. Tested for proper termination and continuity between proper pairs with no split pairs.
 - 3.2. Also located in each IDF area will be the following items provided and/or installed by Unified School District # 512's hardware vendors, subcontractors or district personnel:
 - 1. Network Hub equipment configured for copper and fiber connections.

2. Floor-standing rack unit(s) to mount network hub equipment, copper patch panels and fiber enclosures.

4. TELE-POWER POLES AND RACEWAY

4.1. TELE-POWER POLES

- 4.1.1. Unified School District # 512's standards for Tele-power poles are as listed below:

- a. Wiremold Part # 30TP-2V or approved equal is a 10.5' power pole with two duplex AC outlets and it's series of fittings.
- b. Wiremold Part # 30TP212V or approved equal is a 12.5' power pole with two duplex AC outlets and it's series of fittings.

4.2. LARGE CAPACITY RACEWAY

- 4.2.1. Unified School District # 512's standard for large capacity raceway is Wiremold G4000 Raceway or approved equal and it's series of fittings and device plates.

4.3. SMALL CAPACITY RACEWAY

- 4.3.1. Unified School District # 512's standard for small capacity raceway is Wiremold V700 and V500 Raceway or approved equals and their series of fittings.

5. CABLING AND TERMINATION

5.1. FIBER CABLING

- 5.1.1. MDF to IDF connectivity.

- a. The MDF will be connected to each IDF using armored twelve-strand fiber optic cable, installed in the previously described fiber enclosures with the necessary adapter plates, meeting or exceeding the following standards:
- b. Standards for 50/125 microns.
- c. Meets ISO 9001 manufacturing QC standards.
- d. For Plenum applications, Superior Essex L40125G0S or Riser applications, Superior Essex L30125G0S or approved equal.
- e. The fiber cabling is to be installed in plenum between wiring closets.
- f. The contractor and/or subcontractor is to furnish representatives of Unified School District #512 with complete fiber cabling test results in electronic format (i.e. CSV) from an optical test instrument such as a Microtest OmniFiber/OmniScanner 2 or approved equal device.

5.2. COPPER CABLING

- 5.2.1. Copper Cabling Specifications

- a. Data cabling for end device to MDF/IDF connectivity shall be 4 pair, plenum-rated, solid UTP, Enhanced Category 5e cable. The cable should be Berk-Tek Lanmark-350, part number 10032072 or Draka Comteq SuperCAT360, part number 804508 or approved equal.
- b. The cabling is to be installed according to Category 5e specifications (ANSI/TIA/EIA 568-B.2.)
- c. The contractor and/or subcontractor is to furnish representatives of Unified School District #512 with complete copper cabling test results in electronic format (i.e. CSV) from a copper test instrument such as a Microtest OmniScanner 2 or approved equal device.

5.3. Copper Cabling Termination Specifications

- 5.3.1. Each end device data jack will be terminated using a Category 5e rated station wall jack of modular design in 568B configuration at the location specified by the project drawing set. The District's standard for the station wall jack is the AMP 110Connect System. In new installations and locations with fishable walls, a single gang or double gang outlet box will be used in the wall location, depending on the number of drops installed at the location. In areas with walls that are not fishable and new raceway is to be installed, a surface mount box will be attached to the wall. Screws with no protruding sharp ends will be used to mount the box to the wall. Where cable enters or exits conduit or Wiremold products, grommets made of plastic or Teflon will be used on cut ends of conduit or raceway product to prevent cabling from being chafed or cut. In locations where non-standard wiring practices were used in the past, any new materials and wiring practices will adhere to the specifications in this document.

- a. The following AMP 110 Connect products or approved equals are acceptable for use:

- i Category 5e Jack, Unshielded 406372-2
 - ii 110 Connect Blank Insert 406339-3
 - iii 2 Port, Single Gang Faceplate 557505-3
 - iv 4 Port, Single Gang Faceplate 558088-3
 - v 6 Port, Single Gang Faceplate 557691-3
 - vi 12 Port, Double Gang Faceplate 558086-3
- 5.3.2. Locations where installation is desired in-floor for network nodes; nodes will be terminated in a covered floor workstation module using the AMP 110Connect System products. The District's standard is the AMP Access Floor Workstation Module system. Each Access Floor Workstation Module box is to be properly installed in the recommended concrete form box.
 - a. The following AMP Access Floor Workstation Module products or approved equals are acceptable for use:
 - i 2 Gang Access Floor Workstation Module 558718-1
 - ii 3 Gang Access Floor Workstation Module 558716-1
 - iii 4 Gang Access Floor Workstation Module 406376-1
 - iv 5 Gang Access Floor Workstation Module, Flip-up 557601-1
 - v 5 Gang Access Floor Workstation Module 1116700-1
 - vi 2 Port Faceplate 569916-1
 - vii 3 Port Faceplate 569917-1
 - viii Blank Faceplate 557655-1
- 5.3.3. Locations where surface mount floor termination is desired, the AMP 110Connect jacks are to be installed in a surface mount termination box securely mounted to the floor over a ¾ inch penetration to the space below for cable routing. The penetration is to be fire stopped in accordance with all applicable codes. The District standard for surface mount termination boxes is the AMP Office Box series.
 - a. The following AMP Office Boxes or approved equals are acceptable for use:
 - i 2 Port Office Box 558521-4
 - ii 4 Port Office Box 558522-4
 - iii 6 Port Office Box 558031-4
 - iv Blank Insert 558513-4
- 5.3.4. Locations with an existing Hubbell above-floor box will use the proper Hubbell faceplate with the corresponding AMP mounting strap kit to install the AMP 110Connect jacks.
 - a. The following Hubbell faceplates and AMP mounting strap kits or approved equals are acceptable for use:
 - i Hubbell Blank Plate SS309B
 - ii Hubbell Duplex Receptacle Plate SS309D
 - iii Hubbell Style Line® Plate SS309DS
 - iv AMP Mounting Strap Kit, 2 Port, 110Connect 1116618-3
 - v AMP Mounting Strap Kit, 2 Port, Decorator, 110Connect 1116617-3
 - vi AMP Mounting Strap Kit, 3 Port, Decorator, 110Connect 1116616-3
- 5.3.5. Locations with existing AMP/ACO products where only one port of a dual port installation kit is in use and another data drop is required for that location, both the existing and the new cable runs are to be terminated with 110Connect jacks and the proper 110Connect faceplate is to be installed.
- 5.3.6. In retrofit environments when using existing Wiremold 4000 series raceways or areas with walls that are not fishable and new raceway is to be installed, Leviton snap in jacks and Wiremold single or dual keystone modules are to be installed in Wiremold 4050 device brackets with Wiremold 5507 faceplates. Blank modules are to be installed in the faceplate's empty module positions. In locations where non-standard wiring practices were used in the past, any new materials and wiring practices will adhere to the specifications in this document.

- a. The following Wiremold device brackets, faceplates, device rings, keystone modules and Leviton jacks or approved equals are acceptable for use:

i Wiremold Device Mounting Bracket	G4050
ii Wiremold Blank Faceplate	5507B-G
iii Wiremold Duplex Receptacle Faceplate	5507D-G
iv Wiremold Rectangular Faceplate	5507R-G
v Wiremold Device Ring	CM-EPLA-G
vi Wiremold Single Keystone Module	CM2-U1KEYA-G
vii Wiremold Dual Keystone Module	CM2-U2KEYA-G
viii Leviton CAT5E Data Jack	5G109-RG5
ix Leviton Voice Jack	41106-RG6
x Leviton Blank Module	41084-BGB

- 5.3.7. Both ends of the cabling run termination, node jack and patch panel, are to be terminated in accordance with Category 5e specifications (ANSI/TIA/EIA 568-B.2) in 568B configuration. Both terminations are to be labeled with a labeling tool such as a Brady or Brother (P-Touch) labeling tool. Both terminations of the cabling run are to be labeled with the exact drop name specified by the project drawing set. **All labeling shall be neat and professional in appearance. Handwritten labels are not acceptable.**

5.4. CABLE SEPARATION FROM POWER WIRING

- 5.4.1. The following distances are a guide for voltages up to 480 volts:

Minimum Distance Between Cables	Less Than 2 KV	2 – 5 KVA	More than 5 KVA
Unshielded power lines or electrical equipment	5 inches	12 inches	24 inches
Unshielded power lines or electrical equipment with cable enclosed in grounded metallic conduit	2.5 inches	6 inches	12 inches
Power lines enclosed in a grounded metallic conduit, or lead sheathed power lines, with cable enclosed in a separate grounded metallic conduit	1.5 inches	3 inches	6 inches

5.4.2. Notes:

- a. The minimum distance between the data cable and any fluorescent, neon, incandescent or high intensity discharge (HID) (i.e. mercury vapor) lamp fixture shall be 5 inches.
- b. Cables may be installed close to lighting and convenience outlet power cables (single phase 120v, 20a maximum), in metal cable channels for limited distances, if the following guidelines are observed:
 - i Parallel runs of no more than 15 feet are permissible if a one-inch of separation is maintained between the power cable and the data cable by separators or suitable retention hardware. If necessary, the separation may be less than one inch for a run of up to four inches, if no contact occurs between the data cable and the power cable.
 - ii Parallel runs of no more than 30 feet are permissible if a two-inch separation is maintained. The separation may be less than two inches for a run of up to 123 inches, if no contact occurs between the data cable and the power cable.

- c. Contractor shall correct the dress of all cables, which malfunction due to the proximity of power wiring.

B. LOW VOLTAGE VOICE CABLING SPECIFICATIONS

1. General Notes:

- 1.1. It shall be the Contractor's responsibility to restore any inadvertent demolition or damage of existing cabling or property. All costs, including labor and materials to reinstate said cabling or property to original condition shall be absorbed by the Contractor or any Subcontractor(s) responsible for the demolition or damage and not passed on to Unified School District #512 in any way.
- 1.2. All cabling shall be routed within walls where possible, unless specified otherwise. If cabling cannot reasonably be routed within the walls, surface mount wiremold raceway may be used with prior approval of an authorized representative of the IS Department of Unified School District #512.

2. Voice Cabling and Termination:

2.1. VOICE MAIN DISTRIBUTION FRAME (VMDF)

- 2.1.1. The Voice Main Distribution Frame (VMDF) is to be located as specified on the project drawing set.
- 2.1.2. The following Berk-Tek Category 3 25 pair cable part numbers or approved equals are acceptable for use:
 - a. Riser Applications Category 3, 25 Pair Riser Cable 530367
 - b. Plenum Applications Category 3, 25 Pair Plenum Cable 230801
- 2.1.3. Feeder cables are to be installed as specified on the project drawing set.
- 2.1.4. Feeder cables shall be sized to accommodate dedicated pairing.
- 2.1.5. All feeder cables are to be terminated on the following Siemon Category 5 66 Blocks installed on the corresponding the stand off bracket mounted on a 3/4" fire-rated plywood backboard and protected by the appropriate clear plastic cover or approved equals:
 - a. Siemon Category 5 66 Block S66M1-50
 - b. Siemon 66 Block Bracket S89D-001
 - c. Siemon Clear Snap On Cover MC4
- 2.1.6. All feeder cables are to be installed splice free between the VMDF and VIDF locations.

2.2. VOICE INTERMEDIATE DISTRIBUTION FRAME (VIDF)

- 2.2.1. Voice station cabling is to be installed in teaching, administrative, library and kitchen and other locations as indicated on the project drawing set.
- 2.2.2. All voice cabling is to be installed splice free from the instrument jack location to the VIDF.
- 2.2.3. The VIDF is to be located as specified on the project drawing set. Location choices would be inside the upright IDF cabinet or on wall-mounted 3/4" fire-rated plywood backboard.
- 2.2.4. Feeder cables are to be terminated on one set of 66 blocks and station cables are to be terminated on another set of 66 blocks. Install as indicated on the project drawing set.
- 2.2.5. All wall and floor telephone outlets shall be in conduit and stubbed up to an accessible ceiling location.
- 2.2.6. Where voice or data cables must pass through inaccessible areas of the building, 3" or larger conduits shall be installed to provide a means for cable installation and replacement. Similar spare conduits in each of these areas shall also be provided for future expansion as indicated on the project drawing set.

2.3. VOICE STATION CABLING

- 2.3.1. Voice cabling for instrument to VIDF connectivity shall be 4 pair, plenum-rated, solid UTP, Enhanced Category 5e cable. The cable should be Berk-Tek Lanmark-350, part number 10032072 or Draka Comteq SuperCAT360, part number 804508 or approved equal.

2.4. VOICE IDF CONNECTIVITY

2.4.1. RACK-MOUNTED VIDF

- a. All feeder and station cables are to be terminated on the following Siemon Category 5 66 Blocks and mounted on the corresponding rack mounted cross-connect frame and protected by the appropriate clear plastic cover or approved equals:
 - i Siemon Category 5 66 Block S66M1-50
 - ii Siemon Cross-Connect Frame (Half panel w/4 brackets) CC-2014-TB-DC

- iii Siemon Cross-Connect Frame (Full panel w/8 brackets) CC-2024-TB-DC
- iv Siemon Cross-Connect Frame (Half panel w/5 brackets) CC-2015-TB-DC
- v Siemon Cross-Connect Frame (Full panel w/10 brackets) CC-2025-TB-DC
- vi Siemon Clear Snap On Cover MC4

- b. Proper cable management techniques is to be employed to prevent strain on punched down connections.
- c. Station runs terminating in an upright rack-mounted cabinet are to be secured to the wall outside the cabinet with suitable restraints, as well as inside the cabinet.
- d. All pairs of the four pair cable will be terminated on the 66 blocks.

2.4.2. WALL-MOUNTED VDF

- a. All feeder and station cables are to be terminated on the following Siemon Category 5 66 Blocks installed on the corresponding the stand off bracket mounted on a 3/4" fire-rated plywood backboard and protected by the appropriate clear plastic cover or approved equals.
 - i Siemon Category 5 66 Block S66M1-50
 - ii Siemon 66 Block Bracket S89D-001
 - iii Siemon Clear Snap On Cover MC4
- b. All pairs of the four pair cable will be terminated on the 66 blocks.
- c. Proper cable management techniques shall be employed to prevent strain on punched down connections.

2.5. VOICE STATION LOCATION

- 2.5.1. Each instrument jack will be terminated using an station wall jack of modular design at the location specified by the project drawing set. The District's standard for the instrument jack is the AMP 110Connect System. In new installations and locations with fishable walls, a single gang or double gang outlet box will be used in the wall location, depending on the number of drops installed at the location. In areas with walls that are not fishable and new raceway is to be installed, a surface mount box will be attached to the wall. Screws with no protruding sharp ends will be used to mount the box to the raceway or wall. Where cable enters or exits conduit or Wiremold product, grommets made of plastic or Teflon will be used on cut ends of conduit or raceway product to prevent cabling from being chafed or cut. In locations where non-standard wiring practices were used in the past, any new materials and wiring practices will adhere to the specifications in this document.

- a. The following AMP 110 Connect products or approved equals are acceptable for use:

- i Category 3 Jack, 6 Position 406375-2
- ii 110 Connect Blank Insert 406339-3
- iii 2 Port, Single Gang Faceplate 557505-3
- iv 4 Port, Single Gang Faceplate 558088-3
- v 6 Port, Single Gang Faceplate 557691-3
- vi 12 Port, Double Gang Faceplate 558086-3

- 2.5.2. Locations where installation is desired in-floor for network nodes; nodes will be terminated in a covered floor workstation module using the AMP 110Connect System products. The District's standard is the AMP Access Floor Workstation Module system. Each Access Floor Workstation Module box is to be properly installed in the recommended concrete form box.

- a. The following AMP Access Floor Workstation Module products or approved equals are acceptable for use:

- i 2 Gang Access Floor Workstation Module 558718-1
- ii 3 Gang Access Floor Workstation Module 558716-1
- iii 4 Gang Access Floor Workstation Module 406376-1
- iv 5 Gang Access Floor Workstation Module, Flip-up 557601-1
- v 5 Gang Access Floor Workstation Module 1116700-1
- vi 2 Port Faceplate 569916-1

- vii 3 Port Faceplate 569917-1
- viii Blank Faceplate 557655-1
- 2.5.3. Locations where surface mount floor termination is desired, the AMP 110Connect jacks are to be installed in a surface mount termination box securely mounted to the floor over a $\frac{3}{4}$ inch penetration to the space below for cable routing. The penetration is to be fire stopped in accordance with all applicable codes. The District standard for surface mount termination boxes is the AMP Office Box series.
 - a. The following AMP Office Boxes or approved equals are acceptable for use:
 - i 2 Port Office Box 558521-4
 - ii 4 Port Office Box 558522-4
 - iii 6 Port Office Box 558031-4
 - iv Blank Insert 558513-4
- 2.5.4. Locations with an existing Hubbell above-floor box will use the proper Hubbell faceplate with the corresponding AMP mounting strap kit to install the AMP 110Connect jacks.
 - a. The following Hubbell faceplates and AMP mounting strap kits or approved equals are acceptable for use:
 - i Hubbell Blank Plate SS309B
 - ii Hubbell Duplex Receptacle Plate SS309D
 - iii Hubbell Style Line® Plate SS309DS
 - iv AMP Mounting Strap Kit, 2 Port, 110Connect 1116618-3
 - v AMP Mounting Strap Kit, 2 Port, Decorator, 110Connect 1116617-3
 - vi AMP Mounting Strap Kit, 3 Port, Decorator, 110Connect 1116616-3
- 2.5.5. Locations with existing AMP/ACO products where only one port of a dual port installation kit is in use and another data or voice drop is required for that location, both the existing and the new cable runs are to be terminated with 110Connect jacks and the proper 110Connect faceplate is to be installed. In cases where the existing AMP/ACO module is a dual RJ-11 module or a dual RJ-11 module with an additional external splitter in one of the RJ-11 port, all dual port modules and external splitters are to be replaced with an equal number of 110Connect RJ-11 jacks. Unified School District project manager will provide the proper wiring mapping in diagrammatic form.
- 2.5.6. In retrofit environments when using existing Wiremold 4000 series raceways or areas with walls that are not fishable and new raceway is to be installed, Leviton snap in jacks and Wiremold single or dual keystone modules are to be installed in Wiremold 4050 device brackets with Wiremold 5507 faceplates. Blank modules are to be installed in the faceplate's empty module positions. In locations where non-standard wiring practices were used in the past, any new materials and wiring practices will adhere to the specifications in this document
 - a. The following Wiremold device brackets, faceplates, device rings, keystone modules and Leviton jacks or approved equals are acceptable for use:
 - i Wiremold Device Mounting Bracket G4050
 - ii Wiremold Blank Faceplate 5507B-G
 - iii Wiremold Duplex Receptacle Faceplate 5507D-G
 - iv Wiremold Rectangular Faceplate 5507R-G
 - v Wiremold Device Ring CM-EPLA-G
 - vi Wiremold Single Keystone Module CM2-U1KEYA-G
 - vii Wiremold Dual Keystone Module CM2-U2KEYA-G
 - viii Leviton CAT5E Data Jack 5G109-RG5
 - ix Leviton Voice Jack 41106-RG6
 - x Leviton Blank Module 41084-BGB
- 2.5.7. All terminations and cabling runs are to be wire map tested to ensure there are no opens, shorts, split pairs or other faults.

2.6. CABLE LABELING

- 2.6.1. The instrument end termination is to be labeled with a labeling tool such as a Brady or Brother (P-Touch) labeling tool. The termination on the 66 block is to be labeled with a permanent fine point marker such as a Sharpie Ultra Fine Point. Both terminations of the cabling run are to be labeled with the exact drop name specified by the project drawing set. **All labeling shall be neat and professional in appearance. Handwritten labels are not acceptable at the instrument end termination.**

2.7. CABLE SEPARATION FROM POWER WIRING

- 2.7.1. The following distances are a guide for voltages up to 480 volts:

Minimum Distance Between Cables	Less Than 2 KV	2 – 5 KVA	More than 5 KVA
Unshielded power lines or electrical equipment	5 inches	12 inches	24 inches
Unshielded power lines or electrical equipment with cable enclosed in grounded metallic conduit	2.5 inches	6 inches	12 inches
Power lines enclosed in a grounded metallic conduit, or lead sheathed power lines, with cable enclosed in a separate grounded metallic conduit	1.5 inches	3 inches	6 inches

2.7.2. Notes:

- a. The minimum distance between the data cable and any fluorescent, neon, incandescent or high intensity discharge (HID) (i.e. mercury vapor) lamp fixture shall be 5 inches.
- b. Cables may be installed close to lighting and convenience outlet power cables (single phase 120v, 20a maximum), in metal cable channels for limited distances, if the following guidelines are observed:
 - i. Parallel runs of no more than 15 feet are permissible if a one-inch of separation is maintained between the power cable and the data cable by separators or suitable retention hardware. If necessary, the separation may be less than one inch for a run of up to four inches, if no contact occurs between the data cable and the power cable.
 - ii. Parallel runs of no more than 30 feet are permissible if a two-inch separation is maintained. The separation may be less than two inches for a run of up to 123 inches, if no contact occurs between the data cable and the power cable.
- c. Contractor shall correct the dress of all cables, which malfunction due to the proximity of power wiring.

C. VIDEO AND AUDIO CABLING SPECIFICATIONS

1. General Notes:

- 1.1. It shall be the Contractor's responsibility to restore any inadvertent demolition or damage of existing cabling or property. All costs, including labor and materials to reinstate said cabling or property to original condition shall be absorbed by the Contractor or any Subcontractor(s) responsible for the demolition or damage and not passed on to Unified School District #512 in any way.
- 1.2. All cabling shall be routed within walls where possible, unless specified otherwise. If cabling cannot reasonably be routed within the walls, surface mount wiremold raceway may be used with prior approval of an authorized representative of the IS Department of Unified School District #512.

2. Video and Speaker Cabling and Termination:

- 2.1. The projector and speaker wiring is to be located as specified in the Drawings with each end terminating at the teachers desk or media player location as shown and the other end terminating at the ceiling location of the projector mount and speaker location..
- 2.2. The following Berk-Tek Category 3 25 pair cable part number or approved equals are acceptable for use:
 - 2.2.1. Category 3, 25 Pair Plenum Cable: 10032111.

- 2.2.2. (1) CAT 6 solid UTP plenum
- 2.2.3. (3) Plenum audio cables (WP 25291 or equal.)
- 2.2.4. (4) Plenum video cable (Belden 88241 or equal.)

PART 3 EXECUTION

A. EXAMINATION

1. Examine pathway elements intended for cables. Check raceways, cable trays, and other elements for compliance with space allocations, installation tolerances, hazards to cable installation, and other conditions affecting installation. Proceed with installation only after unsatisfactory conditions have been corrected.

B. Installation

1. A preconstruction meeting shall occur between contractor, engineer, and district personnel to ensure proper procedures are going to be used. This meeting will cover workmanship, schedule, labeling, testing, etc. This meeting is to occur before construction begins.
2. Two (2) post construction meetings shall occur. The first one shall occur around 2 weeks prior to school starting after the first summer's renovation work. The second one shall occur at the completion of the additions. See below for information on testing reports. These meetings will look at actual installations, labeling, test reports, etc.
3. Install cable and hardware in accordance with manufacturer's recommendations.
4. Install cables without damaging conductors, shield, or jacket.
5. Install fiber-optic cable in plenum-rated innerduct.
6. For horizontal runs, cable shall be installed in cable tray, where available. Where cable tray is not available, support cable at 5'-0" intervals maximum with J-hooks or D-rings. Cable shall not rest on ceiling tile.
7. Do not bend cables, in handling or in installing, to smaller radii than minimums recommended by manufacturer.
8. Pull cables without exceeding cable manufacturer's recommended pulling tensions.
 - 8.1. Pull cables simultaneously if more than one is being installed in same raceway.
 - 8.2. Use pulling compound or lubricant if necessary. Use compounds that will not damage conductor or insulation.
 - 8.3. Use pulling means, including fish tape, cable, rope, and basket-weave wire or cable grips, that will not damage media or raceway.
9. For vertical runs within walls, install in raceway.
10. Install exposed cables parallel and perpendicular to surfaces or exposed structural members and follow surface contours where possible.
11. Secure and support cables at intervals not exceeding 60 inches and not more than 6 inches from cabinets, boxes, fittings, outlets, racks, frames, and terminals.
12. Wiring Within Closets and Enclosures: Provide conductors of adequate length. Train conductors to terminal points with no excess. Use lacing bars to restrain cables, to prevent straining connections, and to prevent bending cables to smaller radii than minimums recommended by manufacturer.
13. Separation of Wires: Comply with TIA/EIA-569-A rules for separating unshielded copper voice and data communications cabling from potential EMI sources, including electrical power lines and equipment.
14. Make splices, taps, and terminations only at indicated outlets, terminals, and cross-connect and patch panels.
15. Individual 4-pair horizontal cables shall be installed and terminated at each information outlet. Cables shall be terminated at modular patch panels at assigned area noted on the drawings. All cable runs shall be installed conforming to the star topology.
16. Individual cable runs shall not exceed 295 lineal feet. All cable runs shall be continuous and without splices. Record the length of each cable segment as it is installed.
17. Conduit installations shall not exceed runs of 100 feet or exceed two 90-degree bends without installing a pull box.
18. Insure TIA/EIA Category 5 recommended maximum cable bending radius and pulling tensions are not exceeded.
19. Tie wraps used for stabilizing cables shall not be excessively tightened to incur damage to cable jackets.
20. Utilize correct tools and follow manufacturer's instructions for wire terminations.

21. Information Outlets: Follow all manufacturers' recommended installation and termination guidelines for Category 5. All outlets shall be labeled as directed by the Owner. Labels shall be typed and installed under protective clear plastic. Leave 6 inches of conductor slack at each backbox.
22. Terminate all fibers of the fiber-optic backbone cable. Install fiber connector protective caps on all inactive fiber terminations.
23. Each outlet coverplate shall be permanently labeled with identification numbers corresponding to the patch panel jack numbers. Labeling scheme shall be approved by the Owner prior to labeling.
24. Provide patch cord organizers and troughs for routing patch cords.
25. Route cables into patch panels in neat, trained bundles via D-rings and patch cord organizers.
26. Route cables into termination blocks and panels from both ends. Follow manufacturer's installation and termination guidelines for Category 6.
27. All terminations at the information outlets and cross-connections shall not exceed $\frac{1}{2}$ " of untwisted conductors.
28. All cables shall be labeled at both ends one inch (1") from termination points with appropriate management information conforming to TIA/EIA 606. All labels shall be typed, plastic coded and permanently attached to the cable ends.
29. Firestopping: All holes, conduit penetrations, etc., shall be firestopped to meet applicable codes. Penetrations shall be made using conduit sleeves.
30. Ground equipment racks per Division 16 Section "Grounding."
31. Cable Administration Drawings: Show building floor plans with cable administration point labeling. Identify labeling convention and show labels for telecommunications closets, backbone pathways and cables, terminal hardware and positions, horizontal cables, work areas and workstation terminal positions, grounding buses and pathways, and equipment grounding conductors. Follow convention of TIA/EIA 606. Furnish electronic record of all drawings, in software and format selected by the Owner.
32. Utilize Velcro straps in lieu of tie wraps at all wiring closets.

C. TESTING

1. Visual and Mechanical Inspection: Inspect for physical damage, proper alignment, anchorage, and grounding. Check for proper tightness of all electrical connections and in accordance with manufacturer's recommended values.
2. Local Area Network:
 - 2.1. Testing and Acceptance:
 - 2.1.1. Contractor shall provide a thorough testing program for the cabling system. The testing shall be done in accordance with TIA/EIA TSB-95, Level II E performance. All cables shall be tested.
 - 2.1.2. All cable lengths shall be recorded as part of the test records.
 - 2.1.3. All testing shall be tested with a Category 5 rated cable tester. Contractor shall provide, as part of the system documentation, the type and manufacturer of the test equipment used.
 - 2.1.4. All test faults shall be corrected and re-tested.
 - 2.1.5. Two (2) copies of the test results shall be provided to the Owner as part of the project documentation. Test results shall be recorded on a floppy disk in a format determined by the Owner.
 - 2.1.6. The Owner may choose to randomly check testing results for a sample number of cables. This final acceptance testing shall be conducted by the Contractor and the Owner. Prior to this testing, Contractor shall provide procedures and operating instructions for the test equipment.
3. There shall be two (2) sets of test reports in the project. The first after the first summer construction and the second after the addition is complete. Completed test reports are to be given to owner at least 2 weeks prior to the start of school. This timeframe is to allow for troubleshooting of any runs that are not working and allow a fully working system by the start of school. The district will apply all financial damages as allowed by contract if this timeline is not met.

END OF SECTION 16750

END OF DIVISION 270000

DIVISION 28
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SECTION 280500 – COMMON WORK FOR ELECTRONIC SAFETY & SECURITY

PART 1 GENERAL

1.1. RELATED DOCUMENTS

- A. Division 26 specifications govern the construction methods, materials and other aspects related to electrical work contained in these Division 28 specifications.
- B. Reference
 - 1. Section 260500 - Electrical Provisions
 - 2. Section 260505 - Project Coordination
 - 3. Section 260520 - Basic Electrical Materials And Methods
 - 4. As well as other Division 26 Sections for any other electrical requirements and provisions.
- C. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 280500

SECTION 280510 – ELECTRONIC SAFETY AND SECURITY DEMOLITION

PART 1 - GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500 for Electrical Provisions as well as Section 260510 and other Division 26 Sections for other electrical requirements and provisions.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 280510

SECTION 280513 – CONDUCTORS/CABLES FOR ELECTRONIC SAFETY/SECURITY

PART 1 GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500 for Electrical Provisions as well as Section 260510 and other Division 26 Sections for other electrical requirements and provisions.
- B. 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. Fire alarm wire and cable.

1.3. QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

1.4. 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.

PART 2 PRODUCTS

2.1. PATHWAYS

- A. Support of Open Cabling: NRTL labeled for support of cabling, designed to prevent degradation of cable performance and pinch points that could damage cable.
 - 1. Support brackets with cable tie slots for fastening cable ties to brackets.
 - 2. Lacing bars, spools, J-hooks, and D-rings.
 - 3. Straps and other devices.
- B. Conduit and Boxes: Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." Flexible metal conduit shall not be used.

2.2. FIRE ALARM WIRE AND CABLE

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Honeywell Cable
 - 2. Belden
 - 3. West Penn Wire
 - 4. Allied Wire and Cable
- B. General Wire and Cable Requirements:
 - 1. NRTL listed and labeled as complying with NFPA 70, Article 760.
 - 2. Generally, cable insulation color shall be red. Refer to Part 3, Execution for further direction.
- C. Signaling Line Circuits: Twisted, shielded pair, minimum No. 16 AWG unless larger size recommended by system manufacturer.
 - 1. Circuit Integrity Cable: Twisted shielded pair, NFPA 70, Article 760, Classification CI, for power-limited fire alarm signal service Type FPL. NRTL listed and labeled as complying with UL 1424 and UL 2196 for a 2-hour rating.
- D. Non-Power-Limited Circuits: Solid-copper conductors with 600-V rated, 75 deg C, color-coded insulation.
 - 1. Low-Voltage Circuits: No. 16 AWG, minimum.
 - 2. Line-Voltage Circuits: No. 12 AWG, minimum.

PART 3 EXECUTION

3.1. INSTALLATION OF PATHWAYS

- A. Comply with requirements in Division 26 Section "Raceway and Boxes for Electrical Systems." for installation of conduits and wireways.

3.2. FIRE ALARM WIRING INSTALLATION

- A. Comply with NECA 1 and NFPA 72.
- B. Wiring Method:
 - 1. Install plenum cable in environmental air spaces, including plenum ceilings.
 - 2. Fire alarm circuits and equipment control wiring associated with the fire alarm system shall be installed in a dedicated raceway system where exposed. This system shall not be used for any other wire or cable.
 - a. Cables and raceways used for fire alarm circuits, and equipment control wiring associated with the fire alarm system, may not contain any other wire or cable.
 - 3. Fire-Rated Cables: Use of 2-hour, fire-rated fire alarm cables, NFPA 70, Types MI and CI, is permitted.
 - 4. Signaling Line Circuits: Power-limited fire alarm cables may be installed in the same cable or raceway as signaling line circuits.
- C. Wiring within Enclosures: Separate power-limited and non-power-limited conductors as recommended by manufacturer. Install conductors parallel with or at right angles to sides and back of the enclosure. Bundle, lace, and train conductors to terminal points with no excess. Connect conductors that are terminated, spliced, or interrupted in any enclosure associated with the fire alarm system to terminal blocks. Mark each terminal according to the system's wiring diagrams. Make all connections with approved crimp-on terminal spade lugs, pressure-type terminal blocks, or plug connectors.
- D. Cable Taps: Use numbered terminal strips in junction, pull, and outlet boxes, cabinets, or equipment enclosures where circuit connections are made.
- E. Color-Coding: Color-code fire alarm conductors differently from the normal building power wiring. Use one color-code for alarm circuit wiring and another for supervisory circuits. Color-code audible alarm-indicating circuits differently from alarm-initiating circuits. Use different colors for visible alarm-indicating devices. Paint fire alarm system junction boxes and covers red. Generally cabling shall be red.
- F. Risers: Install at least two vertical cable risers to serve the fire alarm system. Separate risers in close proximity to each other with a minimum one-hour-rated wall, so the loss of one riser does not prevent the receipt or transmission of signals from other floors or zones.
- G. Wiring to Remote Alarm Transmitting Device: 1-inch (25-mm) conduit between the fire alarm control panel and the transmitter. Install number of conductors and electrical supervision for connecting wiring as needed to suit monitoring function.

3.3. CONNECTIONS

- A. Comply with requirements in Division 28 Section "Fire Detection and Alarm" for connecting, terminating, and identifying wires and cables.

3.4. GROUNDING

- A. For low-voltage wiring and cabling, comply with requirements in Division 26 Section "Grounding and Bonding for Electrical Systems."

3.5. IDENTIFICATION

- A. Identify system components, wiring, and cabling. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.6. FIELD QUALITY CONTROL

- A. Perform tests and inspections.

END OF SECTION 280513

SECTION 283110 – FIRE-ALARM SYSTEM MODIFICATIONS

PART 1 GENERAL

1.1. RELATED DOCUMENTS

- A. Reference Section 260500 for Electrical Provisions as well as Section 260510 and other Division 26 Sections for other electrical requirements and provisions.
- B. Drawings and general provisions of Contract, including General and Supplementary Conditions and Division 1 Specification Sections, apply to this Section.

1.2. SYSTEM DESCRIPTION

- A. This scope is to provide additional devices and modifications to the existing building systems. All components required for a complete fire alarm system as shown on plans and as necessary to upgrade and modify the existing system. Contractor shall field verify necessary components prior to bid.

1.3. 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.
- 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 air-conditioning 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.
 - e. Manufacturer's required maintenance related to system warranty requirements.
 - f. Abbreviated operating instructions for mounting at fire-alarm control unit.
 - g. Copy of NFPA 25.
- H. Software and Firmware Operational Documentation:
- 1. Software operating and upgrade manuals.
 - 2. Program Software Backup: On USB stick or other digital media, complete with data files.
 - 3. Device address list.
 - 4. Printout of software application and graphic screens.

1.4. 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 III 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.

1.5. SOFTWARE SERVICE AGREEMENT

- A. Comply with UL 864.
- B. Technical Support: Beginning with Substantial Completion, provide software support for two years.
- C. Upgrade Service: Update software to latest version at Project completion. Install and program software upgrades that become available within two years from date of Substantial Completion. Upgrading software shall include operating system. Upgrade shall include new or revised licenses for use of software.

PART 2 PRODUCTS

2.1. MANUFACTURERS

- A. The fire alarm control panel for the building is a Siemens panel. Contractor to field verify exact model. New devices, equipment, monitoring, initiation, notification, etc. shall connect to the existing fire alarm control panel and be compatible with same.
- B. Provide all necessary equipment, wiring, software upgrades, modifications, etc. as required to support the additional devices from the existing FACP.

2.2. SYSTEMS OPERATIONAL DESCRIPTION

- A. Fire-alarm signal initiation shall be by one or more of the following devices and systems:
 - 1. Manual stations.
 - 2. Heat detectors.
 - 3. Smoke detectors.
 - 4. Automatic sprinkler system water flow.
 - 5. Heat detectors in elevator shaft and pit.
 - 6. Fire-extinguishing system operation.
 - 7. Fire standpipe system.
- B. Fire-alarm signal shall initiate the following actions:
 - 1. Continuously operate alarm-notification appliances.
 - 2. Identify alarm at the 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. Recall elevators to primary or alternate recall floors.
 - 8. Activate emergency lighting control.
 - 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. Duct Smoke Detectors.

2. Valve supervisory switch.
3. Low-air-pressure switch of a dry-pipe sprinkler system.
4. 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 signal-initiating 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.
9. Fire-pump power failure, including a dead-phase or phase-reversal condition.
10. Low-air-pressure switch operation on a dry-pipe or preaction sprinkler system.

E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.

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.

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.).

2.5. NON-SYSTEM SMOKE DETECTORS

A. Refer to Section 262726 – Wiring Devices.

2.6. HEAT DETECTORS

A. General Requirements for Heat Detectors: Comply with UL 521.

- B. Heat Detector, Combination Type: Actuated by either a fixed temperature of 135 deg F or a rate of rise that exceeds 15 deg F per minute unless otherwise indicated.
 - 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
- C. Heat Detector, Fixed-Temperature Type: Actuated by temperature that exceeds a fixed temperature of 190 deg F.
 - 1. Mounting: Twist-lock base interchangeable with smoke-detector bases.
 - 2. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.

2.7. NOTIFICATION APPLIANCES

- A. 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 single-mounting assembly, equipped for mounting as indicated and with screw terminals for system connections.
 - 2. Audio notification appliances located in sleeping spaces (as defined by NFPA) shall produce a low-frequency (520 hz) audible signal.
- B. Chimes, Low-Level Output: Vibrating type, 75-dBA minimum rated output.
- C. Chimes, High-Level Output: Vibrating type, 81-dBA minimum rated output.
- D. 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.
- E. 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.

2.8. MAGNETIC DOOR HOLDERS

- A. Description: Units are equipped for wall or floor mounting as indicated and are complete with matching doorplate.
 - 1. Electromagnet: Requires no more than 3 W to develop 25-lbf holding force.
 - 2. Wall-Mounted Units: Flush mounted unless otherwise indicated.
 - 3. Rating: 24-V ac or dc.
 - 4. Rating: 120-V ac.
- B. Material and Finish: Match door hardware.

2.9. ADDRESSABLE INTERFACE DEVICE

- A. Description: Microelectronic monitor module, NRTL listed for use in providing a system address for alarm-initiating devices for wired applications with normally open contacts.
- B. Integral Relay: Capable of providing a direct signal to elevator controller to initiate elevator recall or to circuit-breaker shunt trip for power shutdown.

PART 3 EXECUTION

3.1. EQUIPMENT INSTALLATION

- A. Comply with NFPA 72 for installation of fire-alarm equipment.
- B. Equipment Mounting: Install fire-alarm control unit on finished floor with tops of cabinets not more than 72 inches above the finished floor.
- C. Connecting to Existing Equipment: 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. Connect new equipment to existing monitoring equipment at the supervising station.
 3. Expand, modify, and supplement existing control or monitoring equipment as necessary to extend existing control or monitoring functions to the new points. New components shall be capable of merging with existing configuration without degrading the performance of either system.
- D. 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 NFPA 72.
 5. HVAC: Locate detectors not closer than 3 feet from air-supply diffuser or return-air opening.
 6. Lighting Fixtures: Locate detectors not closer than 12 inches from any part of a lighting fixture.
 7. Fire alarm panels and power extenders: Provide smoke detectors above all new panels and components as required by NFPA.
- E. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- F. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.
- G. Single-Station Smoke Detectors: Where more than one smoke alarm is installed within a dwelling or suite, they shall be connected so that the operation of any smoke alarm causes the alarm in all smoke alarms to sound.
- H. 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.
- I. 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.
- J. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.
- K. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- L. Power Extenders: Located in electrical closets, mechanical spaces or otherwise in unobtrusive locations. Extenders in shell spaces shall be located in unobtrusive locations and not in locations that will conflict with future buildout. Provide smoke detectors above panels.
- M. Provide wire guards over all indicating devices or devices subject to damage in gymnasium or similar spaces.

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. Alarm-initiating connection to elevator recall system and components.
 3. Supervisory connections at valve supervisory switches.
 4. 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 "Identification for Electrical Systems."
- 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. 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.
- C. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- D. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.
- F. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- G. 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.

END OF SECTION 283110

