

SET NO: _____

SUWANNEE COUNTY SCHOOL BOARD

702 2nd Street N.W.

Live Oak, Florida 32064

SCHOOL BOARD MEMBERS

Jerry Taylor, Chairman	District 1
Catherine Cason	District 2
Julie B. Ulmer	District 3
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J.M. Holtzclaw	District 5

ADMINISTRATION

Jerry A. Scarborough, Superintendent

**SUWANNEE HIGH SCHOOL
COURTYARD REMODEL**

PROJECT MANUAL

**GENERAL CONDITIONS
AND
TECHNICAL SPECIFICATIONS**

A/E Project No. 2012.52

Issued for Bid & Agency Review: April 1, 2013

**SUWANNEE HIGH SCHOOL COURTYARD REMODEL
SUWANNEE COUNTY SCHOOLS
RZK# 2012.52**

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SECTION 00 11 13 - BID NOTICE

PART I - GENERAL

Legal notice is hereby given that sealed bids will be received by the SCHOOL BOARD of SUWANNEE COUNTY, 702 2nd Street N.W., Live Oak, FL 32064 until 2:00 pm (local time) on MAY 8th, 2013 for the SUWANNEE HIGH SCHOOL COURTYARD REMODEL. Any bid received after the specified time and date will be rejected.

A pre-bid conference will be held at the PROJECT SITE, on APRIL 19th, 2013, starting at 10:00 am,. Prospective bidders must wait at the front office reception area until the Facilities Representative arrives to escort all participants

SECURING DOCUMENTS:

Plans and specifications may be downloaded for the SUWANNEE COUNTY SCHOOLS web site at <http://suwannee.schooldesk.net/Bids/tabid/7303/Default.aspx> under Bid #13-209.

BONDS:

Each bid shall be accompanied by a Bid Bond or Cashier's Check in the amount of 5% of the base bid payable to the SCHOOL BOARD OF SUWANNEE COUNTY as evidence of good faith and guaranteeing that the successful bidder will execute and furnish to Owner a Performance Bond meeting the standards outlined in the specifications for 100% of the contract price, within ten (10) days after being awarded the contract, said bond guaranteeing the performance payment of said contract, the premium of said bond to be paid by the said Contractor.

BIDS:

Each bid shall be made in strict accordance with the Instructions to Bidders, Section 00 21 13, and all applicable conditions and requirements specified in the project bid and contract documents.

The successful bidder, if any, will be notified after the client has awarded the contract. The Contractor will be required to complete said project within the time set forth in the contract document. The Owner reserves the right to reject any and all bids, to waive any informalities or irregularities of bids, or to accept any bid in part.

END OF SECTION 00 11 13

SECTION 00 21 13 - INSTRUCTIONS TO BIDDERS

ARTICLE 1:

GENERAL:

DEFINITIONS:

Bidding Documents include the Advertisement or Invitation to Bid, Instructions to Bidders, the bid form, other sample bidding and contract forms and the proposed Contract Documents including any Addenda issued prior to receipt of bids.

All 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.

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 addition, deletions, clarifications, or corrections.

A **Bid** is a complete and properly signed proposal to do the Work or designated portion thereof for the sums stipulated therein supported by data called for by the Bidding Documents.

Base Bid is the sum stated in the Bid for which the Bidder offers to perform Work described as the base, to which Work may be added or deducted for sums stated in Alternate Bids.

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 project scope or materials or methods of construction described in the Bidding Documents is accepted.

A **Unit Price** is an amount stated in the Bid as a price per unit of measurement for materials or services as described in the Contract Documents. Such prices may be used in calculating additions or deletions to the project scope.

A **Bidder** is one who submits a Bid for a prime contract with the Owner for the Work described in the proposed Contract Documents.

A **Sub-bidder** is one who submits a bid to a Bidder for materials or labor for a portion of the Work.

ARTICLE 2:

BIDDER'S REPRESENTATION:

Each Bidder by making his bid represents that:

He has read and understands the Bidding Documents and his Bid is made in accordance therewith.

He has visited the site and existing structures and has familiarized himself with the local conditions under which the Work is to be performed. The "subsurface investigation" report, if applicable, is made a part of this specification and follows in another section.

His Bid is based upon the materials, systems and equipment described in the Bidding Documents without exceptions.

Bidder is advised that any additional changes over and above the Bid cost will not be considered based on the Bidder's lack of knowledge of the Bidding documents.

ARTICLE 3:

BIDDING DOCUMENTS:

Copies:

Complete sets of Bidding Documents shall be used in preparing bids; neither the Owner nor the Architect assume any responsibility for errors or misinterpretations resulting from the use of incomplete sets of Bidding Documents.

The Owner or Architect in making copies of the Bidding Documents available on the above terms, do so only for the purpose of obtaining bids on the Work and do not confer a license or grant for any other use.

Interpretation or correction of bidding documents:

Bidders shall promptly notify the Architect of any ambiguity, inconsistency or error which they may discover upon examination of the Bidding Documents or of the site and local conditions.

Bidders requiring clarification or interpretation of the Bidding Documents shall make a written request to the Architect, to reach him at least ten (10) days prior to the date for receipt of bids.

Any interpretation, correction or change of the Bidding Documents will be made by Addendum. Interpretations, corrections or changes of the Bidding Documents made in any other manner will not be binding, and bidders shall not rely upon such interpretations, corrections and changes.

Substitutions:

The material, 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.

The Bidder shall be allowed to submit Bids on materials and equipment other than those which the specifications are based upon, within the constraints of the individual specifications sections and section 01 60 00.

"Relevant Product Data" shall name the specific substitute product or equipment item by model, type, size, etc., along with product/equipment performance data; appearance, photos and samples; add drawn information to indicated approximate fabrication, location and installation information. The Contractor shall be responsible for installing all substitute products of equipment in a manner consistent with the general design of the facility as interpreted by the Architect/Engineer. Furthermore, the Contractor shall be responsible to interface all substitute products or equipment in a complete and finished manner with no additional cost to the Owner.

Addenda:

Addenda will be mailed or delivered to all general contractors and plan rooms who are known by the Architect to have received a complete set of Bidding Documents.

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

Typically, no Addenda will be issued later than Five (5) calendar days prior to the date for receipt of bids except an Addendum, if necessary, postponing the date for receipt of bids or withdrawing the request for bids. To maintain a bid date, faxed or emailed addenda may be issued up to the day prior to receiving bids.

Each bidder shall ascertain prior to submitting his bid that he has received all Addenda issued, and he shall acknowledge their receipt on his price proposal document.

ARTICLE 4:

BIDDING PROCEDURE:

Form and Style of Bids:

Bids shall be submitted in duplicate (2) on the forms provided by herein.

All blanks on the bid form shall be filled in.

Where so indicated by the makeup of the bid form, sums shall be expressed in both words and figures, and in case of discrepancy between the two, the written amount shall govern.

Any interlineation, alteration or erasure must be initialed by the signer of the Bid.

All requested alternates shall be bid.

Bidder shall make no additional stipulations on the bid form nor qualify his bid in any other manner.

Each copy of the Bid shall include the legal name of Bidder and a statement whether Bidder is a sole proprietor, a partnership, a corporation, or any other legal entity, and 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 agent's authority to bind Bidder.

Bid Security:

Each bid shall be accompanied by a bid security in the amount of at least 5% of the bid in the form of a Cashier's Check made payable to the Owner or a Bid Bond executed by the bidder pledging that the Bidder will enter into a contract with the Owner on the terms stated in his Bid and will, furnish bonds as described hereunder in Article 8 covering the faithful performance of the Contract and the 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 penalty.

The Owner will have the right to retain the bid security of Bidders until either (a), the Contract has been executed and bonds, if required, have been furnished or (b) the sixty (60) days has elapsed so that Bids may be withdrawn, or (c), all Bids have been rejected.

Submission of Bids:

All copies of the bid, and the bid security shall be enclosed in sealed, separate, opaque envelopes, 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 the portion of the project or category of work for which the Bid is submitted. If the bid is sent by mail, the sealed envelopes shall be enclosed in a separate mailing envelope with the notation "BID ENCLOSED" on the face thereof.

Bids shall be deposited at the designated location prior to the time and date for receipt of bids indicated in the Advertisement or Invitation to Bid, or any extension thereof made by Addendum.

Bidder shall assume full responsibility for timely delivery at location designated for receipt of Bids.

Oral, telephonic or telegraphic Bids are invalid and will not receive consideration.

Modification of Withdrawal of Bid:

A Bid may not be modified, withdrawn or canceled by the Bidder for sixty (60) days following the time and date designated for the receipt of Bids, and Bidder so agrees in submitting his Bid.

Prior to the time and date designated for receipt of Bids, Bids submitted early may be modified or withdrawn only by notice to the party receiving Bids at the place and prior to the time designated for receipt of Bids.

Such notice shall be in writing over the signature of the Bidder or be by telegram; if by telegram, written confirmation over the signature of Bidder must have been mailed and postmarked on or before the date and time set for receipt of Bids; it shall be so worded as not to reveal the amount of the original Bid.

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

Bid security, shall be in an amount sufficient for the Bid as modified or resubmitted.

List of Subcontractors:

The Bidder shall submit a list of names of Subcontractors, other persons or organizations (including those who are to furnish materials or fabricate equipment) proposed for the principal portions of the Work at the time of the Bid; or, within 24 hours of the bid receipt time.

The Bidder shall use AIA Document G805, "List of Subcontractors" for this submittal. The Bidder shall not list himself as a material supplier or subcontractor unless A.I.A. Doc. 305 "Contractor: Qualification Statement" clearly identifies a capability for the work. The Bidder must identify a subcontractor for each section of work or risk rejection of his bid. The Bidder, if awarded this contract, may not change the subcontractor without first submitting a written request to the Architect and receiving written acknowledgment in reply.

ARTICLE 5:

CONSIDERATION OF BIDS:

Opening of Bids:

Unless stated otherwise in the Advertisement or Invitation to Bid, the properly identified Bids received on time may or may not be opened publicly or made public at the discretion of the Owner.

Rejection of Bids:

The Owner shall have the right to reject any or all Bids and in particular to reject a Bid not accompanied by any required bid security or data required by the Bidding Documents or a Bid in any way incomplete or irregular.

Acceptance of Bid (Award):

The Owner shall have the right to waive any informality or irregularity in any Bid received.

It is the intent of the Owner, if he accepts any Alternates, to accept them in any order or combination to determine the low Bidder.

ARTICLE 6:

QUALIFICATION OF CONTRACTORS:

Prospective Contractors shall execute and submit A.I.A. Document A305, "Contractor's Qualification Statement" a minimum of 10 days prior to the bid date in order to qualify to bid this work.

ARTICLE 7:

POST-BID INFORMATION:

Submissions:

The Bidder will be required to establish to the satisfaction of the Architect and the Owner the reliability and responsibility of the proposed Subcontractors to furnish and perform the Work described in the sections of the Specifications pertaining to such proposed Subcontractors' respective trades.

Prior to the award of the Contract, the Architect will notify the Bidder in writing if either the Owner or the Architect, after due investigation, has reasonable and substantial objection to any person or organization on such list. If the Owner or Architect has a reasonable and substantial objection to any person or organization on such list, and refuses to accept such person or organization, the Bidder may, at his option, (1) withdraw his bid, or (2) submit an acceptable substitute Subcontractor. In the event of either withdrawal or disqualification under this Subparagraph, bid security will not be forfeited.

Subcontractors and other persons and organizations proposed in writing by the Bidder and accepted by the Owner and the Architect must be used on the Work for which they were proposed and accepted; and, shall not be changed except with the written acknowledgment of the Owner and the Architect.

ARTICLE 8:

PERFORMANCE BOND AND LABOR AND MATERIAL PAYMENT BOND:

Owner's Right to Require Bonds:

The Owner shall require the Bidder to furnish bonds covering the faithful performance of the Contract and the payment of all obligations arising thereunder in such form and amount as the Owner has prescribed in the Supplementary General Conditions, and with such sureties secured through the Bidder's usual sources as may be agreeable to the parties. The furnishing of such bonds shall be paid by the Contractor.

Time of Delivery and Form of Bonds:

The Bidder shall deliver the required bonds to the Owner not later than ten working days (10) from the Award of the Contract and prior to commencement of the Work.

Unless otherwise specified in the Bidding Documents, the bonds shall be written in the form of A.I.A. Document A311, Performance Bond and Labor and Material Payment Bond, meeting the current laws and regulations in the State of Florida including Florida State Statute 255.05 or 713.23 whichever may apply.

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 his Power of Attorney.

ARTICLE 9:

FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR:

Form To Be Used:

Unless otherwise provided in the Bidding Documents, the Agreement for the Work will be written on the Standard Form of Agreement between Owner and Contractor where the basis of payment is a Stipulated Sum. A.I.A. Document A101.

END OF SECTION 00 21 13

SECTION 00 30 00 – AVAILABLE INFORMATION

PART 1 GENERAL

This section includes references to:

- Survey Information
- Existing Hazardous Material Information
- Geotechnical Data

PART 2 – DATA

EXISTING HAZARDOUS MATERIAL INFORMATION:

Available for bidders and contractors for this Work is a copy of a hazardous materials report covering the investigation of and sampling for the existence of asbestos and lead-based paint in the existing portions of the project area.

The investigation, sampling and report was undertaken by: Paul Zak, Project Mgr. with GLE Associates, Inc., 4035 N.W. 43rd Street, Gainesville, FL 32606, phone: 352-335-6648, email: pzak@gleassociates.com.

GEOTECHNICAL DATA:

If applicable, a subsurface soils and geotechnical report with soils stabilization and foundation recommends will be included with the construction documents for the benefit of bidders and contractors working on the project.

The geotechnical work has been undertaken and prepared by: (not applicable this project).

If there are questions regarding results and recommendations, inquiries shall be made directly to the geotechnical engineer. The geotechnical report for this work, if applicable, is included with this Specifications Book.

END OF SECTION 00 30 00

SECTION 00 42 00 - BID PROPOSAL FORM

PART 1 - GENERAL

FROM: (Bidder's Name)_____

hereinafter called "Bidder"

TO: SUWANNEE COUNTY SCHOOL BOARD
702 2nd Street, N.W.
Live Oak, FL 32064

hereinafter called "Owner"

PROJECT:

Pursuant to and in compliance with the invitation to bid and the proposed Contract Documents relating to SUWANNEE HIGH SCHOOL COURTYARD REMODEL.

hereinafter called the "Work"

PROPOSAL:

The undersigned, as bidder, declares that he has examined the site of the Work and informed himself fully in regard to all conditions pertaining to the places where work is to be done, exclusive of destructive investigation; that he has examined the plans and specifications for work and contractual documents relative thereto; that he has read all special provisions furnished prior to the opening of bids; and, that he has satisfied himself relative to the work to be performed.

The Bidder proposes and agrees, if this proposal is accepted, to contract with the Owner in the form of the Work in full and complete accordance with the shown, described, and reasonable intended requirements of the plans and specifications and contract documents to the full and entire satisfaction of the Owner, with a definite understanding that no money will be allowed for extra work except as set forth in the attached General Conditions and Contract Documents.

The proposal amounts, whether base bid or alternate, shall include all overhead, profit, state sales tax, building permit cost, utility fees and any other such costs as required for the work.

BASE BID:

All labor, material, services, and equipment necessary for completion of the work shown on the Drawings and in the Specifications, except for the items described as an "Alternate".

For the lump Sum of

_____ Dollars (\$_____)

ADDENDUM RECEIPT:

Bidders shall acknowledge below the receipt of any and all addenda, if any, to the plans and specifications listing and addenda by number and date.

Addendum No.	Date
Addendum No.	Date
Addendum No.	Date

Addendum No.

Date

FURTHERMORE:

The undersigned, as bidder, hereby declares that the only person or persons interested in the proposal as Principal or Principals is, or are, named herein and that no other person that herein mentioned has any interest in this proposal or in the contract to be entered into, that this proposal is made without connections with any other person, company or parties making a bid.

The Bidder understands that the Owner reserves the right to reject this bid, but that this bid shall remain open and shall not be withdrawn for a period of forty-five (45) days from the date prescribed its opening.

The Bidder further proposes and agrees to commence work under its contract within seven (7) days from the date of written notice to proceed, and shall substantially complete all work under the contract in sixty one (61) **calendar days** from the date of the written notice to proceed. Construction start day is June 8, 2013 with Substantial Completion on August 8, 2013.

The Bidder understands and agrees that no contractual relationship exists, or is created between the Owner and the Bidder by the tendering of this bid proposal.

RESPECTFULLY SUBMITTED,

Name of Firm

BY:_____

TITLE:_____

END OF SECTION 00 42 00

SECTION 00 43 13 - BID BOND

DESCRIPTION:

The Bidder shall provide a Bid Guaranty in accordance with Section 00010 and 00100, in the amount of at least 5% of the bid in the form of a cashier's check made payable to the Owner or a bid bond executed by the bidder, as principal, and having a surety thereon of a Surety company meeting the standard outlined in the Supplementary General Conditions.

EXECUTION:

The Bid Bond, AIA Document A310 shall be executed and accompany the Bidders Bid with method prescribed in Section 00100.

END OF SECTION 00 43 13

SECTION 00 45 13 – BIDDING CONTRACTOR QUALIFICATION STATEMENT

DESCRIPTION:

Prospective Contractors (Bidders) shall execute and submit per specification Section 00 21 13 AIA Document A305, "Contractor's Qualification Statement," a copy of which is available at the Architect's office at the cost of printing only.

END OF SECTION 00 45 13

SECTION 00 52 00 - AGREEMENT BETWEEN OWNER AND CONTRACTOR

DESCRIPTION:

The following AIA Document A101, "Standard Form of Agreement Between Owner and Contractor - Stipulated Sum" shall be the format between the successful Bidder for this work and the Owner.

PROVISIONS:

Article 3 of AIA Document A101 will identify liquidated damages as follows:

"It is specifically agreed by and between the Owner and Contractor that the Owner may retain a sum in the amount as scheduled below from the amount of compensation to be paid the Contractor, herein above, Sundays and Holidays included that the work remains substantially incomplete.

<u>CONTRACT AMOUNT</u>	<u>FIRST 15 DAYS</u>	<u>SECOND 15 DAYS</u>	<u>31ST DAY & THEREAFTER</u>
Under \$50,000	\$50.00	\$100.00	\$200.00
\$50,000 to \$99,999	\$100.00	\$200.00	\$500.00
\$100,000 to \$5,000,000	\$200.00	\$400.00	\$1,000.00
\$5,000,000 and up	\$1,000.00	\$2,000.00	\$3,000.00

This amount as scheduled, is agreed upon as a proper measure of Liquidated Damages which the Owner will sustain per day by failure of the Contractor to complete the work by the item stipulated in this Contract and is not to be construed in any sense as a penalty provision.

The Contractor shall take into account all contingent work which has to be done by other parties, and shall not plead his want of knowledge of said contingent work as an excuse for delay in his work, or for non-performance."

EXECUTION:

The Agreement shall be executed by legal representatives of the Owner and the Contractor.

END OF SECTION 00 52 00

SECTION 00 60 00- PROJECT FORMS

INSTRUCTIONS:

The forms and certificates listed below are to be used by the Contractor for submissions for contractual and administrative requirements specified herein.

Requirements and instructions on the forms may constitute extensions of, or additions to, the contractual conditions of the contract and the general requirements of the specifications.

Prepare all forms as required with all blank spaces filled in, in ink or typewritten.

PROJECT FORM LISTING:

TITLE	DOCUMENT NUMBER
Certificate of Insurance	AIA Doc. G-705
List of Subcontractors	AIA Doc. G-805
Application & Certificate for Payment	AIA Doc. G-702
Application & Certificate for Payment	AIA Doc. G-703
Architect's Field Order	AIA Doc. G-708
Proposal Request	AIA Doc. G-709
Change Order	AIA Doc. G-701
Certificate of Substantial Completion	AIA Doc. G-704
Consent of Surety Company to Final Payment	AIA DOC. G-707
Contractor's Affidavit for Payment of Debts and Claims	AIA Doc. G-706
Contractor's Affidavit of Release of Liens (Final Release)	AIA Doc. G-706A

END OF SECTION 00 60 00

SECTION 00 61 13 - PERFORMANCE AND PAYMENT BOND

DESCRIPTION:

The successful bidder shall provide a "Performance Bond" and "Labor and Material Payment Bond" AIA Documents, A311, copies which follow in accordance with the Owner-Contractor Agreement (Section 00500) and in compliance with current laws and regulations in the State of Florida, including Florida State Statute 255.05 or 713.23 whichever may apply in the amount equal to 100% of the contract price.

EXECUTION:

Within ten (10) calendar days of the award of the contract, and prior to the commencement of construction the Contractor shall submit the Performance and Payment Bond to the Owner fully completed and executed in the manner specified. See Section 00 73 00, Supplementary General Conditions, for additional provision regarding these Bonds.

The Contractor shall provide the name and address of his bonding agent and surety company to all subcontractors and agencies supplying materials or work on this contracted project.

END OF SECTION 00 61 13

SECTION 00 72 00 - GENERAL CONDITIONS

REFERENCE:

The general conditions of this contract are the American Institute of Architects Document A201, "General Conditions of the Contract for Construction", Fourteenth Edition, hereinafter referred to as the "General Conditions".

A copy of the General Conditions may be obtained from the Architects office at cost. Additional copies may be purchased from the American Institute of Architects, 1735 New York Avenue, N.W., Washington, D.C. 20006.

The General Conditions shall apply to each and every section of the Work as though written in full therein.

DEFINITIONS:

The following definitions shall amend the General Conditions in a manner to specifically apply to this project.

Contract Documents: The Contract Documents, as referred to herein, consist of the Contract, the Legal Advertisements covering Opening of Bids, the Performance Bond, the Labor, and Material Payment Bond, the Instruction to Bidders and General Conditions, the Special Conditions, Technical Specifications, Contract Drawings, and Addenda, all incorporated into the contract before its execution. These documents apply to each and every division and section of the specifications, the plans and working drawings and all modifications issued after the execution of the contract, as if written in full therein. All plans and drawings, general requirements, and technical specifications, modifications, and all other items included as a part of the Summary of Work Section 01 10 00 are also a full and effective portion of the Contract Documents.

Owner: As herein used shall mean the: SCHOOL BOARD OF SUWANNEE COUNTY and their designated project representative.

Architect: As herein referred to shall mean ARCHITECTS RZK, INC., 600 Florida Avenue, Suite 202, Cocoa, Florida 32922.

Contractor: As used herein refers to the person, firm, or corporation authorized to do business in the State of Florida with whom a contract has been made directly or through accredited representatives that have entered into a contract with the Owner for the performance of the work described by these documents.

Other Contractors: As used herein shall mean any person, firm or corporation with whom a contract has been made by the Owner for the performance of any work on the site of this building, which work is not a portion of the work covered by this contract.

Inspector: As used herein shall mean any authorized representative of the Owner.

Subcontractor: As used herein refers to and shall include all those performing labor or furnishing materials under the supervision and control of the Contractor and not in contract with the Owner.

Superintendent: As used herein refers to the executive representative of the Contractor who is present on the work at all times during progress, authorized to receive and fulfill instructions from the Architect, and capable of superintending work efficiently.

Surety: As used herein shall mean the firm, corporation, or individual which is bound by the Performance Bond, Labor and Material Payment Bond, with and for the Contractor, and which

engages to be responsible for the Contractor's acceptable Performance, Labor and Material Payment of the work and for payment of all debts pertaining thereto.

Project: As used herein shall mean the SUWANNEE COUNTY HIGH SCHOOL COURTYARD REMODEL

Proposal Guarantee: As used herein shall mean the Bid Bond or good faith deposit, acceptable to the Owner, designated in the proposal to be furnished by the bidder as a guarantee of good faith to enter into a contract with the Board, if the contract is awarded to him.

Written Notice: Shall be deemed to have been duly served if 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 if delivered at or sent by certified or registered mail to the last business address known to him who gives notice.

Work: As used herein means labor or materials furnished by the Contractor or Subcontractor.

Completion: As used herein means that the facility called for is fully executed and completed in accordance with the contract.

Plans: As used herein include all drawings and specifications.

Punch List: Is a compilation of items which have been found to require further attention by Contractor.

END OF SECTION 00 72 00

SECTION 00 73 00 - SUPPLEMENTARY GENERAL CONDITIONS

SCOPE:

The Supplementary General Conditions modify, change, delete from or add to the General Conditions (A.I.A. 1987 Edition) and shall apply to each and every Section of the Work as though written in full therein.

SUPPLEMENTARY CONDITIONS:

The following paragraphs and subparagraphs take precedence over the General Conditions. Where any part of the General Conditions is modified or deleted by the Supplementary General Conditions, the unaltered provisions remain in effect.

Paragraph numbers and titles refer to like numbers and titles in the General Conditions.

ARTICLE 1 - GENERAL PROVISIONS:

- 1.1.3.1 The work of this Contract shall be the SUWANNEE HIGH SCHOOL COURTYARD REMODEL
- 1.1.4.1 The Project Site: The Project Site is where the Project is located, as more specifically described by the contract drawings.
- 1.1.6.1 The section, article and paragraph headings in the Contract Documents are inserted only as a matter of convenience and for reference, and in no way define, limit or describe the scope or intent of any provision of the Contract Documents.
- 1.2.3.1 Locations of piping, ductwork, conduit, outlets and the like, shown on the mechanical and electrical drawings are diagrammatic, except where specifically indicated by dimension or as existing. Therefore, it shall be the duty of the Contractor and his subcontractors to consult with each other and verify existing conditions, and in each case where there is a question of doubt as to adequacy of space or indicated arrangements, to submit a workable solution to the Architect for his approval before installing the work which is questionable.
- 1.2.3.2 Failure to report a conflict or ambiguity in the Contract Documents shall be deemed evidence that the Contractor has elected to proceed in the most expensive manner.
- 1.2.4.1 Scope paragraphs placed at the beginning of the Sections present a brief indication of the principal Work included in that Section, but do not limit Work to subject mentioned.
- 1.2.4.2 The Specifications have been partially "streamlined" and some works and phrases have been intentionally omitted. Missing portions shall be provided by inference as with notes on drawings.
- 1.3.1.1 Upon award of the Contract, the Contractor will furnish a disk containing the Contract Drawings and Specifications.

ARTICLE 2 - OWNER

- 2.2.2 In the first line, insert "reasonable" after "furnish". In the second line, insert "reasonably obtainable" after "and".

- 2.2.2.1 The Owner does not warrant the accuracy of said surveys or utility locations and the Contractor shall be responsible for verifying all existing conditions. Those conditions which vary substantially from that noted or reasonably inferred therefrom will be considered for a change in the contract work.
- 2.2.3 In the first line, insert "construction" after "for", and "customarily" after "are"; in the fourth line, insert "by governmental agencies or utility companies" after "required", and delete "construction" and replace with "the Owners".
- 2.2.5.1 Upon award of the Contract, the Contractor will be furnished Contract Drawings and Specifications, signed and sealed permit sets, by the Owner.

ARTICLE 3 - CONTRACTOR:

- 3.2.1 On line eight, insert, "or should have recognized" after "recognized".
- 3.3.5 Contractor is responsible for correlating the work of Subcontractors and exercising general superintendence over them. Contractor shall determine the extent of work of Subcontractors so the necessary placing of sleeves, inserts, anchors, hangers, bolts, bucks, sub-bases, pipes, conduits, mounting devise and other roughing-in may be accomplished by the proper time to provide for the ultimate placing or installing of equipment and fixtures. Contractor shall see that the work of Subcontractors is performed properly so there will be a minimum of cutting of work in place.
- 3.4.3 Contractor and his Subcontractors shall have full control of all persons in their employ; however, the Owner/Architect shall have the right to require Contractor to remove any Contractor or Subcontractor employee(s) whose actions have a disruptive effect upon the construction site. Further, Owner shall have the right to require Contractor to replace, within ten (10) days of Contractor's receipt of Owner's written notice, any employee or supervisor of Contractor or its Subcontractors.
- 3.4.4 Contractor shall notify Owner of potential jurisdictional disputes of or claims of two or more trades for work and shall consult with the Owner relative to any potential or actual slowdowns, stoppage, picketing or any other action that might result in labor disputes or work disruption at the Project Site.
- 3.4.5 To expedite inspection and testing of materials, the Contractor shall furnish complete statements to the Architect as to the origin, composition and manufacture of all materials to be used in the Work. Such statements shall be furnished promptly after execution of the Contract but, in all cases, prior to delivery of such materials. At the Owner's option, materials may be approved at the source of supply before delivery to the site. If it is found after trial that sources of supply for previously approved materials do not produce specified products, the Contractor shall furnish materials from other sources approved by Owner.
- 3.5.2 Contractor agrees to preserve for Owner any and all warranties furnished by Subcontractors and materialmen. In the event Contractor is unable to obtain from any Subcontractor or materialmen the warranty required by the Contract Documents, Contractor expressly assumes the risk of providing such warranty in lieu of the warranty sought from such Subcontractor or materialmen. Contractor shall accept no limitation of remedies or exclusion of warranties clauses in its Subcontracts or purchase orders or, alternatively, if such clauses are included in its Subcontracts or purchase orders, Contractor agrees to be fully liable to Owner for

all damages sustained by the Owner or those claiming through the Owner notwithstanding such limitation or exclusion clauses. The Owner shall not be bound by any limiting language or clauses contained in any Subcontract or purchase order entered into by Contractor and no limiting language or clauses shall reduce, affect or limit in any way Contractor's liability to Owner. Any exception to this provision must be agreed to in writing by Owner.

- 3.7.5 Where requirements of the Contract Documents differ from laws, ordinances, rules, regulations, orders, the Building Code or the requirements of authorities having jurisdiction, the more stringent requirements shall govern. Subject to the provisions of Subparagraph 3.7.4, any major changes in the scope of the Work as the result of laws, ordinances, rules, regulations, orders or the Building Code, the requirements of which are more stringent than the Contract Documents, shall be accompanied by appropriate Change Order.
- 3.7.6 On behalf of the Owner, the Contractor shall file a Notice-Of-Commencement, in accordance with State of Florida laws, with the applicable jurisdiction for the project.
- 3.9.2 Contractor's superintendent(s) and/or project manager(s) shall have had recent experience in the type of Work to be performed under this Contract which shall be specified in a written Notice to Owner. Owner shall be deemed to accept such person(s) unless, within ten (10) days after receipt of such notice, Owner objects in writing to the selection. If Owner so objects, Contractor shall select another person and the above process shall be repeated. No adjustment in Contract time or Contract Sum shall be permitted for compliance with this subparagraph. Should Contractor's superintendent or project manager have to be replaced during the course of this Contract, this subparagraph shall apply.
- 3.11.1.1 The Job Superintendent, and the plumbing, heating, ventilation and electrical subcontractors shall make and keep current red line corrections on drawings, showing exact location of underground lines. The red line drawings shall include all underground or concealed pipes, conduit, ducts, and all existing items which were not installed exactly as shown on drawings. Failure to keep record drawings current will delay processing of monthly payments.
- 3.12.12 Architect's approval of Shop Drawings or Samples of Product Data which deviate from the Contract Documents does not authorize change to the Contract. Any changes to the Contract affected by such Shop Drawings, Samples or Product Data, if specifically accepted and itemized by the Architect & Owner, shall be recorded by the Contractor on the as-built record drawings. Additional construction cost associated with any changes indicated in approved shop drawing shall be borne by the Contractor who proposes the change.
- 3.13.2 Contractor's proposed use of the Site shall be subject to Owner's prior written approval.
- 3.15.1 Delete this subparagraph and replace with the following: The 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. The Contractor shall oversee cleaning and ensure that building and grounds are maintained free from accumulations of waste materials and rubbish.

At reasonably frequent intervals during progress of Work, Contractor shall clean up site, building and access, and dispose of waste materials, rubbish and debris. Contractor shall provide containers and location on site for collection of waste

materials, rubbish and debris. Contractor shall not allow waste materials, rubbish and debris to accumulate and become an unsightly or hazardous condition.

Contractor shall lower waste materials in a controlled manner with as few handlings as possible and shall not drop or throw materials from heights. Contractor shall schedule cleaning operations so that dust and other contaminants resulting from cleaning process will not fall on wet, newly painted surfaces.

Contractor shall schedule clean-up operations such that it does not interfere with the Owner's operations should that apply.

Contractor shall conduct clean-up and disposal operations to comply with local ordinances and anti-pollution laws. Burning or burying of rubbish and waste materials on the site is not permitted. Disposal of volatile fluid wastes (such as mineral spirits, oil, or paint thinner) in storm or sanitary sewer systems or into streams or waterways or onto the ground is not permitted. Contractor shall remove waste materials, rubbish and debris from the Site and legally dispose of at public or private dumping areas off Owner's property.

Contractor shall vacuum clean interior building areas when ready to receive finish painting and continue vacuum cleaning on an as needed basis until the building areas are ready for Beneficial Occupancy.

ARTICLE 4 - ADMINISTRATION OF THE CONTRACT

- 4.1.4 Delete this subparagraph in its entirety.
- 4.2.4.1 The Owner and Contractor shall issue all communications between each other simultaneously to the Architect.
- 4.3.3 In lines two and three, delete "21" and replace with "ten".
- 4.3.6 In lines eleven and twenty-two, delete "21" and replace with "ten".
- 4.3.7.1 If Contractor wishes to make a claim for an increase in the Contract Sum, he shall give Owner written notice thereof within ten days after the occurrence of the event given rise to such claim. The amount of the adjustment shall be determined by one of the methods set forth in subparagraph 7.3.3. Any change in the Contract Sum resulting from such claim shall be authorized by written Change Order and shall not be valid or effective unless the written Change Order has been signed by Contractor, Owner and Architect.
- 4.3.8.1 Delete the paragraph and insert the following:
Any claim for extension of time or damages for delay or acceleration shall be made in writing to the Architect not more than ten (10) days from the commencement of the delay or acceleration; otherwise, it shall be waived. In the case of a continuing delay, only one claim is necessary.
- 4.3.8.2.1 In case of claims for extension of time because of adverse weather, such extension of time shall be granted only when adverse weather prevented the execution of major items or Work on normal working days. The Contractor shall provide an estimate of the probable effect of such delay on the progress of the Work. "Adverse weather" shall be defined to indicate weather which is not normal (on a 5 year average) for the Site.
- 4.3.9 In line seven, delete "21 days" insert "ten days."

- 4.5 Delete 4.5 in its entirety together with all other references to or concerning arbitration in any Contract Document. Owner shall not be obligated to arbitrate or permit any arbitration binding on the Owner under any of the Contract Documents or in connection with the project in any manner whatsoever. The Owner reserves the right to take any available action to protect the Owner(s) interests.

ARTICLE 5 - SUBCONTRACTORS

- 5.2.3 At the end of the last sentence on line nine, insert "or if the proposed subcontractor has proposed materials or systems not in accordance with requirements of the contract documents".
- 5.2.5 All portions of the Work which the Contractor's organization has not been accustomed to performing shall be performed under Subcontracts.
- 5.3.2 The Owner will contract directly with the Contractor. The Contractor will contract directly with all subcontractors for the Work.

ARTICLE 6 - CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

- 6.2.7 Contractor will be held responsible for damage to the Work or property as provided under this Paragraph 6.2 when such damage is not subject to an insured peril under the insurance procured and maintained by Owner.

ARTICLE 7 - CHANGES IN THE WORK

- 7.2.3 For change order work, the maximum allowance for overhead and profit for the Contractor is 10%. The maximum allowance of 5% profit and 10% overhead shall apply to subcontractors and sub-subcontractors for actual receipted material and direct labor costs.
- 7.3.3 Delete "based on one of the following methods:" and 7.3.3.1 through 7.3.3.4; and, insert the following;
- "The Contractor shall submit a detailed cost breakdown for each task listed in a Proposal Request, AIA Doc. G709, or Change Order request. A cost breakdown shall mean the elements listed in 7.3.6.1 through 7.3.6.5. All cost elements shall be related directly to the tasks listed in the Proposal Request or Change Order Request. Other than profit, overhead and bond premiums, no cost shall be determined in a percentage basis. The Contractor shall submit a reply to the Architect's Proposal Request within ten (10) days of its date unless a letter is received by the Architect prior to the tenth day stating the cause for a delayed response. Upon receipt of a Contractor response, the Owner and Architect shall review the amounts. The Architect shall prepare a change order directive, AIA Doc. G701 as negotiated or deny the change order request; or, direct the work of the change order as allowed by Subparagraph 7.3.6."
- 7.3.3.1 Mark-ups for overhead, profit and commission shall be per subparagraph 7.2.3.
- 7.3.5.1 In the event of failure to reach a timely agreement on a proposal submitted by the Contractor, the Architect and Owner may direct the Contractor to proceed whereby the cost shall be determined in accordance with 7.3.6 but in no case shall that cost exceed the increase of the proposal.

- 7.4.2 Minor changes so documented may, at a later date, be incorporated into the Drawings or Specifications, but this will in no way be cause for Contractor to make claim for additional cost or time if such claim has not been made promptly at the time of receipt of such instructions.

ARTICLE 8 - TIME

- 8.3.4 For each calendar day that any part of the Work remains uncompleted after the expiration of the Contract Time (including all extensions and adjustments as provided in Article 12) sums set out in the Agreement Between Owner and Contractor as liquidated damages, shall be deducted from any monies due Contractor or, if no money is due Contractor, Owner shall have the right to recover said sum or sums from Contractor, from the surety, or from both. The amount of these deductions are to cover liquidated damages to Owner incurred by additional and other expenses due to the failure of Contractor to complete the Work or any part of the work within the time specified, and such deductions are not to be considered as penalties. The sums represent liquidated damages for the loss to Owner on account of the expense due to the employment of the Architect and to any other expenses after the expiration of completion time.
- 8.3.5 By permitting the Contractor to continue and finish the Work, or any part of it, after the date fixed for its completion or after the date to which the time for completion may have been executed, will in no way serve as a waiver on the part of the Owner of any of its rights under the Contract.
- 8.3.6 There shall be no changes in the time limits allotted for Substantial Completion of the Work except by Change Order. Provisions similar to this are included in all contract documents governing work to be performed under this Contract. In the event that Contractor fails to complete any of the various work elements in the allotted time, he shall be liable for additional costs, including all attorney's fees, which are incurred by Owner because of failure of Contractor to complete such work within such time limits.
- 8.3.7 The Contractor shall cooperate with the Owner in order to maintain the contractual schedule. If Owner determines Contractor is falling behind schedule, contractor must, upon written request of Owner, submit to the Architect and Owner operational plans detailing Contractor's plan of action to regain lost time. If Owner determines it is in its own interest, Contractor shall comply with Owner's written orders to Contractor to take such steps as are necessary to improve progress of the Work. These steps may include, but are not limited to, days, expediting delivery times, or increasing overtime operations. No additional compensation will be made to Contractor for work done under this subparagraph.

ARTICLE 9 - PAYMENTS AND COMPLETION

- 9.1.2 The Contractor, his subcontractors, and all materialmen shall cooperate in every respect and shall perform all acts and shall execute all documentation necessary to allow the owner to receive credit for all purchases for the State of Florida sales tax if the Owner choses to do so. The Contractor acknowledges that the Owner is exempt from the State of Florida sales tax. The Contractor shall implement procedures to enable the sales tax exemption be obtained by the owner and shall require the full cooperation of each of its subcontractors and materialmen in this regard. The Contractor shall require that contractual provisions are placed within each of the subcontractors agreements which it hereafter enters into for the completion of the project assuring to the owner that it shall not pay Florida State sales tax for the project.

- 9.2.1.1 The Schedule of Values shall breakdown the bid price in an organized manner to conform to the Technical Specification Index. Include cost of all required building permits, fees, premiums, bonds, etc.
- 9.2.1.2 When the Owner seeks exemption from the Florida State Sales Tax, the Schedule of Values shall have a column added separating the materials and building equipment costs from other costs for each line item.
- 9.3.1.3 The Architect may require a rough of the proposed application to review with the Contractor prior to submitting the final submittal.
- 9.7.1 In lines four and seven, delete "seven" and replace with "ten".
- 9.7.2 Anything to the contrary notwithstanding, Contractor may not stop the Work for Owner's failure to pay if Owner's nonpayment is caused by defects in the Certificate for Payment.
- 9.8.1.1 Substantial completion cannot be achieved by the Contractor without express written approval of the public authorities having jurisdiction over the work.

ARTICLE 10 - PROTECTION OF PERSONS AND PROPERTY

- 10.2.1.4 The Contractor shall be responsible for repair of Contractor damages to any utility lines that are visible, shown on Contract Documents or made known in advance to the Contractor. The Contractor shall promptly report to the Architect any damages to lines not made known to him in advance. Locations of underground lines shown in the drawing are based on best available information, but are not necessarily exact in regard to location or number of lines.
- 10.2.8 Contractor agrees to abide by OSHA and any other safety regulations or regulatory agencies. Contractor will promptly report to Architect all lost time, injuries or property damage involving its work or employees. Such report shall be in writing and in a form acceptable to Architect.
- 10.2.9 When required by law or for the safety of the Work, Contractor shall shore up, brace, underpin and protect foundations and other portions of existing structures which are in any way affected by the Work. Contractor, before commencement of any part of the Work, shall give any notices required to be given to adjoining landowners or other parties.

ARTICLE 11 - INSURANCE AND BONDS

- 11.1.2.1 Contractor's Liability Insurance: During the term of the Contract, the Contractor and each Subcontractor, person, or entity, shall, at their own expense, purchase and maintain the following minimum limits of insurance in companies properly licensed and satisfactory to the Owner.
 - A. Workman's Compensation including Occupational Disease, and Employer's Liability Insurance.
 - 1. STATUTORY - Amounts and coverage as required by Florida Statutes.
 - 2. EMPLOYER'S LIABILITY - At least \$200,000 each accident.
 - B. Public Liability including coverage for Direct Operations, Sublet Work, Comprehensive Form, Premises/Operations, Underground Explosion & Collapse Hazard, Products/Completed Operations, Contractual, Independent Contractors,

Broad Form Property Damage and Personal Injury with limits not less than those stated below:

1.a. PERSONAL INJURY
\$250,000 each person.
\$500,000 each occurrence.
REMOVE EMPLOYEES EXCLUSION.

1.b. BODILY INJURY
\$250,000 each person.
\$500,000 each occurrence.
REMOVE EMPLOYEES EXCLUSION.

2. PROPERTY DAMAGE LIABILITY
\$250,000 each person.
\$500,000 each occurrence.
Regarding Property Damage:

Regarding Completed Operations Liability:
Continue coverage in force for 1 year after completion of the work. Certificate of Insurance A.I.A. Form No. G705 or Acord Form N. Acord 25 (8-84) required, with copy to Owner, prior to commencement of work.

3. Comprehensive Automobile Liability Insurance including coverage for owned, non-owned and hired vehicles with limits not less than those stated below:

a. BODILY INJURY LIABILITY:
\$250,000 each person.
\$500,000 each occurrence.

b. PROPERTY DAMAGE LIABILITY:
\$250,000 each claimant.
\$500,000 each occurrence.

4. Liability insurance may be arranged by Comprehensive General Liability and Comprehensive Automobile Liability Policies for the full limits with the remaining provided by an excess of Umbrella Liability Policy. The project Owner shall be named on the Contractor's Insurance Certificate as AN ADDITIONAL INSURED.

The Contractor's Liability Policy shall provide a "HOLD HARMLESS" rider to cover the provisions of Article 3.18 of the referenced A.I.A. General Conditions and this shall be noted on the contractor's Certificate of Insurance. Article 3.18 of the referenced A.I.A. General Conditions is hereby revised to include the following acknowledgment:

The Contractor hereby acknowledges the receipt of \$10.00 and other good and valuable consideration as part of the Contract sum from the Owner and acknowledges the receipt of \$10.00 and other good and valuable consideration from the Architect/Engineer which has been paid to him as specific consideration for the indemnification provided herein. Insurance Certificate shall be submitted on A.I.A. form G705, or Accord Form Accord 25 (8-84).

ARTICLE 11.2 OWNER'S LIABILITY INSURANCE - DELETE IN ITS ENTIRETY:

ARTICLE 11.3 PROPERTY INSURANCE:

- 11.3 Modify the provisions for property insurance, as called for in Subparagraphs 11.3.1 including 11.3.1.1 thru 11.3.1.4, and 11.3.2, such that it shall be purchased for the Owner, by the Contractor, including Fire, Extended Coverage, Vandalism, and Malicious Mischief, and shall cover at least 100% of the values at risk. The Contractor shall be liable for any deductible amount. If the Contractor wishes additional protection for Theft, he will purchase these policies himself. Although the Owner pays the Contractor for materials stored on site, it is the responsibility of the contractor to protect these materials from theft. Certificates of this insurance shall be forwarded to the Owner prior to the beginning of construction. This insurance shall remain in effect until the Owner accepts the project as substantially complete. The Contractor shall include the cost of this insurance as part of his original bid.

ARTICLE 11.4 PERFORMANCE BOND AND PAYMENT BOND:

- 11.4.1 Delete the existing paragraph and insert the following: The Contractor shall furnish Performance Bonds and Labor & Material Payment Bonds at least equal to the Contract price as security for the faithful performance and payment of all Contractor's obligation under the Contract. These bonds shall identify the Owner as the beneficiary; and, shall remain in effect until one (1) year after the date of final payment, except as otherwise provided by law. Contractor shall also furnish such other bonds as are required by the Supplementary Conditions. All bonds shall be in the forms prescribed by the bidding documents or Supplementary Conditions and be executed by such sureties as (a) are licensed to conduct business in the State of Florida and (b) are named in the current list of "Companies Holding Certificates of Authority as Acceptable Sureties on Federal Bonds and as Acceptable Reinsuring Companies" as published in Circular 570 (amended) by the Audit Staff Bureau of Accounts, U.S. Treasury Department. All bonds signed by an agent must be accompanied by a certified copy of authority to act.
- 11.4.1.1 If the surety of any bond furnished by Contractor is declared bankrupt or becomes insolvent or its right to do business is terminated in Florida or it ceases to meet the requirements of clauses (a) and (b) of 7.5.1, Contractor shall, within five (5) days thereafter, substitute another bond and surety, both of which shall be acceptable to Owner.
- 11.4.1.2 All surety companies are subject to approval and may be rejected by the Owner without cause, in the same manner that bids may be rejected.

ARTICLE 13 - MISCELLANEOUS PROVISIONS

- 13.1.2 If any covenant, condition or provision contained in the Contract Documents is held to be invalid by any court of competent jurisdiction, such invalidity shall not affect the validity of any other covenant, condition or provision therein contained.
- 13.5.1.1 Routine tests of soil, concrete, steel and possible other components shall be made by a professional firm, at frequencies specified by the Architect or Engineer. The Owner shall pay for tests that confirm satisfactory work.
- 13.5.1.2 The Contractor shall pay for all tests and inspections that the architect considers necessary to confirm correction of work found unsatisfactory by previous tests or inspections.
- 13.5.7 Inspections or tests not identified in the Contract Documents, determined by Contractor to be of his/her benefit and ordered by Contractor, shall be paid for by the Contractor.

- 13.5.8 If a proposed substitution requires investigation, testing or approval to determine its suitability for incorporation into the Work, the testing of the proposed substitution shall be determined by the Architect. Contractor shall bear all costs of such investigations or tests, including the Architect's additional services made necessary by such substitutions.

ARTICLE 14 - TERMINATION OR SUSPENSION OF THE CONTRACT

- 14.1.2.1 Nothing in 14.1.2 shall authorize payment to Contractor for anticipated profits.

END OF SECTION 00 73 00

SECTION 00 90 10 - PROJECT FORMS

INSTRUCTIONS:

The forms and certificates listed below are to be used by the Contractor for submissions for contractual and administrative requirements specified herein.

Requirements and instructions on the forms may constitute extensions of, or additions to, the contractual conditions of the contract and the general requirements of the specifications.

Prepare all forms as required with all blank spaces filled in, in ink or typewritten.

PROJECT FORM LISTING:

TITLE	DOCUMENT NUMBER
Architect's Supplemental Instructions	AIA Doc. G710
Change Order	OEF Form 425
Contractor's Affidavit of Payment of Debts and Claims	AIA Doc. G706
Contractor's Affidavit of Release of Liens	AIA Doc. G706A
Consent of Surety Company to Final Payment	AIA Doc. G707
Proposal Request	AIA Doc. G709
Request for Inspection and Occupancy Certificate	OEF Form 110
Certificate of Final Inspection	OEF Form 209
Request for Information	SBBC Form
Project Close-Out Check List	SBBC Form
Project Substantial Completion Check List	SBBC Form
Project Final Close-Out Check List	SBBBC Form

END OF SECTION 00 90 10

SECTION 01 10 00 - SUMMARY OF THE WORK

PART 1 - GENERAL

RELATED DOCUMENTS:

Work of Contract can be summarized by reference to the Contract, General Conditions & Supplementary Conditions, specification sections as listed in the "Index of Specification Sections" bound herewith, drawings as listed in the Drawings and addenda and modifications to the contract documents issued subsequent to the initial printing of this project manual, and including but not necessarily limited to printed matter referenced by any of these.

General: The work of this contract includes the remodeling of a Courtyard on an existing high school campus.

Abbreviated Written Summary: The work includes the provision and installation of all materials and equipment shown on contract drawings and/or specified in the contract specifications unless otherwise noted.

The work includes construction of a new enclosure and interior features on an existing, occupied high school campus. In addition to the precautionary Life Safety concerns, the contractor shall satisfy the Jessica Lunsford Act requirements, along with other workman conduct control/monitoring.

The work includes adherence to State Requirements for Educational Facilities (SREF) as defined within the Florida Building Code (FBC) 2010 edition.

The work includes adherence to all pertinent requirements of the Florida Building Code (FBC) and other codes as referenced therein.

The work includes coordination of the contractor's planned construction activities with the district's Facilities Manager and the Principal of the school, as well as any persons identified by the district's Project Manager.

The work includes limited site work and site drainage associated with the roof drainage.

The exterior finishes include an SBS roof membrane on rigid insulation and stucco on subsheathing.

The Interior finishes includes ceilings of suspended acoustical panels, painted and textured gypsum wallboard on furring or steel stud framing. Floors are specified to be covered with terrazzo tile. Interior doors are all solid core, wood as specified in the documents.

The HVAC system includes a new roof top DX unit with ducted supply and return air.

The HVAC system is further defined under respective sections herein.

The Plumbing System includes condensate and rain water collection.

The Plumbing System is further defined under respective sections herein.

The Electrical System includes power for convenience, lighting for ordinary illumination and wiring for various communication systems.

The Electrical System is further defined under respective sections herein.

PART 2 - PRODUCTS

SCHEDULE:

A project schedule is identified by the overall campus effort and in other locations of this specification book.

PART 3 - EXECUTION

CONSTRUCTION SUPERVISION

The Contractor shall provide a Project Manager and full time Construction Superintendent. The Project Manager and Superintendent shall not be a subcontractor or tradesman engaged to perform as such on these projects. No work shall be performed by the Contractor or his subcontractors, at the site, unless either of these individuals is on site.

END OF SECTION 01 10 00

SECTION 01 31 00 - SCHEDULES, REPORTS, PAYMENTS

PART 1 - GENERAL

RELATED DOCUMENTS:

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

COORDINATION:

Coordinate both the listing and timing of reports and other activities required by provisions of this section and other sections, so as to provide consistency and logical coordination between the reports. Maintain coordination and correlation between separate reports by updating at monthly or shorter time intervals. Make appropriate distribution of each report and updated report to all parties involved in the work including the Architect/Engineer and Owner. In particular, provide close coordination of the progress schedule, schedule of values, listing of subcontracts, schedule of submittals, progress reports, and payment requests.

EXISTING CONDITIONS REPORTING:

Contractor shall immediately after notice to proceed, prepare a listing and "photo" report of the adjacent conditions of existing structure(s), prior to start of work. A copy of the photos and report shall be reviewed with and submitted to the architect and owner before demolition begins. Any items/fixtures missing which were to remain or be repaired/restored are to be identified in this report. Any structural cracking or damage to existing structures shall also be reported. Concealed adverse conditions, which could not be observed until demolition begins must be reported immediately as discovered/uncovered. Any and all claims by the contractor without substantiation by said reports and photos will be denied.

CONSTRUCTION PROGRESS SCHEDULE:

Chart Schedule: The form to be used for reporting progress schedules shall be as approved or provided by the Architect. Secure critical time commitments for performing major elements of the work. Within 20 days of the date established for "commencement of the work", submit a completed progress schedule, in accordance with the form instructions.

CPM Scheduling: CPM scheduling is required per the Contractual & General Conditions. For specific requirements refer to those documents.

Distribution: Following the initial submittal to and response by the Architect/Engineer, print and distribute progress schedules to the Architect/Engineer and Owner (3 copies minimum).

Schedule Updating: Update schedule as required to maintain accurate current information and at least monthly. Minimally, submit three (3) copies minimum with the monthly application for payment.

SUBMITTAL SCHEDULE:

General: Immediately after acceptance of the fully developed progress schedule, prepare a complete schedule of work-related submittals. Correlate this submittal schedule with the listing of principal subcontractors, as required by the General Conditions, and with Section 01 32 00 SHOP DRAWINGS, PRODUCT DATA AND SAMPLES.

SPECIAL REPORTS:

General: Submit special reports directly to the Owner within one day of an occurrence. Submit a copy of the report to the Architect and other entities that are affected by the occurrence.

Reporting Unusual Events: When an event of an unusual and significant nature occurs at the site, prepare and submit a special report. List chain of events, persons participating, response by the Contractor's personnel, an evaluation of the results or effects and similar pertinent information. Advise the Owner in advance when such events are known or predictable.

Reporting Accidents: Prepare and submit reports of significant accidents, at site and anywhere else work is in progress. Record and document data and actions. For this purpose, a significant accident is defined to include events where personal injury is sustained, or property loss of substance is sustained, or where the event posed a significant threat of loss or personal injury.

PROGRESS MEETINGS, REPORTING:

General: In addition to specific coordination and pre-installation meetings for each element of work, and other regular project meetings held for other purposes, hold general progress meetings each month with time coordinated with preparation of the payment requests. Review each entity's present and future needs including interface requirements, time, sequences, deliveries, access, site utilization, temporary facilities and services, hours of work, hazard and risks, housekeeping, change orders, and documentation of information for payment requests. Discuss whether each element of current work is ahead of schedule, on time, or behind schedule in relation with updated progress schedule. Determine how behind-schedule work will be expedited, and secure commitments from entities involved in doing so. Discuss whether schedule revisions are required to ensure that current work and subsequent work will be completed within Contract Time. Review everything of significance which could affect progress of the work.

Initial Progress Meeting: Schedule initial progress meeting, recognized as "Pre-Construction Conference", for a date not more than 10 days after date of commencement of the work. Use it as an organizational meeting, and review responsibilities and personnel assignments.

Reporting: Within 3 days after each progress meeting date, distribute copies of minutes-of-the-meeting to each entity present and to others who should have been present. Include brief summary (in narrative form) of progress of the work since previous meeting and report.

Schedule Updating: Immediately following each progress meeting, where revisions to progress schedule have been made or recognized, revise progress schedule. Reissue revised schedule concurrently with report of each meeting.

Daily Reports: Prepare a daily report, recording the following information concerning events at the site; and submit duplicate copies to Architect/Engineer at regular intervals not exceeding weekly intervals:

- List of subcontractors at the site
- List of separate contractors at the site
- Approximate count of personnel at the site
- High/low temperatures, general weather conditions
- Accidents (refer to accident reports)
- Meetings and significant decisions
- Unusual events (refer to special reports)
- Stoppages, delays, shortages, losses
- Meter readings and similar recordings
- Emergency procedures, field orders
- Orders/requests by governing authorities
- Change orders received, implemented

Services connected, disconnected
Equipment system tests and start-ups
Partial completions, occupancies
Substantial completions approved

SCHEDULE OF VALUES:

General: Prepare the schedule of values, as required by the General Conditions, in conjunction with the preparation of the progress schedule. Coordinate preparation of schedule of values and progress schedule. Correlate line items with other administrative schedules and the forms required for the work, including the progress schedule, payment request form, listing of subcontractors, schedule of allowances, schedule of alternatives, listing of products and principal suppliers and fabricators, and the schedule of submittals. Provide breakdown of the Contract Sum, by specification section, in sufficient detail to facilitate continued evaluation of payment requests and progress reports. Break down principal subcontract amounts into several line items. Round off to the nearest whole dollar, but with the total equal the Contract Sum. Submit for review and approval by A/E prior to first application submittal.

PAYMENT REQUESTS:

General: Except as otherwise indicated, the progress payment cycle is to be regular. Each application must be consistent with previous applications and payments. Certain applications for payment, such as the initial application, the application at substantial completion, and the final payment application involve additional requirements.

Waivers of Lien: Submit waivers of lien, per the SBBC Contractual & General Conditions, from every entity (including Contractor) who could lawfully and possibly file a lien in excess of \$200 arising out of the Contract, at intervals identified within those documents. Submit partial waivers for the amount requested, prior to deduction or retainage, on each item. When the application shows completion of an item, submit final or full waivers. The Owner reserves the right to designate which entities involved in the work must submit waivers.

Payment Application Times: The "date" for each progress payment application is as indicated in Owner-Contractor Agreement or, if none is indicated therein, it is the 25th day of each month. The period of construction work covered by each payment request is period indicated in Owner-Contractor Agreement or, if none is indicated therein, it is the 25th day of previous month or day following end of previous period to 24th day of present month.

Application Preparation: Except as otherwise indicated, complete every entry provided for on the form, including notarization and execution by authorized persons. Incomplete applications will be returned by Architect/Engineer without action. Entries must match current data of schedule of values and progress schedule and report. Listing must include amounts of change orders issued prior to last day of the "period of construction" covered by application.

Payment will be for work installed in place in a correct and operable manner. Payment for material stored at the project site will not be considered in the application for payment process.

Initial Payment Application: The principal administrative actions and submittals which must precede or coincide with submittal of contractor's first payment application can be summarized as follows, but not necessarily by way of limitation submit at least three (3) copies of each unless noted elsewhere to be more:

Listing of subcontractors and principal suppliers and fabricators

Schedule of values

Progress schedule

Schedule of submittals

Listing of Contractor's staff assignments and principal consultants

Copies of acquired building permits and similar authorizations and licenses from governing authorities for current performance of the work

Performance and/or payment bonds

Evidence satisfactory to Owner that Contractor's insurance coverage have been secured

Data needed to acquire Owner's insurance coverage

Typical Monthly Payment Application:

Provide at least three (3) copies of the following items by transmittal listing each.

- Application For Payment, properly numbered
- Updated Schedule of Values
- Updated Progress Schedule
- Waivers of Lien
- Stored Material invoices

Application at Time of Substantial Completion: Following issuance of Architect's or Engineer's "certificate of substantial completion", and as applicable, a payment application may be prepared allowing 100% completion of the work, if it is 100% completed, minus the retainage; and, submitted by Contractor. The principal administrative actions and submittals which must proceed or coincide with such special applications are summarized under Section 01 77 00 - PROJECT CLOSE-OUT.

Final Payment Application: The administrative actions and submittals which must precede or coincide with submittal of contractor's final payment application are also summarized under Section 01 77 00 - PROJECT CLOSE-OUT.

Application Transmittal: Submit 3 originally executed copies of each payment application. Transmit each copy with a transmittal form listing those attachments, and recording appropriate information related to application in a manner acceptable to Architect/Engineer. Transmit to Architect/Engineer by means ensuring receipt within 24 hours.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 31 00

SECTION 01 33 00 - SHOP DRAWINGS, PRODUCT DATA AND SAMPLES

PART 1 - GENERAL

RELATED DOCUMENTS:

Drawing and general provisions of contract, including General and Supplementary Conditions and other Division 1 Specifications Sections, apply to work of this section. Pay special attention to Section 01 60 00, Products and Substitutions.

DESCRIPTION OF REQUIREMENTS:

General: This section specifies procedural requirements for non-administrative submittals including shop drawings, product data, samples and other miscellaneous work-related submittals. Shop drawings, product data, samples and other work-related submittals are required to amplify, expand and coordinate the information contained in the Contract Documents.

Shop drawings are technical drawings and data that have been specially prepared for this project, including but not limited to the following items:

- Coordination drawings
- Fabrication and installation drawings
- Schedules
- Design mix formulas
- Contractor's engineering calculations
- Specialty engineering calculations and drawings.

Standard information prepared without specific reference to a project is not considered to be shop drawings.

Product data includes standard printed information on manufactured products that has not been specially-prepared for this project, including but not limited to the following items:

- Manufacturer's product specifications and installation instructions
- Standard color charts
- Catalog cuts
- Printed performance curves
- Operational range diagrams
- Mill reports
- Standard product operating and maintenance manuals

Samples are physical examples of work, including but not limited to the following items:

- Partial sections of manufactured or fabricated work
- Small cuts or containers of materials
- Complete units of repetitively-used materials
- Swatches showing color, texture and pattern
- Color range sets
- Units of work to be used for independent inspection and testing

Mock-ups are special forms of samples, which are too large or otherwise inconvenient for handling in the manner specified for transmittal of sample submittals.

Miscellaneous submittals are work-related, non-administrative submittals that do not fit in the three previous categories; including, but not limited to the following:

- Specially prepared and standard printed warranties
- Maintenance agreements
- Workmanship bonds
- Project photographs
- Testing and certification reports
- Record drawings
- Field measurement data
- Operating and maintenance manuals
- Keys and other security protection devices
- Maintenance tools and spare parts
- Overrun stock

SUBMITTAL PROCEDURES:

Coordination: Coordinate the preparation and processing of submittals with the performance of the work. Coordinate each separate submittal with other submittals and related activities such as testing, purchasing, fabrication, delivery and similar activities that require sequential activity.

Scheduling: In each appropriate administrative submittal, such as the progress schedule, show the principal work-related submittals and time requirements for coordination of submittal activity with related work.

Coordination of Submittal Times: Prepare and transmit each submittal to the Architect/Engineer within **20 days** of the date of the notice to proceed. Coordinate the submittal of different units of interrelated work so that one submittal will not be delayed by the Architect/Engineer's need to review a related submittal. **The Architect/Engineer reserves the right to withhold action on any submittal requiring coordination with other submittals until related submittals are also received.**

Contractor's Review: Before submittal of items for review, the Contractor shall check and verify all pertinent field dimensions, make sure that all submitted items are properly coordinated and conform to the drawing and specifications, noting in colored pencil (any color except red) any modifications necessary to bring them into conformity. Shop drawings shall indicate the location of the different items shown on same, or make reference to the sheet number of the contract specifications to which they refer, and shall further indicate compliance with the referenced technical society or organization specifications. It shall be the Contractor's responsibility to see that shop drawings are submitted in logical groups to permit a complete review. Individual components which depend upon the proper selection of other components of a system are not to be submitted separately. In the event an item is submitted independently, to expedite procurement or for other reasons, and it is later discovered to be a poor selection due to the influence of items which are submitted for review in a different submission, the Contractor shall have the full responsibility for taking corrective action as directed by the Architect and at no additional cost to the Owner. Partial or incomplete submittals will be returned without review. The Contractor shall certify that he has verified the correctness, completeness and adequacy of all items submitted by suitable stamp and his signature.

Shop drawings submitted without Contractor's certification, and shop drawings which are not complete, may be returned for proper submission.

Review Time: Allow sufficient time so that the installation will not be delayed as a result of the time required to properly process submittals, including time for resubmittal, if necessary. Advise the Architect/Engineer on each submittal, as to whether processing time is critical to the progress of the work and if the work would be expedited if processing time could be shortened.

Allow two weeks from receipt by the Architect/Engineer's for initial processing of each submittal. Allow a longer time period where processing must be delayed for coordination with subsequent or

concurrent submittals. The Architect/Engineer will advise the Contractor when it is determined that a submittal being processed must be delayed for coordination.

Allow one week from receipt by the Architect for reprocessing each submittal.

No extension of time will be authorized because of the Contractor's failure to transmit submittals to the Architect/Engineer sufficiently in advance of the work.

Submittal Preparation: Mark each submittal with a permanent label for identification.

Submittal Transmittal: Package each submittal appropriately for transmittal and handling. Transmit each submittal from the Contractor to the Architect/Engineer, and to other destinations as indicated, by use of a transmittal form. Submittals received from sources other than the Contractor will not be reviewed.

Shop drawing delivery and pick up at the Architect's office is the responsibility of the Contractor.

Architect will provide only a review comment sheet to contractor as the review.

Architect will only ship, only submittals back to the Contractor at the Contractor's cost. Contractor's shipping account number must be provided prior to shipment. If the submittal is electronic and of a suitable file size to be easily e-mailed, that is the best.

Provide on the form places for the following information:

- Project name
- Date
- To:
- From:
- Names of subcontractor, manufacturer and supplier
- References
- Specification section number and type of submittal
- Submittal purpose and description
- Submittal and transmittal distribution record
- Signature of transmitter
- Contractor's certification stating that the information submitted complies with the requirements of the Contract Documents, with a place for the Contractor's signature

Submittal Log: Prepare a submittal log indicating submittal type, extent of all anticipated submittals and chronological disposition of each. Submit initial log showing anticipated submittals for review and acceptance by Architect. Special attention shall be given to those submittals requiring color selection or long lead items.

SPECIFIC SUBMITTAL REQUIREMENTS:

SHOP DRAWINGS: Information required on shop drawings includes, dimensions, identification of specific products and materials which are included in the work compliance with specified standards and notations of coordination requirements with other work. Provide special notation of dimensions that have been established by field measurement. Highlight, encircle or otherwise indicate deviations from the contract documents on the shop drawings.

Refer to all Sections for additional general requirements applicable to shop drawings.

Do not permit shop drawing copies without an appropriate final "Action" marking by the Architect/Engineer to be used in connection with the work.

Or, submit a .pdf file of newly prepared information, drawn to accurate scale. Indicate the name of the firm that prepared each shop drawing and provide appropriate project identification in the title block. Submit three (3) signed and sealed sets of shop drawings and data for construction materials and systems specified to be pre-engineered or engineered by others than the architect and engineers-of-record for this work.

Do not reproduce contract documents or copy standard printed information as the basis of shop drawings.

Preparation: Submit newly prepared information, drawn to accurate scale on sheets not less than 8 1/2" x 11" and the maximum sheet size shall not exceed 24" x 36". Indicate the name of the firm that prepared each shop drawing and provide appropriate project identification in the title block.

Do not reproduce contract documents or copy standard printed information as the basis of shop drawings.

PRODUCT DATA: General information required specifically as product data includes manufacturer's standard printed recommendations for application and use, compliance with recognized standards of trade associations and testing agencies, and the application of their labels and seals (if any), special notation of dimensions which have been verified by way of field measurement, and special coordination requirements for interfacing the material, product or system with other work.

Preparation: Collect required product data into a single submittal for each specification section of work. Mark each copy to show which choices and options are applicable to the project.

Where product data must be specially prepared for required products, materials or systems, because standard printed data is not suitable for use, submit data as "Shop Drawings" and not as "Product Data".

Submittals: Product data submittal is required for information and record and to determine that the products, materials and systems comply with the provisions of the contract documents. Therefore, the initial submittal is also the final submittal, except where the Architect/Engineer observes that there is non-compliance with the provisions of the contract documents and returns the submittal promptly to the Contractor marked with the appropriate "Action".

Except as otherwise indicated in individual sections of these specifications, submit 5 copies of each required product data submittal, plus 2 additional copies where required for maintenance manuals. The Architect/Engineer will retain 2 - 3 copies, and will return the others marked with "Action" and corrections or modifications as required.

Do not submit product data or allow its use on the project, until compliance with the requirements of the contract documents has been confirmed by the Contractor.

Do not proceed with installation of materials, products and systems until a copy of product data applicable to the installation is in the possession of the installer.

SAMPLES: Submit samples for the Architect/Engineer's visual review of general generic kind, color, pattern, and texture, and for a final check of the coordination of these characteristics with other related elements of the work. Samples are also submitted for quality control comparison of these characteristics between the final sample submittal and the actual work as it is delivered and installed.

Documentation required specifically for sample submittals includes a generic description of the sample, the sample source or the product name or manufacturer, compliance with governing

regulations and recognized standards. In addition, indicate limitations in terms of availability, sizes, delivery time, and similar limiting characteristics.

Preparation: Where possible, provide samples that are physically identical with the proposed material or product to be incorporated into the work; provide full scale, fully fabricated samples cured and finished in the manner specified. Where variations in color, pattern, or texture are inherent in the material or product represented by the sample, submit multiple units of the samples (not less than 3 different units), which show the approximate limits of variations. Where samples are specified for the Architect/Engineer's selection of color, texture or pattern, submit a full set of available choices for the material or product. Mount, display, or package samples in the manner specified to facilitate the review of indicated qualities. Prepare samples to match the Architect/Engineer's sample where so indicated. The Architect/Engineer shall retain the samples throughout the life of the work as evidence to the acceptable standard for the work.

Distribution of Samples: Maintain the submittal sets of samples, if returned by the Architect/Engineer, at the project site, available for quality control comparisons throughout the course of performing the work. Prepare and distribute additional sets of samples to subcontractors, suppliers, fabricators, manufacturers, installers, governing authorities, and others as required for proper performance of the work. Show final distribution on transmittal forms.

Mock-up and similar samples specified in individual work sections are special types of samples. Comply with sample submittal requirements to the fullest extent possible. Process transmittal forms to provide a record of activity.

COLOR SELECTION:

Be advised that the Architect shall retain all shop drawings, product and samples until he has received all items requiring color selection. Once all are received, he shall prepare a Color Schedule for the Owner's review. Once approved by the Owner, submittals with the Color Schedule shall be transmitted to the Contractor for his action. In the meantime, the submittals shall not be finally approved by the Architect until approval of the Color Schedule is given by the Owner. There is time involved with this process; therefore, the Contractor is encouraged to provide all submittals requiring color selection as soon after the Notice-to-Proceed as possible.

MISCELLANEOUS SUBMITTALS:

Inspection and Test Reports: Classify each inspection and test report as being either "shop drawings" or "product data" depending on whether the report is specially prepared for the project, or a standard publication of workmanship control testing at the point of production. Process inspection and test reports accordingly.

Warranties: Provide proposed warranty data at early submittals with product data. Refer to section "Project Closeout" for specific general requirements on warranties, product bonds, workmanship bonds and maintenance agreements relative to closeout.

Standards: Where submittal of a copy of standards is indicated, and except where copies of standards are specified as an integral part of a "Product Data" submittal, submit a single copy of standards for the Architect/Engineer's use. Where workmanship, whether at the project site or elsewhere is governed by a standard, furnish additional copies of the standard to fabricators, installers and others involved in the performance of the work.

Closeout Submittals: Refer to section "Project Closeout" and to individual sections of these specifications for specific submittal requirements of project closeout information, materials, tools, extra stock, and similar items.

Record Documents: Refer to section "Project Closeout" and other sections of these specifications for submittal of record documents.

Operating and Maintenance Data: Refer to "Project Closeout" and other sections of these specifications for submittal of this data.

Materials and Tools: Refer to "Project Closeout" and other individual sections of these specifications for required quantities of spare parts, extra and overrun stock, maintenance tools and devices, keys, and similar physical units to be submitted.

ARCHITECT/ENGINEER'S ACTION:

Action Stamp: The Architect/Engineer will stamp each submittal to be returned with a uniform, self explanatory action stamp, appropriately marked and executed to indicate whether the submittal returned is for unrestricted use, final-but-restricted use (as marked), must be revised and resubmitted (use not permitted) or without action (as explained on the transmittal form).

Final Unrestricted Release: Where the submittals are marked as follows, the work covered by the submittal may proceed provided it complies with the requirements of the contract documents; acceptance of the work will depend upon that compliance.

"No Exceptions Taken"

Returned for Resubmittal: When the submittal is marked as follows, do not proceed with the work covered by the submittal, including purchasing, fabrication, delivery, or other activity. Revise the submittal or prepare a new submittal in activity. Revise the submittal or prepare a new submittal in accordance with the Architect's/Engineer's notations stating the reasons for returning the submittals with the following marking to be used at the project site, or elsewhere where work is in progress.

"Revise and Resubmit"

"Rejected, Comments Attached"

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 33 00

SECTION 01 40 00 - QUALITY CONTROL SERVICES

PART 1 - GENERAL

DESCRIPTION OF REQUIREMENTS:

Definitions: The requirements of this section relate primarily to customized fabrication and installation procedures, rather than the production of standard products. Quality control services include inspections, tests and related actions, including reports, performed by independent agencies and governing authorities, as well as those contracted directly by the Contractor. **Refer to specific sections throughout the project specifications for the required testing.**

Requirements for the Contractor to provide quality control services, as required by the Architect/Engineer, the Owner, governing authorities or other authorized entities are not limited by the provisions of this section.

The contract enforcement activities performed directly by the Architect/Engineer (design consultants) or owner's independent representative are not a quality control service. Should the Architect/Engineer or owner's independent representative identify defective or non-conforming work or products and be required to inspect the deficiency more than once to confirm if corrections have been made, his services for reinspection shall be an extra to the Owner at his current contracted hourly rates and such charges shall be deducted, by change order, from the construction contract.

RESPONSIBILITIES:

Owner Responsibilities: Except where they are specifically indicated as being the Contractor's responsibility, or where they are to be provided by another identified entity such as testing for standard products, initial inspections, tests and similar quality control services specified to be performed by independent agencies are the Owner's responsibility. Costs for these services may not be included in the Contract Sum. The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are the Owner's responsibility.

Retest Responsibility: Where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance of related work with the requirements of the contract documents; then, retests by the initial testing firm are the responsibility of the Contractor, regardless of whether the original test was the Contractor's responsibility. Retesting of work revised or replaced by the Contractor is the Contractor's responsibility and the Architect will make the decision for the extent of retesting to be performed.

Testing or inspections of field assembled work is envisioned as a verification on behalf of the Owner that the work complies with the contract requirements. Such inspection(s) are not provided as a replacement for the Contractor's own quality control efforts. The Contractor shall have performed his own quality control checks before notifying the testing agency of a time for their verification. Costs associated to lengthy initial inspections or reinspections, or when required as a result of poor quality control by the Contractor will be borne by the Contractor.

Responsibility for Associated Services: The Contractor is required to cooperate with the independent agency performing required inspections, tests and similar services. Provide such auxiliary services as are reasonably requested. The Contractor shall notify the testing agency sufficiently in advance of operations to permit assignment of personnel. These auxiliary services include but are not necessarily limited to the following:

- Providing access to the work.
- Taking samples or assistance with taking samples.

- Delivery of samples to test laboratories.
- Delivery and protection of samples and test equipment at the project site.

Coordination: The Contractor and each independent agency engaged to perform inspections, tests and similar services for the project shall coordinate the sequence of their activities so as to accommodate required services with a minimum of delay in the progress of the work. In addition the Contractor and each independent testing agency shall coordinate their work so as to avoid the necessity of removing and replacing work to accommodate inspections and tests. The Contractor is responsible for scheduling times for inspections, tests, taking of samples and similar activities.

SUBMITTALS:

General: Refer to Division-1 section on "Submittals" for the general requirements on submittals. Submit a certified written report of each inspection, test or similar service, directly to the Architect/Engineer, in duplicate. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

Report Data: Written reports of each inspection, test or similar service shall include, but not be limited to the following:

- Name of testing agency or test laboratory.
- Dates and locations of samples and tests or inspections.
- Names of individuals making the inspection or test.
- Designation of the work and test method.
- Complete inspection or test data.
- Test results.
- Interpretations of test results.
- Notation of significant ambient conditions at the time of sample-taking and testing.
- Comments or professional opinion as to whether inspected or tested work complies with requirements of the contract documents.
- Recommendations on retesting, if applicable.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

REPAIR AND PROTECTION:

General: Upon completion of inspection, testing, sample-taking and similar services performed on the work, repair damaged work and restore substrates and finishes to eliminate deficiencies, including deficiencies in the visual qualities of exposed finishes. Comply with the contract document requirements for Cutting and Patching. Protect work exposed by or for quality control service activities, and protect repaired work. Repair and protection is the Contractor's responsibility, regardless of the assignment of responsibility for inspection, testing or similar services.

END OF SECTION 01 40 00

SECTION 01 41 00 - PROJECT COORDINATION

PART 1 - GENERAL

DESCRIPTION OF WORK:

Minimum administrative and supervisory requirements necessary for coordination of work on the project include but are not necessarily limited to the following:

- Coordination drawings
- Coordination and meetings
- Surveys and records or reports
- Special reports
- Project safety
- General installation provisions
- Cleaning and protection

COORDINATION DRAWINGS AND MEETINGS:

Coordination Drawings: The contractor's staff or a designated subcontractor (usually the HVAC subcontractor) shall prepare coordination drawings where work by separate entities requires fabrication of products and materials which must accurately interface above ceilings, within walls or specialties exposed to view. Coordination drawings shall indicate how work by separate contractors or as shown by separate shop drawings will interface, and shall indicate sequence for installation. Comply with all requirements of the "Submittals" section.

All items which will impact the visual integrity shall be specifically reviewed with the architect. The submittal drawings must be specific and include all components, anchors, etc.

Weekly Coordination Meetings: Hold weekly general project coordination meetings at regularly scheduled times convenient for all parties involved. These meetings are in addition to specific meetings held for other purposes, such as regular project meetings and special pre-installation meetings. Request representation at each meeting by every contractor currently involved in coordination or planning for the work of the entire project. Conduct meetings in a manner which will resolve coordination problems. Record results of the meeting and distribute copies to everyone in attendance and to others affected by decisions or actions resulting from each meeting.

SURVEYS AND RECORDS/REPORTS:

General: Working from lines and levels established by the property survey, establish and maintain benchmarks and other dependable markers. Establish benchmarks and markers to set lines and level for work at each story of construction and elsewhere as needed to properly locate each element of the project. Calculate and measure required dimensions as shown within recognized tolerances. Drawings shall not be scaled to determine dimensions. Advise entities performing work, of marked lines and levels provided for their use.

Surveyor: Engage a Land Surveyor or Professional Engineer experienced and specializing in land survey work, who is registered in the State where the project is located, to perform those services specified in this article.

Survey Procedures: Before proceeding with the layout of actual work, verify the layout information shown on the drawings, in relation to the property survey and existing bench marks. As work proceeds, check every major element for line, level and plumb. Maintain a surveyor's log or record book of such checks; make the log or record book available for the Architect or Engineer's reference. Record deviations from required lines and levels, and advise the Architect

or Engineer promptly upon detection of deviations that exceed indicated or recognized tolerances. Record deviations which are accepted, and not corrected, on record drawings.

Final Property Survey: Before substantial completion, prepare a final property survey and submit per Section 01 32 00 and 01 77 00.

SPECIAL REPORTS:

General: Submit special reports per Section 01 31 00, directly to the Owner within one day of an occurrence. Submit a copy of the report to the Architect and other entities that are affected by the occurrence.

PROJECT SAFETY:

The Contractor and his subcontractor and their subcontractors shall perform all work in accordance with current federal safety standard as established by O.S.H.A. Likewise, the work environment shall be set up and operated in a manner to meet all current federal safety standards as established by O.S.H.A.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

GENERAL INSTALLATION PROVISIONS:

Existing Conditions: All projects have existing conditions whether it be just a site or a building undertaking renovation and/or additions. In any case, within 10 days of the Notice-to-Proceed with the work, the Contractor shall initiate an 'in depth' inspection and record and file with the Owner the existing conditions of all site features, facility features and equipment which are scheduled to remain and be a part of the completed site, building, or operation. The record-of-existing-conditions may be in the form of video tape and photographs of sufficient quantity, size and detail so as to see all items. For equipment or fixtures which are to remain and be functional at the close of the contract, whether renovation, reconditioned or not, the Contractor shall prepare a report which clearly and specifically identifies the function of the individual items at the time of inspection. If no documentation is submitted, the Contractor shall replace or repair existing items at the Owner's directions.

If the Contractor observes conditions with site, building or equipment which are contrary to instructions of the contract documents, he shall notify the SBBC Project Manager within 48 hours of discovery. All site features, building features and equipment conditions shall become accepted by the Contractor as they exist if not recorded in the manner identified above.

Pre-Installation Conferences: Hold a pre-installation meeting at the project site well before installation of each unit of work which requires coordination with other work. Installer and representatives of the manufacturers and fabricators who are involved in or affected by that unit of work, and with its coordination or integration with other work that has preceded or will follow shall attend this meeting. Advise the Architect of scheduled meeting dates.

Record significant discussions of each conference, and record agreements and disagreements, along with the final plan of action. Distribute the record of meeting promptly to everyone concerned, including the Owner and Architect.

Do not proceed with the work if the pre-installation conference can not be successfully concluded. Initiate whatever actions are necessary to resolve impediments to performance of the work and reconvene pre-installation conference at the earliest feasible date.

Installer's Inspection of Conditions: Require the Installer of each major unit of work to inspect the substrate to receive work and conditions under which the work is to be performed. The Installer shall report all unsatisfactory conditions in writing to the Contractor. Do not proceed with the work until unsatisfactory conditions have been corrected in a manner acceptable to the Installer.

Manufacturer's Instructions: Where installations include manufactured products, comply with the manufacturer's applicable instructions and recommendations for installation, to the extent that these instructions and recommendations are more explicit or more stringent than requirements indicated in the contract documents.

Inspect each item of material or equipment immediately prior to installation. Reject damaged and defective items.

Provide attachment and connection devices and methods for securing work. Secure work true to line and level, and within recognized industry tolerances. Allow expansion and building movement. Provide uniform joint width in exposed work. Arrange joints in exposed work to obtain the best visual effect. Refer questionable visual-effect choices to the Architect for final decision.

Recheck measurements and dimensions of the work, as an integral step of starting each installation. **The contractor is solely responsible for assuring the project is built to accurate, true and correct dimensions. Any discrepancies in the documents must be referred to the Architect for confirmation or acceptance prior to fabrication or construction.**

Install each unit-of-work during weather conditions and project status which will ensure the best possible results in coordination with the entire work. Isolate each unit of work from incompatible work as necessary to prevent deterioration.

Coordinate enclosure of the work with required inspections and tests, so as to minimize the necessity of uncovering work for the purpose.

Mounting Heights: Where mounting heights are not indicated, mount individual units of work at industry recognized standard mounting heights for the particular application indicated. Refer questionable mounting height choices to the Architect for final decision.

EXPOSURES OF WORK:

Limiting Exposures of Work: Supervise performance of the work in such a manner and by such means which will ensure that none of the work, whether completed or in progress, will be subjected to harmful, dangerous, damaging or otherwise deleterious exposure during the construction period. Such exposures include, where applicable, but not by way of limitation of the following:

- Excessive static or dynamic loading
- Excessive internal or external pressures
- Excessively high or low temperatures
- Excessively high or low humidity
- Water
- Solvents
- Chemicals
- Light
- Puncture
- Abrasion
- Heavy traffic
- Soiling

Insect infestation
Combustion
Improper lubrication, unusual wear
Incompatible interface
Destructive testing
Misalignment
Excessive weathering
Unprotected storage
Improper shipping or handling
Theft
Vandalism

CLEANING AND PROTECTION:

General: During handling and installation of work at the project site, clean and protect work in progress and adjoining work on the basis of continuous maintenance. Apply protective covering on installed work where it is required to ensure freedom from damage or deterioration at time of substantial completion.

Clean and perform maintenance on installed work as frequently as necessary through the remainder of the construction period. Adjust and lubricate operable components to ensure operability without damaging effects.

END OF SECTION 01 41 00

SECTION 01 42 00 - DEFINITIONS AND STANDARDS

PART 1 - GENERAL

RELATED DOCUMENTS:

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

DESCRIPTION OF REQUIREMENTS:

General: This section specifies procedural and administrative requirements for compliance with governing regulations and codes and other standards imposed upon the Work. These requirements include obtaining permits, licenses, inspections, releases and similar documentation, as well as payments, statements and similar requirements associated with regulations, codes and standards.

The term, "Regulations", is defined to include laws, statutes, ordinances and lawful orders issued by governing authorities, as well as those rules, conventions and agreements within the construction industry which effectively control the performance of the work regardless of whether they are lawfully imposed by governing authority or not.

Governing Regulations: Refer to General and Supplementary Conditions for requirements related to compliance with governing regulations.

DEFINITIONS:

Approve/Accept: Where used in conjunction with the Architect's/Engineer's response to submittals, requests, applications, inquiries, reports and claims by the Contractor, the meaning of the term "approved" will be held to limitations of the Architect's/Engineer's responsibilities and duties as specified in General and Supplementary Conditions. In no case will the Architect/Engineer's approval or acceptance be interpreted as a release of the Contractor from responsibilities to fulfill requirements of contract documents.

Architect: The use of the term, Architect-of-Record, within the usual architectural specifications and drawings is consistent with the Architect who signs and seals the documents. For Divisions 2, 15 and 16 it shall collectively refer to the Architect-of-Record, the Engineers-of-Record for the various disciplines and the Owner's project representatives.

Directed, Requested, Etc.: Where not otherwise explained, terms such as "directed", "requested", "authorized", "selected", "approved", "required", "accepted", and "permitted" mean "directed by the Architect/Engineer", "requested by the Architect/Engineer", and similar phrases. However, no such implied meaning will be interpreted to extend the Architect's/Engineer's responsibility into the Contractor's area of construction supervision or safety administrative efforts.

Furnish: Except as otherwise defined in greater detail, the term "furnish" is used to mean "supply and deliver to the project site, ready for unloading, unpacking, assembly, installation, and similar operations" as applicable in each instance.

General Explanation: A substantial amount of specification language consists of definitions of terms found in other contract documents, including drawings. (Drawings are recognized as being diagrammatic in nature and not completely descriptive of the requirements indicated thereon). Certain terms used in contract documents are defined in this article. Definitions and explanations contained in this section are not necessarily either complete or exclusive, but are general for the

Work to the extent that they are not stated more explicitly in another element of the contract documents.

General Requirements: The provisions or requirements of other Division -1 sections apply to entire work of the Contract and, where so indicated, to other elements which are included in the project.

Indicated: The term, "indicated", is a cross-reference to graphic representations, notes or schedules on the drawings, to other paragraphs or schedules in the specifications, and to similar means of recording requirements in contract documents. Where terms such as "shown", "noted", "scheduled", and specified" are used in lieu of "indicated", it is for the purpose of helping the reader locate the cross-reference, and no limitation of location is intended except as specifically noted.

Install: Except as otherwise defined in greater detail, 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", as applicable in each instance.

Installer: The term "installer" is defined as "the entity" (person or firm) engaged by the Contractor, its subcontractor or sub-subcontractor for performance of a particular unit of work at the project site, including installation, erection, application and similar required operations. It is a requirement that installers are experienced in the operations they are engaged to perform.

Project Site: The term, "project site", is defined as the space available to the Contractor for performance of the Work, 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 land upon which the project is to be build.

Provide: Except as otherwise defined in greater detail, the term "provide" means "to furnish and install, complete and ready for intended use", as applicable in each instance.

Testing Laboratories: The term "testing laboratory" is defined as an independent entity engaged to perform specific inspections or tests of the work, either at the project site or elsewhere, and to report, and (if required) interpret results of those inspections or tests.

DRAWINGS AND SPECIFICATIONS:

The organization of the Specifications into divisions, sections and articles and the arrangement of drawings is for clarity only and shall not control the Contractor in dividing the work among subcontractors or in establishing the extent of work to be performed by any trade. The Contractor may subcontract the work in such divisions as he sees fit and he is ultimately responsible for furnishing all work shown on the drawings and/or in the specifications.

In the event of inconsistencies between parts of the Contract Documents or between the Contract Documents and applicable standards, codes and ordinances, the Contractor shall: (1) provide the better quality and/or greater quantity of work; or (2) comply with the more stringent requirement: either or both in accordance with the Architect's interpretation. Technical specifications take priority over general specifications and detail drawings take precedence over general drawings. Any work shown on one drawing shall be construed to be shown in all drawings and the Contractor will coordinate the work and the drawings. If any portion of the Contract Document shall be in conflict with any other portion, the various documents comprising the Contract Documents shall govern in the following order of precedence: The Owner-Contractor Agreement; Modifications; Addenda; and Supplementary Conditions; the General Conditions; the Specifications; the Drawings; as between schedules and information given on Drawings, the schedules shall govern; as between figures given on Drawings and the scaled

measurements, the figures shall govern; as between large-scale drawings and small scale drawings, the larger scale shall govern. Any such conflict or inconsistency between or in the drawings shall be submitted to the Architect whose decision thereon shall be final and conclusive.

SPECIFICATION FORMAT AND CONTENT EXPLANATION:

General: This article is provided to help the user of these specifications more readily understand the format, language, implied requirements and similar conventions of content. None of the following explanations shall be interpreted to modify the substance of the contract requirements.

Production Methods: Portions of these specifications have been produced by the Architect/Engineer's standard method of editing master specifications; they may contain minor deviations from traditional writing formats. Such deviations are a natural result of this production technique, and no other meaning shall be implied.

Specification Format: These specifications are organized based upon the Construction Specifications Institute's 33-Division format. The organization of these specifications into Divisions, Sections or Trade Headings conforms generally to no recognized industry practice.

Specification Content: This project specification has been produced employing certain conventions in the use of language as well as conventions regarding the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

In certain circumstances, the language of the specifications and other contract documents is of the abbreviated type. It implies words and meanings that will be appropriately interpreted. Singular words will be interpreted as plural and plural words will be interpreted as singular where applicable and where the full context of the contract documents so indicates.

Imperative Language is used generally in the specifications. Requirements expressed imperatively are to be performed by the Contractor. At certain locations in the text, for clarity, contrasting subjective language is used to describe responsibilities which must be fulfilled indirectly by the Contractor, or by others when so noted.

Methods of Specifying: The techniques or methods of specifying requirements varies throughout the text. The method used for specifying one element of the Work has no bearing on requirements for another element of the Work. The methods of specifying may include the following, or any combination of the following:

Assignment of Specialists: In certain circumstances, the specification text requires or implies that specific elements of the Work are to be assigned to specialists who must be engaged to perform that element of the Work. Such assignments are special requirements over which the Contractor has no choice or option. Such assignments are intended to establish which party or entity involved in a specific element of the Work is considered as being sufficiently experienced in the indicated construction processes or operations to be recognized as "expert" in those processes or operations. Nevertheless, the ultimate responsibility for fulfilling all contract requirements remains with the Contractor.

These requirements should not be interpreted to conflict with the enforcement of building codes and similar regulations governing the work. They are also not intended to interfere with local trade union jurisdictional settlements and similar conventions.

Trades: The use of certain titles such as "carpentry" in the specification text, is not intended to imply that the Work must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter". It also is not exclusively to work by tradespersons of that corresponding generic name.

INDUSTRY STANDARDS:

Applicability of Standards: Except where more explicit or more stringent requirements are written into the contract documents, applicable construction industry standards have the same force and effect as if bound into or copied directly into the contract documents. Such industry standards are made a part of the contract documents by reference. Individual specification sections indicate which codes and standards the Contractor must keep available at the project site for reference.

Referenced Standards: (standards referenced directly in the contract documents) take precedence over non-referenced standards that are recognized in the industry for applicability to the Work.

Un-referenced Standards: Except as otherwise limited by the contract documents, un-referenced standards recognized in the construction industry are defined as having direct applicability to the Work and will be enforced for the performance of the Work. The decision as to whether an industry code or standard is applicable to the Work, or as to which of several standards are applicable, is the sole responsibility of the Architect/Engineer.

Publication Dates: Except as otherwise indicated, where compliance with an industry standard is required, comply with standard in effect or as recognized as governing by code authorities, as of date of contract documents.

Updated Standards: At the request of the Architect/Engineer, Contractor or governing authority, submit a change order proposal where an applicable industry code or standard has been revised and reissued after the date of the contract documents and before the performance of the work affected. The Architect/Engineer will decide whether to issue the change order to proceed with the updated standard.

Conflicting Requirements: Where compliance with two or more standards is specified, and where these standards establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the contract documents specifically indicate a less stringent requirement. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect/Engineer for a decision before proceeding.

Copies of Standards: The contract documents require that each entity performing work be experienced in that part of the work being performed. Each entity is also required to be familiar with industry standards applicable to that part of the work. Copies of applicable standards are not bound with the contract documents.

Where copies of standards are needed for proper performance of the Work, the Contractor is required to obtain such copies directly from the publication source.

Although certain copies of standards needed for enforcement of the requirements may be required submittals, the Architect/Engineer reserves the right to require the Contractor to submit additional copies of these standards as necessary for enforcement of the requirements.

Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. Where acronyms or abbreviations are used in the specifications or other contract documents they are defined to mean the recognized name of the trade association, standards generating organization, governing authority or other entity applicable to the context of the text provision. Refer to the "Encyclopedia of Associations", published by Gale Research Co., available in most libraries.

Abbreviations and Names: Trade association names and titles of general standards are frequently abbreviated. The following acronyms or abbreviations as referenced in contract documents are defined to mean the associated names. Both names and addresses are subject to change, and are believed to be, but are not assured to be, accurate and up-to-date as of date of contract documents:

AA	Aluminum Association 900 19th St. N.W., Suite 300 Washington, DC 20006	(202) 862-5100
AABC	Associated Air Balance Council 1518 K Street, NW, Suite 503 Washington, DC 20005	(202) 737-0202
AAMA	American Architectural Manufacturer's Association 1540 E. Dundee Road, Suite 310 Palatine, IL 60067-8321	(708) 202-1350
ACI	American Concrete Institute P. O. Box 9094 Farmington Hills, MI 48333	(313) 532-2600
ACIL	American Council of Independent Laboratories 1629 K Street, NW, Suite 400 Washington, DC 20006	(202) 887-5872
ACS	Acoustical Society of America 500 Sunnyside Blvd. Woodbury, NY 11797	(516) 576-2360
ADC	Air Diffusion Council 11 S. LaSalle St., #1400 Chicago, IL 60603	(312) 201-0101
AHA	American Hardboard Association 1210 W. Northwest Hwy. Palatine, IL 60067	(847) 934-8800
AIA	American Institute of Architects 1735 New York Ave., NW Washington, DC 20006	(202) 626-7300
AISC	American Institute of Steel Construction 1 E. Wacker Dr., #3100 Chicago, IL 60601-2001	(312) 670-2400
AISI	American Iron and Steel Institute 1101 17th St., N.W., Suite 1300 Washington, DC 20036	(202) 452-7100
AMCA	Air Movement and Control Association 30 W. University Drive Arlington Heights, IL 60004	(847) 394-0150
ANSI	American National Standards Institute 11 W. 42nd St., 13 th Floor	

	New York, NY 10036	(212) 642-4900
ARI	Air Conditioning and Refrigeration Institute 4301 N. Fairfax Dr., Suite 425 Arlington, VA 22203	(703) 524-8800
ARMA	Asphalt Roofing Manufacturers Association 4041 Powder Hill Road, Suite 404 Calverton, MD 20705	(301) 231-9050
ASC	Adhesive and Sealant Council 1627 K St., N.W., Suite 1000 Washington, DC 20006-1707	(202) 452-1500
ASHRAE	American Society of Heating, Refrigerating and Air-Conditioning Engineers, Inc. 1791 Tullie Circle, NE Atlanta, GA 30329-2305	(800) 527-4723 (404) 636-8400
ASME	American Society of Mechanical Engineers 345 East 47th Street New York, NY 10017	(800) THE-ASME (212) 705-7722
ASPE	American Society of Plumbing Engineers 3617 Thousand Oaks Blvd., Suite 210 Westlake Village, CA 91362-3649	(805) 495-7120
ASTM	American Society for Testing & Materials 100 Barr Harbor Dr. W. Conshohocken, PA 19428-2959	(610) 832-9500
AWI	Architectural Woodwork Institute 1952 Isaac Newton Sq. Reston, VA 20190	(703) 222-1100
AWPA	American Wood-Preservers' Association P. O. Box 286 Woodstock, MD 21163-0286	(410) 465-3169
AWPI	American Wood Preservers' Institute 1945 Old Gallows Road, Suite 150 Vienna, VA 22182	(800) 356-AWPI (703) 893-4005
AWS	American Welding Society 550 Le Jeune Road, NW Miami, FL 33126	(800) 443-9353
AWWA	American Water Works Association 6666 W. Quincy Ave. Denver, CO 80235	(303) 794-7711
BHMA	Builders' Hardware Manufacturers Assn. 355 Lexington Ave., 17th floor New York, NY 10017	(212) 661-4261
CAUS	Color Association of the United States	

	409 W. 44th St. New York, NY 10036	(212) 582-6884
CRSI	Concrete Reinforcing Steel Institute 933 N. Plum Grove Road Schaumburg, IL 60173	(847) 517-1200
CTI	Ceramic Tile Institute of America, Inc. 12061 W. Jefferson Culver City, CA 90230-6219	(310) 574-7800
DHI	Door and Hardware Institute 14170 Newbrook Drive Chantilly, VA 22021-2223	(703) 222-2010
GANA	Glass Association of North America 3310 S. W. Harrison St. Topeka, KS 66611-2279	(913) 266-7013
FMER	Factory Mutual Engineering and Research 1151 Boston-Providence Turnpike Norwood, MA 02062	(781) 762-4300
GA	Gypsum Association 810 First Street, N.E. Suite 510 Washington, DC 20002	(202) 289-5440
HEI	Heat Exchange Institute 1300 Sumner Avenue Cleveland, OH 44115	(216) 241-7333
ICEA	Insulated Cable Engineers Assn, Inc. P. O. Box 440 South Yarmouth, MA 02664	(508) 394-4424
IEc	International Electrotechnical Commission 11 W. 42nd St., 13 th Floor New York, NY 10036	(212) 642-4900
IEEE	Institute of Electrical and Electronic Engineers U.S. Activities Board 1828 L St., N.W., Suite 1202 Washington, DC 20036-5104	(202) 785-0017
MCA	Metal Construction Association 11 S. LaSalle Street; Suite 1400 Chicago, IL 60603	(312) 201-0193
MSS	Manufacturers Standardization Society of the Valve and Fittings Industry 127 Park Street, NE Vienna, VA 22180	(703) 281-6613
NAAMM	National Association of Architectural Metal Manufacturers 8 S. Michigan Ave., Suite 1000 Chicago, IL 60603	(312) 456-5590

NCMA	National Concrete Masonry Assn. 2302 Horse Pen Road Herndon, VA 20171	(703) 713-1900
NEC	National Electric Code (by NFPA)	
NECA	National Electrical Contractors Assn. 3 Bethesda Metro Ctr., Suite 1100 Bethesda, MD 20814	(301) 657-3110
NEMA	National Electrical Manufacturers Assn. 1300 N. 17th St., Suite 1847 Rosslyn, VA 22209	(703) 841-3200
NPCA	National Paint and Coating Assn. 1500 Rhode Island Ave., NW Washington, DC 20005	(202) 462-6272
NRCA	National Roofing Contractors Assn. 10255 W. Higgins Road, Suite 600 Rosemont, IL 60018	(847) 299-9070
PDI	Plumbing and Drainage Institute c/o W. C. Whitehead 45 Bristol Drive, Suite 101 Easton, MA 02375	(508) 230-3516
RFCI	Resilient Floor Covering Institute 966 Hungerford Drive; Suite 12-B Rockville, MD 20850	(301) 340-8580
RMA	Rubber Manufacturers Assn. 1400 K Street, NW, Suite 900 Washington, DC 20005	(202) 682-4800
SDI	Steel Deck Institute P. O. Box 9506 Canton, OH 44711	(330) 493-7886
S.D.I.	Steel Door Institute 30200 Detroit Road Cleveland, OH 44145	(216) 899-0010
SIGMA	Sealed Insulating Glass Manufacturers Assn. 401 N. Michigan Ave. Chicago, IL 60611-4267	(312) 644-6610
SJI	Steel Joist Institute 1205 48th Street, North; Suite A Myrtle Beach, SC 29577-5424	(803) 449-0487
SMACNA	Sheet Metal and Air Conditioning Contractors' National Assn. 4201 Lafayette Ctr. Dr. Chantilly, VA 22021	(703) 803-2980

SPC	Southern Pine Council P. O. Box 641700 Kenner, LA 70064-1700	(504) 443-4464
SSPC	Steel Structures Painting Council 40 24th St. Pittsburgh, PA 15222	(412) 281-2331
TCA	Tile Council of American, Inc. P. O. Box 1787 Clemson, SC 29633-1787	(864) 646-8453
UL	Underwriters Laboratories, Inc. 333 Pfingsten Road Northbrook, IL 60062	(708) 272-8800
WRI	Wire Reinforcement Institute 203 Loudoun St., S.W. Leesburg, VA 22075	(703) 779-2339
WSC	Water Systems Council 800 Roosevelt Rd, Suite 20, Building C Glen Ellyn, IL 60137	(708) 545-1762
W.W.P.A.	Woven Wire Products Assn. 2462 Hickory Glen Dr. Bloomfield Hills, MI 48304	(810) 258-5756

SUBMITTALS:

Certificates: For the Owner's records, submit copies of certifications, inspection reports, releases, jurisdictional settlements, notices, receipts for fee payments, judgments, and similar documents, correspondence and records established in conjunction with compliance with standards and regulations bearing upon performance of the work.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION (Not Applicable)

END OF SECTION 01 42 00

SECTION 01 50 00 - TEMPORARY FACILITIES

PART 1 - GENERAL

DESCRIPTION OF REQUIREMENTS:

Definitions: Nothing in this section is intended to limit types and amounts of temporary work required, and no omission from this section will be recognized as an indication by Architect or Engineer that such temporary activity is not required for successful completion of the work and compliance with requirements of contract documents. Provisions of this section are applicable to, but not by way of limitation, utility services, construction facilities, security/protection provisions, and support facilities.

Use Charges: No cost or usage charges for temporary services or facilities are chargeable to the Owner or Architect/Engineer. Cost or use charges for temporary services or facilities will not be accepted as a basis of claims for a change-order extra.

JOB CONDITIONS:

Conditions of Use: Install, operate, maintain and protect temporary facilities in a manner and at locations which will be safe, non-hazardous, sanitary and protective of persons and property, and free of deleterious effects.

PARTS 2 AND 3 - PRODUCTS AND EXECUTION

TEMPORARY UTILITY SERVICES:

The types of services required include, but not by way of limitation, water, sewerage, surface drainage, electrical power and telephones. Where possible and reasonable, contractor shall connect to existing franchised utilities for required services; and comply with service companies' recommendations on materials and methods, or engage service companies to install services. Locate and relocate services (as necessary) to minimize interference with construction operations with minimum 14 days notice to Owner and affected utility company. If service from utility company(ies) is unavailable, contractor shall provide well(s), portable generator or other similar methods for temporary utilities.

Potable Water: Contractor may use owner's (electric) water service provided it is not abused or wasted.

Temporary Power: Contractor may use owner's (electric) water service provided it is not abused or wasted.

TEMPORARY CONSTRUCTION FACILITIES:

The types of temporary construction facilities required may include, but not by way of limitation, water distribution, enclosure of work, heat, ventilation, electrical power distribution, lighting, hoisting facilities, stairs, ladders, and access roads. Provide facilities reasonably required to perform construction operations properly and adequately.

Enclosure: Provide temporary enclosure where reasonably required to ensure adequate workmanship and protection from weather and unsatisfactory ambient conditions for the work, including enclosure where temporary heat is used. Provide fire-retardant treated lumber and plywood. Provide tarpaulins with UL label and flame spread of 15 or less; provide translucent type (nylon reinforced polyethylene) where day-lighting of enclosed space would be beneficial for workmanship, and reduce use of temporary lighting.

Lighting: Provide sufficient temporary lighting to ensure proper workmanship everywhere; by combined use of daylight, general lighting, and portable plug-in task lighting.

Provide uniformly spaced general lighting equivalent to not less than one 200-watt incandescent lamp per 1000 sq. ft. of floor area, and one 100-watt lamp per 50' of corridor and per flight of stairs.

Access Provisions: Provide ramps, stairs, ladders and similar temporary access elements as reasonably required to perform the work and facilitate its inspection during installation.

SECURITY/PROTECTION PROVISIONS:

The types of temporary security and protection provisions required may include, but not by way of limitation, fire protection, barricades, warning signs/lights, site enclosure fence, sidewalk bridges, building enclosure/lockup, watchman service, personnel security program (theft prevention), environmental protection, and similar provisions intended to minimize property losses, personal injuries and claims for damages at project site. Provide security/protection services and systems in coordination with activities and in a manner to achieve 24-hour, 7-day-per-week effectiveness.

Fire Extinguishers: Provide types, sizes, numbers and locations as would be reasonably effective in extinguishing fires during early stages, by personnel at project site. Provide Type A extinguishers at locations of low-potential for either electrical or grease-oil-flammable liquids fires; provide Type ABC dry chemical extinguishers at other locations; comply with recommendations of NFPA No. 10. Post warning and quick-instructions at each extinguisher location, and instruct personnel at project site, at time of their first arrival, on proper use of extinguishers and other available facilities at project site. Post local fire department call number on each telephone instrument at project site.

Building Enclosure and Lockup: At earliest possible date, secure building against unauthorized entrance at times when personnel are not working. Provide secure temporary enclosures at ground floor and other locations of possible entry, with locked entrances.

Hurricane & Tropical Storm Preparedness: When there is news of a tropical storm or hurricane approaching and forecasted to affect the project area, the Contractor shall pick up all materials, scaffolding, equipment, etc. which are in place or attached to the structure but not in final position. He shall secure doors, windows and other openings in as much as is practical to close-in the project structure. The Contractor shall secure all equipment, materials and construction trailer(s) to be left at the site with locks, hold-down straps and ropes to prevent their movement in as much as is possible. Prior to leaving the site, the Contractor shall take several photographs showing the entire project and site; and, upon return to the site, the Contractor shall immediately take several photographs showing the entire project and site. Copies of these photographs shall be immediately made available to the Owner upon request.

TEMPORARY SUPPORT FACILITIES:

The types of temporary support facilities required include, but not by way of limitation, field offices, storage sheds, fabrication sheds, sanitary facilities, drinking water, as may be reasonably required for proficient performance of the work and accommodation of personnel at the site including Owner's and Architect's/Engineer's personnel. Discontinue and remove temporary support facilities, and make incidental similar use of permanent work of the project, only when and in manner authorized by Architect/ Engineer; and, if not otherwise indicated, immediately before time of substantial completion. Locate temporary support facilities for convenience of users, and for minimum interference with construction activities.

Contractor's Field Office: Provide adequate office space for Contractor's field office functions. Include a telephone with recorder, a FAX machine (or computer with active email service), toilet,

and an air-conditioned conference room of sufficient size for meetings with Owner's representatives.

Contractor's superintendent shall have a cell phone(s) at all times from job start and during the closeout period until final payment is made.

Sanitary Facilities: Provide toilet facilities acceptable to governing authorities, adequate for use of personnel at project site.

Drinking Water: Provide drinking water.

Project Identification Sign: Provide project identification sign including owner, GC, architect, name and contact information. Engage an experienced sign painter to paint graphics on sign as indicated. Colors per the Architect.

END OF SECTION 01 50 00

SECTION 01 60 00 - PRODUCTS AND SUBSTITUTIONS

PART 1 - GENERAL

DESCRIPTION OF REQUIREMENTS:

Substitutions: The Contractor's requests for changes of products, materials, equipment and methods of construction required by the contract documents are considered requests for "substitutions", and are subject to the requirements specified herein.

The Architect or Engineer's reference to "or equal" products or equipment; and, a contractor's submittal of a proposed "equal" product is considered a "substitution", and is subject to the requirements of this section.

In certain specifications sections, it may be indicated that substitute or alternative product will be considered prior to bid date. Beyond that time limit, no substitution is to be made; and, the Architect-Engineer is not obligated to accept or approve a proposed substitution. The following are not considered substitutions:

Substitutions requested during the bidding period, which have been accepted, in writing, prior to the "Bid Date", are included in the contract documents and are not subject to the requirements for substitutions as herein specified.

Specified Contractor options on products and construction methods included in the contract documents are choices available to the Contractor and are not subject to the requirements for substitutions as herein specified provided all requirements for a product performance as specified are met.

Standards: Refer to the products specified for the project, and for acronyms used in the text of the specification sections.

Where a proposed substitution involves the work of more than one prime contractor, each prime contractor involved shall cooperate and coordinate the work with each other prime contractor involved, so as to provide uniformity and consistency and to assure the compatibility of products.

QUALITY ASSURANCE:

Source Limitations: To the fullest extent possible, provide products of the same generic kind, from a single source, for each unit of work.

When it is discovered that specified products are available only from sources that do not or cannot produce an adequate quantity to complete project requirements in a timely manner, consult with the Architect/Engineer for a determination of what product qualities, such as visual, structural, durability, or compatibility, that are most important. When the Architect/Engineer's determination has been made, select products from those sources that produce products that possess the most important qualities, to the fullest extent possible.

Compatibility of Options: Compatibility of products is a basic requirement of product selection. When the Contractor is given the option of selecting between two or more products for use on the project, the product selected must be compatible with other products previously selected, even if the products previously selected were also Contractor options. The complete compatibility between the various choices available to the Contractor is not assured by the various requirements of the Contract documents, but must be provided by the Contractor.

SUBMITTALS:

Substitution Request Submittal:

Requests for Substitutions: Submit 3 copies of each request for substitution. In each request identify the product or fabrication or installation method to be replaced by the substitution; include related specification section and drawing numbers, and complete documentation showing compliance with the requirements for substitutions. Include the following information, as appropriate, with each request.

Provide complete product data, drawings and descriptions of products, and fabrication and installation procedures.

Provide samples where applicable or requested.

Provide a detailed comparison of the significant qualities of the proposed substitution with those of the work originally specified. Significant qualities include elements such as size, weight, durability, performance and visual effect where applicable.

Provide complete coordination information. Include all changes required in other elements of the work to accommodate the substitution, including work performed by the Owner and separate Contractors.

Provide a statement indicating the effect the substitution will have on the work schedule in comparison to the schedule without approval of the proposed substitution. Include information regarding the effect of the proposed substitution on the Contract Time.

Provide certification by the Contractor to the effect that, in the Contractor's opinion, after thorough evaluation, the proposed substitution will result in work that in every significant respect is equal-to or better than the work required by the Contract documents, and that it will perform adequately in the application indicated.

Include in this certification, the Contractor's waiver of rights to additional payment or time, which may subsequently be necessary because of the failure of the substitution to perform adequately.

Architect/Engineer's Action: Within one week of receipt of the Contractor's request for substitution, the Architect/Engineer will request additional information or documentation as may be needed for evaluation of the request. Within 2 weeks of receipt of the request, or within one week of receipt of the requested additional information or documentation, whichever is later, the Architect/Engineer will notify the Contractor of either the acceptance or rejection of the proposed substitution.

Excessive or repeated requests/submittals for substitutions solely for the benefit of the Contractor, or substitutions which are being requested based on false information (i.e.: no longer made available) are unacceptable and extra work for the Architect/ Engineer. The Contractor shall bear the cost for same, which will be deducted from the construction contract via a change order; the basis of which cost shall be the Architect's contracted hourly rate plus any expenses. The owner will in turn pay the Architect all amounts so deducted.

PART 2 - PRODUCTS

GENERAL PRODUCT COMPLIANCE:

General: Requirements for individual products are indicated in the contract documents; compliance with these requirements is in itself a contract requirement. These requirements may

be specified in any one of several different specifying methods, or in any combination of these methods. These methods include the following:

Proprietary
Descriptive
Performance
Compliance with Reference Standards.

Compliance with codes, compliance with graphic details, allowances, and similar provisions of the contract documents also have a bearing on the selection process.

Procedures for Selecting Products: Contractor's options in selecting products are limited by requirements of the contract documents and governing regulations. They are not controlled by industry traditions or procedures experienced by the Contractor on previous construction projects. Required procedures include but are not limited to the following for the various indicated methods of specifying:

Proprietary Specification Requirements: Where the specifications identify one or more manufacturers as acceptable, but limit the contractor to same except by approval prior to bid, or by approval in accordance with this section; the contractor shall provide that product(s) by the manufacturers listed unless approval prior to bids has been incorporated, in writing, into the contract documents. Likewise, if the specifications indicate one or more contractors as a basis for design but allow others as "equals", the contractor shall receive approval of the "equals" prior to bids.

Non-Proprietary Specification Requirements: Where the specifications name products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to the use of these products only, the Contractor may at his option, use any available product that complies with contract requirements.

Descriptive Specification Requirements: Where the specifications describe a product or assembly generically, in detail, listing the exact characteristics required, but without use of a brand or trade name, provide products or assemblies that provide the characteristics indicated and otherwise comply with contract requirements.

Performance Specification Requirements: Where the specifications require compliance with indicated performance requirements, provide products that comply with the specific performance requirements indicated, and that are recommended by the manufacturer for the application indicated. The manufacturer's recommendations may be contained in published product literature, or by the manufacturer's individual certification of performance. General overall performance of a product is implied where the product is specified for specific performances.

Compliance with Standards, Codes and Regulations: Where the specifications require only compliance with an imposed standard, code or regulation, the Contractor has the option of selecting a product that complies with specification requirements, including the standards, codes and regulations.

Visual Matching: Where matching an established sample is required, the final judgment of whether a product proposed by the Contractor matches the sample satisfactorily will be determined by the Architect. Where there is no product available within the specified product category that matches the sample satisfactorily and also complies with other specified requirements, comply with the provisions of the contract documents concerning "substitutions" for the selection of a matching product in another product category, or for non-compliance with specified requirements.

Visual Selection: Except as otherwise indicated, where specified product requirements include the phrase "...as selected from the manufacturer's standard colors, patterns, textures..." or similar phrases, the Contractor has the option of selecting the product and manufacturer, provided the selection complies with other specified requirements. The Architect is subsequently responsible for selecting the color, pattern and texture from the product line selected by the Contractor.

Producer's Statement of Applicability: Where individual specification sections indicate products that require a "Statement of Applicability" from the manufacturer or other producer, submit a written-certified statement from the producer stating that the producer has reviewed the proposed application of the product on the project. This statement shall state that the producer agrees with or does not object to the Architect/Engineer's specification and the Contractor's selection of the product for use in the Work. The statement shall also state that the proposed application of the product on the project is suitable and proper.

SUBSTITUTIONS:

Conditions: Contractor's request for substitution will be received and considered when extensive revisions to the contract documents are not required, when the proposed changes are in keeping with the general intent of the contract documents, when the request is timely, fully documented and properly submitted, and when one or more of the following conditions is satisfied, all as judged by the Architect/Engineer; otherwise the requests will be returned without action except to record non-compliance with these requirements.

The Architect/Engineer will consider a request for substitution where the request is directly related to an "or equal" clause or similar language in the contract documents.

The Architect/Engineer will consider a request for substitution where the specified product or method cannot be provided within the Contract Time. However, the request will not be considered if the product or method can not be provided as a result of the Contractor's failure to pursue the work promptly or to coordinate the various activities properly.

The Architect/Engineer will consider a request for substitution where the specified product or method cannot receive necessary approval by a governing authority, and the requested substitution can be approved.

The Architect/Engineer will consider a request for a substitution where a substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit after deducting offsetting responsibilities the Owner may be required to bear. These additional responsibilities may include such considerations as additional compensation to the Architect/Engineer for redesign and evaluation services, the contractor(s), and similar considerations.

The Architect/Engineer will consider a request for substitution when the specified product or method cannot be provided in a manner which is compatible with other materials of the work, and where the Contractor certifies that the substitution will overcome the incompatibility.

The Architect/Engineer will consider a request for substitution when the specified product or method can not be properly coordinated with other materials in the work, and where the Contractor certifies that the proposed substitution can be properly coordinated.

The Architect/Engineer will consider a request for substitution when the specified product or method can not receive a warranty as required by the contract documents and where the contractor certifies that the proposed substitution receive the required warranty.

Work-Related Submittals: Contractor's submittal of and the Architect's/Engineer's acceptance of shop drawings, product data or samples which relate to work not complying with requirements of

the contract documents, does not constitute an acceptable or valid request for a substitution, nor approval thereof.

GENERAL PRODUCT REQUIREMENTS:

General: Provide products that comply with the requirements of the contract documents and that are undamaged and, unless otherwise indicated, unused at the time of installation. Provide products that are 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.

Continued Availability: Where, because of the nature of its application, the Owner is likely to need replacement parts or additional amounts of a product at a later date, either for maintenance and repair or replacement, provide standard, domestically produced products for which the manufacturer has published assurances that the products and its parts are likely to be available to the Owner at a later date.

PART 3 - EXECUTION

INSTALLATION OF PRODUCTS:

General: Except as otherwise indicated in individual sections of these specifications, comply with the manufacturer's instructions and recommendations for installation of the products in the applications indicated. Anchor each product securely in place, accurately located and aligned with other work. Clean exposed surfaces and protect surfaces as necessary to ensure freedom from damage and deterioration at time of acceptance.

END OF SECTION 01 60 00

SECTION 01 60 01 - ZERO TOLERANCE HAZARDOUS MATERIALS STATEMENT

PART 1 - GENERAL

Attached hereto is a "Zero Tolerance Hazardous Materials Statement". It is a statement regarding all products and materials that are to be incorporated into the work. The General Contractor is advised to secure similar statements from all suppliers and subcontractors and submit same along with his statement at project closeout.

END OF SECTION 01 60 01

All materials are to be 100% FREE OF ASBESTOS and no LEAD BASE PAINT MATERIALS shall be used in the construction of this project. In the event that such material is discovered either during construction, or following completion of construction and close-out of the construction contract, it will be the responsibility of this contractor to pay all costs incurred to remove and replace those materials, including repair or replacement of all adjacent materials which are affected by the abatement process.

BUSINESS ADDRESS: _____

My Commission Expires _____, 20__.

SECTION 01 73 10 - REMOVAL, CUTTING, PATCHING AND REPAIR

PART 1 - GENERAL

DESCRIPTION OF REQUIREMENTS:

Definition: "Removal, cutting and patching" includes removal of or cutting into existing construction to provide for the installation or performance of other work and subsequent fitting and patching required to restore surfaces to their original (like new) condition.

SCOPE OF WORK:

The Contractor may also be required to patch and repair areas where hazardous materials have been abated, either by him or others.

Additional specific requirements may be contained in other divisions in these specifications or on the drawings.

QUALITY ASSURANCE:

Requirements for Structural Work: Do not arbitrarily cut and patch structural work in a manner that would result in a reduction of load-carrying capacity or of load-deflection ratio. Where cutting and patching of an existing structural member is required and is the only alternative method of fitting the new work, review proposed procedure with the Architect/Engineer in accordance with Section 01 32 00, Shop Drawings and Submittals.

Before cutting and patching the following categories of work, obtain the Architect/Engineer's approval to proceed with cutting and patching as described in the procedural proposal for cutting and patching.

Structural steel
Structural concrete
Foundation construction
Bearing and retaining walls
Structural decking

Operational and Safety Limitations: Do not cut and patch operational elements or safety related components in a manner that would result in a reduction of their capacity to perform in the manner intended, including energy performance, or that would result in increased maintenance, or decreased operational life or decreased energy.

SUBMITTALS:

Procedural Proposal for Removal, Cutting and Patching: Where prior approval of removal, cutting and/or patching is required, submit proposed procedures for this work well in advance of the time work will be performed and request approval to proceed. Include the following information, as applicable, in the submittal:

List products to be used and firms that will perform work.

Give dates when work is expected to be performed.

Acceptance by the Architect/Engineer to proceed with work does not waive the Architect/Engineer's right to later require complete removal and replacement of work found to be performed in an unsatisfactory manner.

JOB CONDITIONS:

Condition of Structures: Owner assumes no responsibility for actual condition of items or structures.

Contractor shall prepare a listing and "photo" record of the condition of the existing structure and nearby structures and their contents at start of project and before any demolition or construction work begins. File one copy of the labeled photos with the owner immediately. Immediately report any missing or inoperable items or equipment as required by Section 01 31 00.

Contractor should be aware that older structures may contain hazardous materials such as asbestos or lead base paint. The owners have completed a survey and testing to confirm same, a report of which is included herewith. The Contractor will assume full responsibility for reporting suspicious materials immediately.

Partial Removal: Items indicated to be removed but of salvageable value to Contractor may be removed from structure as work progresses. Transport salvaged items from site as they are removed.

Storage or sale of removed items on site will not be permitted.

Protections: Provide temporary barricades and other forms of protection as required to protect occupants and general public from injury due to selective removal work.

Protect from damage, existing finish work that is to remain in place and becomes exposed during removal operations.

Protect existing features (structures and site) with suitable coverings when necessary.

Provide temporary weather protection during interval between removal of existing construction on exterior surfaces and installation of new construction, to insure that no water leakage or damage occurs to structure or interior areas of existing building.

Damages: Promptly repair damages caused to adjacent facilities work at no cost to owner.

Traffic: Conduct selective removal operations and debris removal in a manner to ensure minimum interference with roads, streets, walks, and other adjacent occupied or used facilities.

Do not close, block or otherwise obstruct egress paths required for life safety, streets, walks or other occupied or used facilities without written permission from authorities having jurisdiction. Provide alternate routes around closed or obstructed pedestrian or traffic ways if required by governing regulations.

Explosives: Use of any type of explosives will not be permitted.

PART 2 - PRODUCTS

MATERIALS:

General: Except as otherwise indicated or as directed by the Architect/Engineer, use materials for repair and patching that are identical to existing materials. If identical materials are not available, or cannot be used, use materials that match existing adjacent surfaces to the fullest extent possible with regard to visual effect, as acceptable to the Architect or Owner's representative. Use materials for repair and patching that will result in equivalent-or-better performance characteristics.

GENERAL:

The demolition plans and schedules are general in nature and attempt to familiarize the contractor with an overall view of the work. When specific demolition or patching is required to install new or replacement items or when it is required to insure proper use or operation as intended but is not shown, it shall be a part of the work as if identified on the drawings or schedules.

PART 3 - EXECUTION

INSPECTION:

Before removal or cutting, examine the surrounding surfaces and the conditions under which the work is to be performed. If unsafe or otherwise unsatisfactory conditions are encountered, take corrective action before proceeding with work.

Before the start of cutting work, meet at the work site with all parties involved in cutting and patching. Review areas of potential interference and conflict between the various trades. Coordinate layout of the work and resolve potential conflicts before proceeding with the work.

PREPARATION:

Temporary Support: To prevent failure provide temp. support of work to be cut.

Protection: Protect other work and finishes, during removal, cutting and patching to prevent damage. Provide protection from adverse weather conditions for that part of the project that may be exposed during cutting and patching operations.

Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

PERFORMANCE:

General: Employ skilled workmen to perform removal, cutting and patching work. Except as otherwise indicated or as approved by the Architect/Engineer, proceed with work at the earliest feasible time and complete it without delay.

Removal: Perform selective removal work in a systematic manner and as quickly as possible. Use such methods as required to complete work indicated, and in accordance with governing regulations.

Cutting: Cut the work using methods that are least likely to damage work to be retained or adjoining work.

In general, where cutting is required, use hand or small power tools designed for sawing or grinding, not hammering and chopping. Cut through concrete and masonry using a cutting machine such as a carborundum saw or core drill to insure a neat hole. Cut holes and slots neatly to size required with minimum disturbance of adjacent work. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into surfaces, cut or drill from the exposed or finished side into concealed surfaces. Temporarily cover openings when not in use.

Comply with requirements of applicable sections of Division 2 where cutting and patching requires excavating and backfilling.

By-pass utility services such as pipe and conduit, before cutting, where such utility services are shown or required to be removed, relocated or abandoned. Cut-off conduit and pipe in wall or

partitions to be removed. After by-pass and cutting, cap, valve or plug and seal tight remaining portion of pipe and conduit to prevent entrance of moisture or other foreign matter.

Patching/Repair: Patch with seams which are durable and as invisible as possible. Comply with specified tolerances for the work.

Restore exposed finishes of patched or repaired areas and where necessary extend finish restoration into adjoining work in a manner which will eliminate evidence of patching and refinishing.

Where removal of wall or partitions extends one finished area into another finished area, patch and repair floor and wall surfaces in the new space to provide an even surface of uniform color and appearance. If necessary to achieve uniform color and appearance, remove existing floor and wall coverings and replace with new materials.

Where patch occurs in a smooth painted surface, extend final paint coat over entire unbroken surface containing patch, after patched area has received prime and base coat.

DISPOSAL OF MATERIALS:

Remove debris, rubbish and other materials resulting from operations from building site daily. Transport and legally dispose of materials off site.

If hazardous materials are encountered during removal operations, comply with applicable regulations, laws, and ordinances concerning removal, handling and protection against exposure or environmental pollution.

Burning of removed materials is not permitted on project site.

Where materials are to be turned over to the owners, properly store on site or within a designated area of the structure, as necessary for proper protection, and notify owner for pick-up.

CLEANING:

When interior demolition operations are complete, remove all oil, putty, mortar or similar substances by scraping or solvent and thoroughly clean all surfaces by pressure washing, using a 1/3 to 2/3 mix of bleach and water.

END OF SECTION 01 73 10

SECTION 01 74 19 – CONSTRUCTION WASTE MANAGEMENT

PART 1 – GENERAL

RELATED DOCUMENTS:

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

SUMMARY:

This section includes administrative and procedural requirements for the following:

- Salvaging non-hazardous demolition and construction waste
- Recycling non-hazardous demolition and construction waste
- Disposing of non-hazardous demolition and construction waste

Related Sections include the following: Division 1 Section “Temporary Facilities and Controls” for environmental-protection measures during construction, and location of waste containers at project site.

DEFINITIONS:

Construction Waste: Building and site improvement materials and other solid waste resulting from construction, remodeling, renovation, or repair operations. Construction waste includes packaging.

Demolition Waste: Building and site improvement materials resulting from demolition or selective demolition operations.

Disposal: Removal off-site of demolition and construction waste and subsequent sale, recycling, reuse, or deposit in landfill or incinerator acceptable to authorities having jurisdiction.

Recycle: Recovery of demolition or construction waste for subsequent processing in preparation for reuse.

Salvage: Recovery of demolition or construction waste and subsequent sale or reuse in another facility.

Salvage and Reuse: Recovery of demolition or construction waste and subsequent incorporation into the work.

PERFORMANCE REQUIREMENTS:

General: Develop waste management plan that results in end-of-project rates for salvage/recycling of 50 percent by weight of total waste generated by the work.

Salvage/Recycle Requirements: Owner’s goal is to salvage and recycle as much non-hazardous demolition and construction waste as possible. Owner has established minimum goals for the following materials:

Demolition Waste:

- Asphaltic concrete paving
- Concrete
- Concrete reinforcing steel
- Brick
- Concrete masonry units

- Wood studs
- Wood joists
- Plywood and oriented strand board
- Wood paneling
- Wood trim
- Structural and miscellaneous steel
- Rough hardware
- Roofing
- Insulation
- Doors and frames
- Door hardware
- Windows
- Glazing
- Metal studs
- Gypsum board
- Acoustical tile and panels
- Carpet
- Carpet pad
- Demountable partitions
- Equipment
- Cabinets
- Plumbing fixtures
- Piping
- Supports and hangers
- Valves
- Sprinklers
- Mechanical equipment
- Refrigerants
- Electrical conduit
- Copper wiring
- Lighting fixtures
- Lamps
- Ballasts
- Electrical devices
- Switchgear and panelboards
- Transformers

Construction waste:

- Site-clearing waste
- Masonry and CMU
- Lumber
- Wood sheet materials
- Wood trim
- Metals
- Roofing
- Insulation
- Carpet and pad
- Gypsum board
- Piping
- Electrical conduit

Packaging: Regardless of salvage/recycle goal indicated above, salvage or recycle 100 percent of the following uncontaminated packaging materials:

- Paper
- Cardboard
- Boxes
- Plastic sheet and film
- Polystyrene packaging
- Wood crates
- Plastic pails

SUBMITTALS:

Waste Management Plan: Submit 3 copies of plan within 7 days of date established for the Notice to Proceed.

Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report, Include separate reports for demolition and construction waste. Include the following information:

- Material category
- Generation point of waste
- Total quantity of waste in tons
- Quantity of waste salvaged, both estimated and actual in tons
- Quantity of waste recycled, both estimated and actual in tons
- Total quantity of waste recovered (salvaged plus recycled) in tons
- Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste

Waste Reduction Calculations: Before request for Substantial Completion, submit three copies of calculated end-of-project rates for salvage, recycling, and disposal as a percentage of total waste generated by the work.

Records of Donations: Indicate receipt and acceptance of salvageable waste donated to individuals and organizations. Indicate whether organization is tax exempt.

Records of Sales: Indicate receipt and acceptance of salvageable waste sold to individuals and organizations. Indicate whether organization is tax exempt.

Recycling and Processing Facility Records: Indicate receipt and acceptance of recyclable waste by recycling and processing facilities licensed to accept them. Include manifests, weight tickets, receipts, and invoices.

Landfill and Incinerator Disposal records: Indicate receipt and acceptance of waste by landfills and incinerator facilities licensed to accept them. Include manifests, weight tickets, receipts and invoices.

Qualification Data: For Waste Management Coordinator and refrigerant recovery technician.

Statement of Refrigerant Recovery: Signed by refrigerant recovery technician responsible for recovering refrigerant, stating that all refrigerant that was present was recovered and that recovery was performed according to EPA regulations. Include name and address of technician and date refrigerant was recovered.

QUALITY ASSURANCE:

Waste Management Coordinator Qualifications: Minimum of five (5) years of experience.

Refrigerant Recovery Technician Qualifications: Certified by EPA-approved certification program.

Regulatory Requirements: Comply with hauling and disposal regulations of authorities having jurisdiction.

Waste Management Conference: Conduct conference at project site to comply with requirements in Division 1 Section 01040, 'Project Coordination'. Review methods and procedures related to waste management including, but not limited to the following:

- Review and discuss waste management plan including responsibilities of Waste Management Coordinator.
- Review requirements for documenting quantities of each type of waste and its disposition.
- Review and finalize procedures for materials separation and verify availability of containers and bins needed to avoid delays.
- Review procedures for periodic waste collection and transportation to recycling and disposal facilities.
- Review waste management requirements for each trade.

WASTE MANAGEMENT PLAN:

General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Include separate sections in plan for demolition and construction waste. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.

Waste Identification: Indicate anticipated types and quantities of demolition, site-clearing and construction waste generated by the work. Include estimated quantities and assumptions for estimates.

Waste Reduction Work Plan: List each type of waste and whether it will be salvaged, recycled, or disposed of in landfill or incinerator. Include points of waste generation, total quantity of each type of waste, quantity for each means of recovery, and handling and transportation procedures.

Salvaged Materials for Reuse: For materials that will be salvaged and reused in this project, describe methods for preparing salvaged materials before incorporation into the work.

Salvaged Materials for Sale: For materials that will be sold to individuals and organizations, include list of their names, addresses, and telephone numbers.

Salvaged Materials for Donation: For materials that will be donated to individuals and organizations, include list of their names, addresses, and telephone numbers.

Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.

Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.

Handling and Transportation Procedures: Include method that will be used for separating recyclable waste including sizes of containers, container labeling, and designated location on project site where materials separation will be located.

Cost/Revenue Analysis: Indicate total cost of waste disposal as if there was no waste management plan and net additional cost or net savings resulting from implementing waste management plan. Include the following:

- Total quantity of waste.
- Estimated cost of disposal (cost per unit). Include hauling and tipping fees and cost of collection containers for each type of waste.
- Total cost of disposal (with no waste management).
- Revenue from salvaged materials.
- Revenue from recycled materials.
- Savings in hauling and tipping fees by donating materials.
- Savings in hauling and tipping fees that are avoided.
- Handling and transportation costs. Include cost of collection containers for each type of waste.
- Net additional cost or net savings from waste management plan.

PART 2 – PRODUCTS (Not Used)

PART 3 – EXECUTION

PLAN IMPLEMENTATION:

General: Implement waste management plan as approved by Project LEED accredited professional. Provide handling, containers, storage, signage, transportation, and other items as required to implement waste management plan during the entire duration of the Contract.

Comply with Division 1 Section “Temporary Facilities and Controls” for operation, termination, and removal requirements.

Waste Management Coordinator: Engage a waste management coordinator to be responsible for implementing, monitoring, and reporting status of waste management work plan. Coordinator shall be present at project site full time for duration of project.

Training: Train workers, subcontractors, and suppliers on proper waste management procedures, as appropriate for the work occurring at project site.

Distribute waste management plan to everyone concerned within three days of submittal return.

Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

Site Access and Temporary Controls: Conduct waste management operations to ensure minimum interference with roads, streets, walks, walkways, and other adjacent occupied and used facilities.

Designate and label specific areas on project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.

Comply with Division 1 Section “Temporary Facilities and Controls” for controlling dust and dirt, environmental protection, and noise control.

SALVAGING DEMOLITION WASTE:

Salvaged Items for Reuse in the Work:

- Clean salvaged items.
- Pack or crate items after cleaning. Identify contents of containers.
- Store items in a secure area until installation.
- Protect items from damage during transport and storage.
- Install salvaged items to comply with installation requirements for new materials and equipment.

- Provide connections, supports, and miscellaneous materials necessary to make items functional for use indicated.

Salvaged Items for Sale and Donation: Not permitted on project site.

Salvaged Items for Owner's Use:

- Clean salvaged items.
- Pack or crate items after cleaning. Identify contents of containers.
- Store items in a secure area until delivery to Owner.
- Transport items to Owner's storage area off-site.
- Protect items from damage during transport and storage.

Doors and Hardware: Brace open end of door frames. Except for removing door closers, leave door hardware attached to doors.

RECYCLING DEMOLITION AND CONSTRUCTION WASTE, GENERAL:

General: Recycle paper and beverage containers used by on-site workers.

Recycling Incentives: Revenues, savings, rebates, tax credits, and other incentives received for recycling waste materials shall accrue to Owner.

Procedures: Separate recyclable waste from other waste materials, trash, and debris. Separate recyclable waste by type at project site to the maximum extent practical.

Provide appropriately marked containers or bins for controlling recyclable waste until they are removed from project site. Include list of acceptable and unacceptable materials at each container and bin.

Inspect containers and bins for contamination and remove contaminated materials if found.

Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.

Stockpile materials away from construction area. Do not store within drip line of remaining trees.

Store components off the ground and protect from the weather.

Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

RECYCLING DEMOLITION WASTE:

Asphaltic Concrete Paving: Grind asphalt to maximum 1-1/2-inch size.

Crush asphaltic concrete paving and screen to comply with requirements in Division 2 Section "Earthwork" for use as general fill.

Asphaltic Concrete Paving: Break up and transport paving to asphalt-recycling facility.

Concrete: Remove reinforcement and other metals from concrete and sort with other metals.

Pulverize concrete to maximum 1-1/2-inch size.

Crush concrete and screen to comply with requirements in Division 2 Section "Earthwork" for use as satisfactory soil for fill or subbase.

Masonry: Remove metal reinforcement, anchors, and ties from masonry and sort with other metals.

Pulverize masonry to maximum ¾-inch size.

Crush masonry and screen to comply with requirements in Division 2 Section "Earthwork" for use as satisfactory soil for fill or subbase.

Crush masonry and screen to comply with requirements in Division 2 Section "Exterior Plants" for use as mineral mulch.

Clean and stack undamaged, whole masonry units on wood pallets.

Wood Materials: Sort and stack members according to size, type, and length. Separate lumber, engineered wood products, panel products, and treated wood materials.

Metals: Separate metals by type.

Structural Steel: Stack members according to size, type of member, and length.

Remove and dispose of bolts, nuts, washers, and other rough hardware.

Asphalt Shingle Roofing: Separate organic and glass-fiber asphalt shingles and felts. Remove and dispose of nails, staples and accessories.

Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location. Remove edge trim and sort with other metals. Remove and dispose of fasteners.

Acoustical Ceiling Panels and Tile: Stack large clean pieces on wood pallets and store in a dry location.

Separate suspension system, trim, and other metals from panels and tile and sort with other metals.

Carpet and Pad:

- Roll large pieces tightly after removing debris, trash, adhesive, and tack strips.
- Store clean, dry carpet and pad in a closed container or trailer provided by Carpet Reclamation Agency or carpet recycler.

Equipment: Drain tanks, piping, and fixtures. Seal openings with caps or plugs. Protect equipment from exposure to weather.

Plumbing Fixtures: Separate by type and size.

Piping: Reduce piping to straight lengths and store by type and size. Separate supports, hangers, valves, sprinklers, and other components by type and size.

Lighting Fixtures: Separate lamps by type and protect from breakage.

Electrical Devices: Separate switches, receptacles, switchgear, transformers, meters, panelboards, circuit breakers, and other devices by type.

Conduit: Reduce conduit to straight lengths and store by type and size.

RECYCLING CONSTRUCTION WASTE:

Packaging:

Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.

Polystyrene Packaging: Separate and bag materials.

Pallets: As much as possible, require deliveries using pallets to remove pallets from project site. For pallets that remain on-site, break down pallets into component wood pieces and comply with requirements for recycling wood.

Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

Site-Clearing Wastes: Chip brush, branches, and trees at landfill facility.

Comply with requirements in Division 2 Section "Exterior Plants" for use of chipped organic waste as organic mulch.

Wood Materials:

Clean Cut-Offs of Lumber: Grind or chip into small pieces.

Clean Sawdust: Bag sawdust that does not contain painted or treated wood.

Comply with requirements in Division 2 Section "Exterior Plants" for use of clean sawdust as organic mulch.

Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.

Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.

Comply with requirements in Division 2 Section "Exterior Plants" for use of clean ground gypsum board as inorganic soil amendment.

DISPOSAL OF WASTE:

General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from project site and legally dispose of the in a landfill or incinerator acceptable to authorities having jurisdiction.

Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.

Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

Burning: Do not burn waste materials.

Burning: Burning of waste materials is permitted only at designated areas on Owner's property, provided required permits are obtained. Provide full-time monitoring for burning materials until fires are extinguished.

Disposal: Transport waste materials and dispose of at designated spoil areas on Owner's property.

Disposal: Transport waste materials off Owner's property and legally dispose of them.

END OF SECTION 01 74 19

SECTION 01 77 00 - PROJECT CLOSE-OUT

PART 1 - GENERAL

DESCRIPTION OF REQUIREMENTS:

Definitions: Project close-out is the term used to describe certain collective project requirements, indicating completion of the Work items that are to be fulfilled near the end of the Contract time in preparation for occupancy and final acceptance of the Work by the Owner, as well as final payment to the Contractor and the normal termination of the Contract.

Specific requirements for individual units of work are included in the appropriate sections in Divisions 2 through 16.

Time of close-out is directly related to "Substantial Completion." For this project, the time of close-out will be a single time/date for the entire Work.

PREREQUISITES FOR SUBSTANTIAL COMPLETION:

General: Complete the following before requesting the Owner's or Architect/Engineer's inspection for certification of substantial completion, for the entire Work. Portions of the Work may be reviewed for acceptance as being fit for occupancy per the schedule. Substantial completion of the entire project will be considered only when all portions are substantially complete.

In the progress payment request that coincides with, or is the first request following, the date substantial completion is claimed for the entire work, show either 100% completion for the Work claimed as "substantially complete", or list incomplete items, the value of incomplete work, and reasons for the Work being incomplete.

Submit supporting documentation for review prior to the anticipated substantial completion date as indicated below and elsewhere in the contract documents. Supporting documentation for portions of the entire work that are substantially completed may include parts of the documentation as determined by the Architect.

Submit certified copy of final property survey in accordance with Section 01 41 00, Project Coordination, at least one month prior to the anticipated substantial completion date.

Submit all operational and maintenance instruction manuals and the final test and balance report(s) at least one month prior to substantial completion.

Provide operational and maintenance instructions and training to all Owner-designated personnel at least one week prior to the anticipated substantial completion date.

Failure to provide proper/complete final survey, test and balance report(s), and operations and maintenance manuals and subsequent training may delay substantial completion and will delay the actual warranty start date. The General Contractor and his subcontractors will provide all maintenance until the manuals and training are accepted.

Advise Owner of pending insurance change-over requirements.

Submit special warranties, workmanship/maintenance bonds, maintenance agreements, final certifications, special test certifications and similar documents.

Complete final cleaning-up requirements, including touch-up painting of marred surfaces.

Make final change out to permanent door locks leaving only specific doors with construction keying for access by the Contractor to complete the punchlist as acceptable to the Architect.

Touch-up and otherwise repair and restore marred exposed finishes.

Inspection Procedures: Upon receipt of the Contractor's written request for inspection, the Architect/Engineer will either proceed with inspection or advise the Contractor of unfilled prerequisites.

Following the initial inspection, the Architect/Engineer will either prepare the certificate of substantial completion, or will advise the Contractor of work which must be performed before the certificate will be issued. The Architect/Engineer will repeat the inspection one time for those areas determined as incomplete when requested and when assured that the Work has been completed. Contractor shall bear all the costs of the Architect's and Engineer's reinspections at the hourly rates stipulated in the Owner/Architect Agreement.

Results of the completed inspection will form the initial "punchlist" for final acceptance.

PREREQUISITES FOR FINAL ACCEPTANCE:

General: Complete the following before requesting the Architect/Engineer's final inspection for certification of final acceptance, and final payment as required by the General Conditions. List known exceptions, if any, in the request.

Submit the final payment request with final releases and supporting documentation not previously submitted and accepted. Include certificates of insurance for products and completed operations where required.

Submit an updated final statement, accounting for all additional changes to the Contract Sum.

Submit a certified copy of the Architect/Engineer's and local authority(ies)' final punchlist of itemized work to be completed or corrected, signed, dated and notarized by the Contractor and stating that each item has been completed or otherwise resolved for acceptance and has been endorsed and dated by the Architect/Engineer.

Submit consent of surety.

Submit a final liquidated damages settlement statement, acceptable to the Owner.

Submit evidence of final, continuing insurance coverage complying with insurance requirements.

Submit all as-built drawings, record drawings, specifications and shop drawings as required, clearly marked to indicate installed conditions.

Deliver tools, spare parts, extra stock of material and similar physical items to the owner and obtain a written receipt for each. Copy Architect with receipt.

Reinspection Procedure: The Owner's representative or Architect/Engineer will reinspect the Work upon receipt of the Contractor's written notice that the work, including punchlist items resulting from earlier inspections, has been completed, except for these items whose completion has been delayed because of circumstances that are acceptable to the Architect/Engineer.

Upon completion of reinspection, the Architect/Engineer will either prepare a certificate of final acceptance, or will advise the Contractor of work that is incomplete of obligations that have not been fulfilled, but are required for final acceptance.

If necessary, the reinspection procedure will be repeated and such cost as are currently paid the Architect on an hourly basis will be deducted from the Contractor's final payment request to reimburse the Architect for additional services.

RECORD DOCUMENT SUBMITTALS:

General: Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the General Conditions. General submittal requirements are indicated in the various "submittals" sections.

Do not use record documents for construction purposes; protect from deterioration and loss in a secure, fire-resistive location; provide access to record documents for the Architect/Engineer's reference during normal working hours.

Record Drawings: Maintain a record set of blue or black line white-prints of contract drawings and shop drawings in a clean, undamaged condition. Mark-up the set of record documents to show the actual installation where the installed work varies from the work as originally shown. Mark whichever drawing is most capable of showing the actual "field" condition fully and accurately; however, where shop drawings are used for mark-up, record a cross-reference at the corresponding location on the working drawings. Give particular attention to concealed work that would be difficult to measure and record at a later date.

Mark record sets on at least a monthly basis with red erasable pencil and, where feasible, use other colors to distinguish between variations in separate categories of work. Review with architect, engineer and owner's representatives before or at each pay request. The pay request will be delayed until drawings are updated.

Mark-up new information which is known to be important to the Owner (i.e.: underground utilities, electrical circuitry or any concealed work), that is not shown on either contract drawings or shop drawings.

Note related change order numbers where applicable.

Organize record 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.

Additionally, make an electronic copy (scan) in pdf after final review with the architect, engineer and owner.

Record Specifications: Maintain one complete copy of the Project Manual, including specifications and addenda, and one copy of other written construction documents such as change orders and similar modifications issued in printed form during construction. Mark these documents to show substantial variations in the actual work performed in comparison with the text of the specifications and modifications as issued. Give particular attention to substitutions, selection of options and similar information on work where it is concealed or cannot otherwise be readily discerned at a later date by direct observation. Note related record drawing information and product data, where applicable.

Upon completion of the Work, submit record specifications to the Architect/Engineer for the Owner's records.

Miscellaneous Record Submittals: Refer to other sections of these specifications for requirements of miscellaneous record keeping and submittals in connection with the actual performance of the Work. Immediately prior to the date or date of final completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to Architect/Engineer for the Owner's records.

Operations and Maintenance Manuals: Organize operating and maintenance data into suitable sets of manageable size. Bind data into individual binders properly identified and indexed. Bind each set of data in a heavy duty 2 inch, 3 ring, vinyl covered binder, with pocket folders for folded sheet information. Mark the appropriate identification on both front and spine of each binder. Provide three (3) copies with original warranties, guarantees, and manufacturer's instruction booklets/data.

Organize the manuals into sections which correspond to that of the specifications (i.e.: Division 2, 3 and etc.). Subsections for each division shall be further broken into sections as noted below and as approved by the Architect.

- Copies of warranties - manufacturer's and Contractor's/installer's.
- Written review of instruction/training procedures and all manufacturer's operational data
- Emergency instructions
- Cleaning procedures (manufacturer's)
- Inspection procedures
- Recommended "turn-around" cycles
- Spare parts listing
- Wiring diagrams
- All shop drawings and product data

Also include an electronic (scanned) pdf copy, in each manual, of all of the above.

PART 2 - PRODUCTS (Not Applicable)

PART 3 - EXECUTION

CLOSE-OUT PROCEDURES:

General Operating and Maintenance Instructions: Arrange for each installer of operating equipment and other work that requires regular or continuing maintenance, to meet at the site with the owner's personnel to provide necessary basic instruction in the proper operation and maintenance of the entire Work. Where installers are not experienced in the required procedures, include instruction by the manufacturer's representatives. Provide meeting minutes of meetings and submit copies to the Owners and Architect.

As part of this instruction, provide a detailed review of the following items:

- Maintenance manuals
- Record documents
- Spare parts and materials
- Tools
- Lubricants
- Fuels
- Identification systems
- Control sequences
- Hazards
- Cleaning
- Warranties, bonds, maintenance agreements and similar continuing commitments

As part of this instruction for operating equipment, demonstrate the following procedures:

- Emergency operations
- Noise and vibration adjustments
- Safety procedures

- Economy and efficiency adjustments
- Effective energy utilization

FINAL CLEANING:

General: Special cleaning requirements for specific units of Work are included in the appropriate sections of Divisions 2 through 16. General cleaning during the regular progress of the Work is required by the General Conditions and is included under section "Temporary Facilities".

Cleaning: Provide final cleaning of the Work at the time indicated. Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit of work to the condition expected from a normal, commercial building cleaning and maintenance program. Comply with the manufacturer's instructions for operations.

Complete the following cleaning operations before requesting the Architect/Engineer's inspection for certification of substantial completion.

Remove labels which are not required as permanent labels.

Clean transparent materials, including mirrors and glass in doors and windows, to a polished condition. Remove putty and other substances which are noticeable as 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 dust, stains, films and similar noticeable distracting substances. Restore reflective surfaces to their original reflective condition. Leave concrete floors broom clean. Vacuum carpeted surfaces, strip, seal and wax all vinyl flooring using procedures, equipment and products equal to that which the Owners use on their other properties.

Clean the project site, including landscape development areas of rubbish, litter and other foreign substances. Sweep paved areas to a broom clean condition if disturbed during construction; remove stains, spills and other foreign deposits. Rake grounds that are neither paved nor planted, to a smooth even-textured surface.

Clean floor surfaces per Section 01 77 10, Floor Care.

Compliance: Comply with safety standards and governing regulations for cleaning operations. Do not burn waste materials at site. Do not bury debris or excess materials on Owner's property. Do not discharge volatile or other harmful or dangerous materials into drainage systems. Remove waste materials from the site and dispose of in a lawful manner.

Where extra materials of value remaining after completion of associated work have become Owner's property, dispose of these materials to the Owner's best advantage as directed.

END OF SECTION 01 77 00

SECTION 01 77 10 - FLOOR CARE

PART 1 - GENERAL

SCOPE OF WORK:

The Contractor shall provide all personnel, equipment, tools, materials, supplies, chemicals, transportation, supervision, and other items necessary to perform services as defined in this section.

QUALITY CONTROL:

The Contractor shall provide sufficient personnel to perform, supervise, and control the quality of all the work required by this contract.

The Contractor shall insure all employees are capable of demonstrating adequate knowledge of chemicals, tools, equipment, safety procedures, and the techniques based on the duties they perform.

All employees must be trained in the use of Material Safety Data Sheets (MSDS), how to recognize hazards, personal protection, labels as required by the OSHA Hazard Communication Standard, 1910.1200.

The Contractor shall apply the proper floor finish for each type of flooring based on the specific floor surface. The Contractor shall not apply floor finish to floors which are not compatible with the product and floors that have not been cleaned.

TECHNICAL DEFINITIONS:

Professional: Conforming to the technical or ethical standards of a profession. Displaying the conduct, appearance, and qualities that characterize or mark a profession. Possessing skill, experience and competence in a profession.

Floor Coverings: Floor coverings vary and include; Linoleum Vinyl Composition Tile, Porcelain Tile, Ceramic Tile, Terazzo and Carpet.

Floor Maintenance: The Contractor shall scrub all floors (except carpet) and shall seal, finish and burnish all vinyl composition floor coverings.

Dirt: Particles of sand, soil, grit, or pebbles; mud, dust, fuzz, tar, liquid stains, ashes, etc.

Debris: Any articles, or parts thereof, such as paper, gum, candy, lint, stings, cigarette butts, etc.

Dust Mop: Removing dirt and debris from the floor surfaces by use of a dust mop.

Damp Mop: Cleaning floor surfaces after sweeping or dust mopping to pick up any remaining dust or dirt utilizing clean water and a detergent solution.

Stripping: Using a pad, floor machine, and alkaline solution that breaks up and emulsifies finish on the floor, strip away old wax, rinse two or more times with clean water or with a neutralizing agent, leaving the floor clean of any residue.

Scrubbing: Using a pad, floor machine, and a General Purpose Cleaner, clean the Ceramic Tile floors in Restrooms, Locker rooms, Shower rooms, etc. leaving the floor clean of any residue, scuff marks, etc.

Finish (Wax): Applying manufacturer recommended thin coats of non-skid floor wax solution that protects the floor surfaces and leaves a glossy, uniform appearance. Cure time will be that recommended by the manufacturer. Three coats of finish to be applied.

Burnishing: After finish has cured the prescribed manufacturer's time, the floor shall be properly dust mopped and then it shall be spray buffed with floor maintainer with a machine that has speeds of 1500 rpm's or higher, resulting in a high-gloss finish.

Police: To pick up and dispose in dumpster any trash, garbage, dirt or debris that is left behind after the cleaning/floor finishing operation.

SUBMITTALS:

In accordance with Section 01 32 00, Submittals, provide product data, instructions and etc.

PART 2 - EQUIPMENT/TOOLS, MATERIALS/SUPPLIES

Equipment and Tools: The Contractor's equipment shall be of commercial quality and the size and type suitable for accomplishing the various phases of work specified and operate from existing sources of electrical power. All electrical equipment used shall meet all safety requirements of this contract and shall be UL approved. It shall be the responsibility of the Contractor to prevent the operation of equipment which requires power exceeding the capacity of the existing building circuits.

Equipment: The following includes most of the equipment the Contractor will need to comply with the Performance Work Statement.

- Wet/Dry Vacuum
- Scrubber/Buffer. For floor stripping vinyl, quarry tile, and ceramic.
- High Speed Burnisher. 1500 rpm's minimum.

Tools: The following are a representative of some of the tools and supplies the Contractor will need.

- Dust Mops
- Mop Bucket with Wringer
- Wax Applicator
- Water Hoses for janitorial sinks
- Pads for Buffer/Scrubber and Burnisher
- Mops

Supplies: The Contractor will provide a complete floor finish maintenance system including *stripper, GP cleaner, sealer, and finish*. The sealer and finish may be one product combined of the two individual products.

Floor Care System: A complete floor care system for resilient floors. The system must include compatible Stripper/Sealer/Finish/ Cleaner products; NO flashpoint, rinses completely with either hot or cold water, machine scrub, pick up with either wet/dry vacuum or damp mop. Finish shall have a high gloss luster, long wearability, resistant to black heel marks, scuffing, powdering, water spills and is non-skid resistant exceeding ASTM specifications. The finish must be a minimum of 20% solids. Sealer will be compatible with the manufacturer's recommendation for the sealing of resilient flooring and with the use of the supplied finish. Cleaner, finish, stripper and sealer will be in 5 gallon pails.

Manufacturer: The floor care products shall be S.C. Johnson's BRAVO, CAREFREE and/or VECTRA; Lawton's BLAST-OFF, ACCRUSEAL and CLASSIC 25; or Spartin's SQUARE ONE AND ON AN' ON.

PART 3 - EXECUTION

Floor Maintenance Service Required: Strip/Scrub the floor coverings in all buildings and seal, finish and burnish all vinyl composition floor coverings.

For vinyl composition flooring, three (3) finish coats shall be applied followed by spray buffing/burnishing following the methods prescribed by manufacturer. Upon completion, the floor shall have a uniform high gloss (wet look) sheen. The floors shall be free of scuff marks, heel marks, and other stains and discoloration's. All floor maintenance solutions shall be removed from baseboards, furniture, trash receptacles, etc. The Contractor shall dust mop after burnishing so all dust and excess restorer residue is removed. The floors shall be swept/dust mopped before and after it is burnished.

For porcelain and ceramic tile and Terrazzo; the floor shall be properly cleaned and sealed. Sealer shall be product approved by the Architect and owner's maintenance department.

For carpet, vacuum all areas. If necessary, steam vacuum to remove any construction soils which have been embedded into the carpet.

END OF SECTION 01 77 10

SECTION 02 28 00 - TERMITE CONTROL

PART 1 - GENERAL

SCOPE OF WORK:

Provide soil treatment for termite control as herein specified.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, submit copies of applicator's license, product data and certification for the work of this section.

QUALITY ASSURANCE:

In addition to requirements of these specifications, comply with manufacturer's instructions and recommendations for work, including preparation of substrate and application.

Engage a license professional pest control operator, for application of soil treatment solution.

Use only termiticides which bear a Federal registration number of the U.S. Environmental Protection Agency.

JOB CONDITIONS:

Restrictions: Do not apply soil treatment solution until excavating, filling and grading operations are completed, except as otherwise required in construction operations.

To insure penetration, do not apply soil treatment to frozen or excessively wet soils or during inclement weather. Comply with handling and application instructions of soil toxicant manufacturer.

SPECIFIC PRODUCT WARRANTY:

Furnish written warranty certifying that applied soil termiticide treatment will prevent infestation of subterranean termites and, that if subterranean termite activity is discovered during warranty period, Contractor will re-treat soil and repair or replace damage caused by termite infestation to maximum value of \$100,000.00.

Provide warranty for a period of 5 years from date of treatment, including yearly maintenance and inspections at no additional cost.

PART 2 - PRODUCTS

SOIL TREATMENT SOLUTION:

Use emulsible concentrate termiticide for dilution with water, specially formulated to prevent termite infestation. Provide a working solution of one of the following (or equal) chemical elements and concentrations.

Chloropyrifos, ("Dursban TC"); 1.0% in water emulsion.

Permethrin, ("Dragnet", "Torpedo"); 0.5% in water emulsion.

Other solutions may be used as recommended by Applicator if acceptable by EPA and to local governing authorities and to Architect. Use only soil treatment solutions which are not injurious to planting.

PART 3 - EXECUTION

GENERAL:

Advise Owner's representative of schedule for application of solution. A minimum of 48 hours notice will be required. Do not proceed without Owner's representative present to observe; otherwise, a second application will be required.

APPLICATION:

Surface Preparation: Remove foreign matter which could decrease effectiveness of treatment on areas to be treated. Loosen, rake, and level soil to be treated, except previously compacted areas under slabs and foundations. Termiticide may be applied before placement of compacted fill underslabs, if recommended by manufacturer.

Application Rates: Apply soil treatment solution as follows:

Under slab-on-grade, including all building structures, adjacent patios, walks and stoops, treat soil before concrete slabs are placed using the following rates of application as a minimum:

Apply one gallon of chemical solution per 10 sq. ft. as an overall treatment under slab and attached slab areas where fill is soil or unwashed gravel. Apply 1 1/2 gallons per 10 sq. ft. of chemical solution to areas where fill is washed gravel or other coarse absorbent material.

Apply 4 gallons of chemical solution per 10 lin. ft. to soil critical areas under slabs, including entire inside perimeter inside of foundation walls, along both sides of interior partition walls which penetrate slab, around plumbing pipes and electric conduit penetrating slab, and around interior column footers.

Apply 4 gallons of chemical solution per 10 lin. ft. of trench, for each foot of depth from grade to footing, along outside edge of building. Mix chemical solution with the soil as it is being replaced in trench.

At hollow masonry foundations or grade beams, treat voids at rate of 2 gal. per 10 lin. ft., poured directly into the hollow spaces.

At expansion joints, control joints, and areas where slabs will be penetrated, apply at rate of 4 gals. per 10 lin. ft. of penetration.

Reapply soil treatment solution to areas disturbed by subsequent excavation, landscape grading, or other construction activities following application.

END OF SECTION 02 28 00

SECTION 02 41 00 – DEMOLITION

PART 1 – GENERAL

DESCRIPTION OF THE WORK:

The work of this project includes the removal of materials currently a part of an existing site and building; and, the replacement with new or similar materials. Demolition includes but is not solely limited to the following items. The purpose of this Section is to communicate the general scope and intent of material removal.

All materials which are removed from the building and site shall be taken from the project site on at least a monthly basis and disposed of off-site in a legal manner.

Exterior – Site

- Portions of existing concrete sidewalk are to be removed and replaced.
- Existing healthy palm trees are to be relocated on site as shown on design drawings.
- Disturbed areas of the exterior site shall be leveled to receive new grass sod.
- Portions of the existing asphalt on-site parking may be cut and removed to adjust for positioning as shown on the architectural site plan.

Exterior – Building

- Existing building roof materials shall be removed down to the roof deck, cleaned and made ready to receive new roofing materials. Existing roof deck with holes or showing deterioration as determined by the Architect shall be replaced with new material using a nailing pattern to meet current code requirements.
- Existing soffit materials are to be removed in order for new soffit materials to be installed.
- Existing exterior doors and windows shall be removed where shown on the drawings. The remaining opening shall be cleaned to receive new materials as detailed.
- The existing exterior wall is stucco. Where equipment and windows are removed and not replaced with similar, the openings shall be cleaned to receive new masonry materials. The existing stucco finish is meant to remain and be repainted. The contractor shall repair all wall blemishes to make ready for the finish painting process.

Interior – Building

- All interior doors, windows and frames are to be removed. In some case the remaining openings shall be cleaned and prepared to receive new materials.
- All interior plumbing fixtures are to be removed in accordance with directions on the drawings. In some cases, the remaining walls and floors are to be repaired and cleaned to receive new materials.
- All interior electrical work and fixtures are to be removed in accordance with electrical plans.
- All existing built-in cabinetry and shelving is to be removed.
- Several existing interior masonry and non-masonry walls are to be removed; and, adjacent surfaces-to-remain cleaned, patched and repaired to receive new materials. In some instances

shoring may be required to carry roof loads temporarily during construction, see structural drawings.

- All existing flooring is to be removed and the floors cleaned to receive new materials.
- Existing hard ceilings are to remain. Where existing ceilings are exposed to view in the new plan, they shall be repaired and refinished to appear to be uniform in color and texture.
- All existing ceramic tile shall be removed from existing walls and doors that are scheduled to remain. The surfaces shall be cleaned and repaired to receive new materials.

ASBESTOS CONTAINING MATERIALS:

A Report exists and is available to the contractor describing areas in the structure that were sampled for asbestos. The Report identifies a few locations where the material does exist. The extent of materials containing asbestos is minor. In most cases, it is the intent of this scope of the work for this project to avoid disturbance of the material and abandon, cover or encapsulate the material.

If it is the contractor's opinion that some asbestos containing material needs to be removed, the contractor shall accept the responsibility for removal and disposal of the material in accordance with current laws. Furthermore, the cost for abatement shall be in the contractor's bid price for this work.

PART 2 – PRODUCTS/MATERIALS

(not applicable)

PART 3 – EXECUTION

All debris shall be removed from the project site on a regular basis not to exceed one month's duration and disposed of in a legal manner.

All hazardous materials that are disturbed, detached and removed from the building and site shall be done in accordance with current laws; and, disposed of in a legal manner.

END OF SECTION 02 41 00

SECTION 03 30 00 - CAST-IN-PLACE CONCRETE

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:
 - 1. Footings.
 - 2. Slabs-on-grade.
 - 3. Building frame members.
 - 4. Building walls.

1.3 DEFINITIONS

- A. Cementitious Materials: Portland cement alone or in combination with one or more of the following: blended hydraulic cement, fly ash and other pozzolans, ground granulated blast-furnace slag, and silica fume; 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. Formwork Shop Drawings: Prepared by or under the supervision of a qualified professional engineer detailing fabrication, assembly, and support of formwork.
 - 1. Shoring and Reshoring: Indicate proposed schedule and sequence of stripping formwork, shoring removal, and reshoring installation and removal.
- E. 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 Installer and 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. Fiber reinforcement.
 - 6. Waterstops.
 - 7. Curing compounds.
 - 8. Floor and slab treatments.
 - 9. Bonding agents.
 - 10. Adhesives.
 - 11. Vapor retarders.
 - 12. Semirigid joint filler.
 - 13. Joint-filler strips.
 - 14. Repair materials.
- D. Minutes of preinstallation 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. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from single source, and obtain admixtures from single source from single manufacturer.
- D. Welding Qualifications: Qualify procedures and personnel according to AWS D1.4/D 1.4M, "Structural Welding Code - Reinforcing Steel."
- E. 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."
- F. Preinstallation 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. Ready-mix concrete manufacturer.
 - c. Concrete subcontractor.
 - d. 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, semirigid joint fillers, forms and form removal limitations, shoring and reshoring procedures, 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.

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, and as follows:
 - a. High-density overlay, Class 1 or better.
 - b. Medium-density overlay, Class 1 or better; mill-release agent treated and edge sealed.
 - c. Structural 1, B-B or better; mill oiled and edge sealed.
 - d. B-B (Concrete Form), Class 1 or better; mill oiled and edge sealed.
- B. Rough-Formed Finished Concrete: Plywood, lumber, metal, or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.
- C. Chamfer Strips: Wood, metal, PVC, or rubber strips, 3/4 by 3/4 inch , minimum.
- D. Rustication Strips: Wood, metal, PVC, or rubber strips, kerfed for ease of form removal.
- E. 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.
- F. 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 to the plane of exposed concrete surface.
 2. Furnish ties that, when removed, will leave holes no larger than 1 inch 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 preconsumer recycled content not less than 25 percent.
- B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60 , deformed.

- C. Low-Alloy-Steel Reinforcing Bars: ASTM A 706/A 706M, deformed.

2.3 REINFORCEMENT ACCESSORIES

- A. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:
 - 1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.
 - 2. For epoxy-coated reinforcement, use epoxy-coated or other dielectric-polymer-coated wire bar supports.
 - 3. For zinc-coated reinforcement, use galvanized wire or dielectric-polymer-coated wire bar supports.

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, gray. Supplement with the following:
 - a. Fly Ash: ASTM C 618, Class F or C.
 - b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.
- 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: 3/4 inch nominal.
 - 2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.
- C. Water: ASTM C 94/C 94M and potable.

2.5 ADMIXTURES

- A. 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.

2.6 FIBER REINFORCEMENT

- A. Synthetic Macro-Fiber: Polyolefin macro-fibers engineered and designed for use in concrete, complying with ASTM C 1116/C 1116M, Type III, 1 to 2-1/4 inches long.
 - 1. Products: Subject to compliance with requirements, provide the following:
 - a. Grace Construction Products, W. R. Grace & Co.; Strux 90/40.
 - b. Propex Concrete Systems Corp.; Fibermesh 650.

2.7 WATERSTOPS

- A. Flexible Rubber Waterstops: CE CRD-C 513, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 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. Greenstreak.
 - b. Williams Products, Inc.
 - 2. Profile: Ribbed with center bulb.
 - 3. Dimensions: 6 inches by 3/8 inch thick; nontapered.
- B. Flexible PVC Waterstops: CE CRD-C 572, with factory-installed metal eyelets, for embedding in concrete to prevent passage of fluids through joints. Factory fabricate corners, intersections, and directional changes.
 - 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. BoMetals, Inc.
 - b. Greenstreak.
 - c. Paul Murphy Plastics Company.
 - d. Vinylex Corp.
 - 2. Profile: Ribbed with center bulb.
 - 3. Dimensions: 6 inches by 3/8 inch thick; nontapered.

2.8 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, provide the following:
 - a. Fortifiber Building Systems Group; Moistop Ultra 15.
 - b. Meadows, W. R., Inc.; Perminator 15 mil.
 - c. Raven Industries Inc.; Vapor Block 15.
 - d. Reef Industries, Inc.; Griffolyn 15 mil Green.
 - 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 sieve and 0 to 5 percent passing a No. 8 sieve.
- C. Fine-Graded Granular Material: Clean mixture of crushed stone, crushed gravel, and manufactured or natural sand; ASTM D 448, Size 10, with 100 percent passing a 3/8-inch sieve, 10 to 30 percent passing a No. 100 sieve, and at least 5 percent passing No. 200 sieve; complying with deleterious substance limits of ASTM C 33 for fine aggregates.

2.9 CURING MATERIALS

- A. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.
- B. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.
- C. Water: Potable.

- D. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, dissipating.
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. Anti-Hydro International, Inc.; AH Curing Compound #2 DR WB.
 - b. BASF Construction Chemicals - Building Systems; Kure 200.
 - c. ChemMasters; Safe-Cure Clear.
 - d. Conspec by Dayton Superior; W.B. Resin Cure.
 - e. Dayton Superior Corporation; Day-Chem Rez Cure (J-11-W).
 - f. Edoco by Dayton Superior; Res X Cure WB.
 - g. Euclid Chemical Company (The), an RPM company; Kurez W VOX; TAMMSCURE WB 30C.
 - h. Kaufman Products, Inc.; Thinfilm 420.
 - i. Lambert Corporation; AQUA KURE - CLEAR.
 - j. L&M Construction Chemicals, Inc.; L&M Cure R.
 - k. Meadows, W. R., Inc.; 1100-CLEAR.
 - l. Nox-Crete Products Group; Resin Cure E.
 - m. Right Pointe; Clear Water Resin.
 - n. SpecChem, LLC; Spec Rez Clear.
 - o. Symons by Dayton Superior; Resi-Chem Clear.
 - p. TK Products, Division of Sierra Corporation; TK-2519 DC WB.
 - q. Vexcon Chemicals, Inc.; Certi-Vex Enviocure 100.

2.10 RELATED MATERIALS

- A. Expansion- and Isolation-Joint-Filler Strips: ASTM D 1751, asphalt-saturated cellulosic fiber or ASTM D 1752, cork or self-expanding cork.
- B. Semirigid Joint Filler: Two-component, semirigid, 100 percent solids, epoxy resin with a Type A shore durometer hardness of 80 per ASTM D 2240.
- C. Bonding Agent: ASTM C 1059/C 1059M, Type II, non-redispersible, acrylic emulsion or styrene butadiene.
- D. Epoxy Bonding Adhesive: ASTM C 881, two-component epoxy resin, capable of humid curing and bonding to damp surfaces, of class suitable for application temperature and of grade to suit requirements, and as follows:
 1. Types IV and V, load bearing, for bonding hardened or freshly mixed concrete to hardened concrete.
- E. Dovetail Anchor Slots: Hot-dip galvanized-steel sheet, not less than 0.034 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.11 REPAIR MATERIALS

- A. Repair Underlayment: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/8 inch and that can be feathered at edges to 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 underlayment manufacturer recommended for substrate, conditions, and application.

3. Aggregate: Well-graded, washed gravel, 1/8 to 1/4 inch or coarse sand as recommended by underlayment manufacturer.
 4. Compressive Strength: Not less than 4000 psi at 28 days when tested according to ASTM C 109/C 109M.
- B. Repair Overlay: Cement-based, polymer-modified, self-leveling product that can be applied in thicknesses from 1/4 inch and that can be filled in over a scarified surface to 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 or coarse sand as recommended by topping manufacturer.
 4. Compressive Strength: Not less than 5000 psi at 28 days when tested according to ASTM C 109/C 109M.

2.12 CONCRETE MIXTURES, GENERAL

- A. Cementitious Materials: Limit percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25 percent.
 2. Combined Fly Ash and Pozzolan: 25 percent.
 3. Ground Granulated Blast-Furnace Slag: 50 percent.
 4. Combined Fly Ash or Pozzolan and Ground Granulated Blast-Furnace Slag: 50 percent portland cement minimum, with fly ash or pozzolan not exceeding 25 percent.
- B. Limit water-soluble, chloride-ion content in hardened concrete to 0.15 percent by weight of cement.
- C. 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.
 4. Use corrosion-inhibiting admixture in concrete mixtures where indicated.
- D. Color Pigment: Add color pigment to concrete mixture according to manufacturer's written instructions and to result in hardened concrete color consistent with approved mockup.

2.13 CONCRETE MIXTURES FOR BUILDING ELEMENTS

- A. Footings: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: As indicated.
 2. Maximum Water-Cementitious Materials Ratio: As indicated.
 3. Slump Limit: As indicated, before adding high-range water-reducing admixture or plasticizing admixture.
- B. Slabs-on-Grade: Proportion normal-weight concrete mixture as follows:
1. Minimum Compressive Strength: As indicated.

2. Maximum Water-Cementitious Materials Ratio: As indicated.
3. Slump Limit: As indicated, before adding high-range water-reducing admixture or plasticizing admixture.
4. Air Content: Do not allow air content of trowel-finished floors to exceed 3 percent.
5. Synthetic Macro-Fiber: Uniformly disperse in concrete mixture at manufacturer's recommended rate, but not less than 3.0 lb/cu. yd.

C. Building Frame Members: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated.
2. Maximum Water-Cementitious Materials Ratio: As indicated.
3. Slump Limit: As indicated, before adding high-range water-reducing admixture or plasticizing admixture.

D. Building Walls: Proportion normal-weight concrete mixture as follows:

1. Minimum Compressive Strength: As indicated.
2. Maximum Water-Cementitious Materials Ratio: As indicated.
3. Slump Limit: As indicated, before adding high-range water-reducing admixture or plasticizing admixture.

2.14 FABRICATING REINFORCEMENT

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

2.15 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 , reduce mixing and delivery time from 1-1/2 hours to 75 minutes; when air temperature is above 90 deg F , reduce mixing and delivery time to 60 minutes.

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 for smooth-formed finished surfaces.
 2. Class B, 1/4 inch 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.
- L. Coat contact surfaces of forms with form-release agent, according to manufacturer's written instructions, before placing reinforcement.

3.2 EMBEDDED ITEMS

- A. Place and secure anchorage devices and other embedded items required for adjoining work that is attached to or supported by cast-in-place concrete. Use setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
1. Install anchor rods, accurately located, to elevations required and complying with tolerances in Section 7.5 of AISC's "Code of Standard Practice for Steel Buildings and Bridges."
 2. Install dovetail anchor slots in concrete structures as indicated.

3.3 REMOVING AND REUSING FORMS

- A. General: Formwork for sides of beams, walls, columns, and similar parts of the Work that does not support weight of concrete may be removed after cumulatively curing at not less than 50 deg F for 24 hours after placing concrete. Concrete has to be hard enough to not be damaged by form-removal operations and curing and protection operations need to be maintained.
1. Leave formwork for beam soffits, joists, slabs, and other structural elements that supports weight of concrete in place until concrete has achieved at least 70 percent of its 28-day design compressive strength.
 2. Remove forms only if shores have been arranged to permit removal of forms without loosening or disturbing shores.
- B. Clean and repair surfaces of forms to be reused in the Work. Split, frayed, delaminated, or otherwise damaged form-facing material will not be acceptable for exposed surfaces. Apply new form-release agent.

- C. When forms are reused, clean surfaces, remove fins and laitance, and tighten to close joints. Align and secure joints to avoid offsets. Do not use patched forms for exposed concrete surfaces unless approved by Architect.

3.4 SHORES AND RESHORES

- A. Comply with ACI 318 and ACI 301 for design, installation, and removal of shoring and reshoring.
 - 1. Do not remove shoring or reshoring until measurement of slab tolerances is complete.
- B. In multistory construction, extend shoring or reshoring over a sufficient number of stories to distribute loads in such a manner that no floor or member will be excessively loaded or will induce tensile stress in concrete members without sufficient steel reinforcement.
- C. Plan sequence of removal of shores and reshore to avoid damage to concrete. Locate and provide adequate reshoring to support construction without excessive stress or deflection.

3.5 VAPOR RETARDERS

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

3.6 STEEL REINFORCEMENT

- A. General: Comply with CRSI's "Manual of Standard Practice" for placing reinforcement.
 - 1. Do not cut or puncture vapor retarder. Repair damage and reseal vapor retarder before placing concrete.
- B. Clean reinforcement of loose rust and mill scale, earth, ice, and other foreign materials that would reduce bond to concrete.
- C. Accurately position, support, and secure reinforcement against displacement. Locate and support reinforcement with bar supports to maintain minimum concrete cover. Do not tack weld crossing reinforcing bars.
 - 1. Weld reinforcing bars according to AWS D1.4/D 1.4M, where indicated.
- D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

3.7 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 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 epoxy-bonding adhesive at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.
- C. Contraction Joints in Slabs-on-Grade: Form weakened-plane contraction joints, sectioning concrete into areas as indicated. Construct contraction joints for a depth equal to at least one-fourth of concrete thickness as follows:
1. Sawed Joints: Form contraction joints with power saws equipped with shatterproof abrasive or diamond-rimmed blades. Cut 1/8-inch- wide joints into concrete when cutting action will not tear, abrade, or otherwise damage surface and before concrete develops random contraction cracks.
- D. Isolation Joints in Slabs-on-Grade: After removing formwork, install joint-filler strips at slab junctions with vertical surfaces, such as column pedestals, foundation walls, grade beams, and other locations, as indicated.
1. Extend joint-filler strips full width and depth of joint, terminating flush with finished concrete surface unless otherwise indicated.
 2. Terminate full-width joint-filler strips not less than 1/2 inch or more than 1 inch below finished concrete surface where joint sealants, specified in Division 07 Section "Joint Sealants," are indicated.
 3. Install joint-filler strips in lengths as long as practicable. Where more than one length is required, lace or clip sections together.

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, with approval from the Architect and subject to limitations of ACI 301.
1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.
 2. Concrete mix design submitted must indicate allowable amount of water to be added at Project site, and must indicate the required mixing time and drum speed after adding water prior to discharging concrete from truck.
- D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
 2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
 3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that

have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

- E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
 - 1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
 - 2. Maintain reinforcement in position on chairs during concrete placement.
 - 3. Screed slab surfaces with a straightedge and strike off to correct elevations.
 - 4. Slope surfaces uniformly to drains where required.
 - 5. Begin initial floating using bull floats or darbies to form a uniform and open-textured surface plane, before excess bleedwater appears on the surface. Do not further disturb slab surfaces before starting finishing operations.
- F. Cold-Weather Placement: Comply with ACI 306.1 and as follows. Protect concrete work from physical damage or reduced strength that could be caused by frost, freezing actions, or low temperatures.
 - 1. When average high and low temperature is expected to fall below 40 deg F for three successive days, maintain delivered concrete mixture temperature within the temperature range required by ACI 301.
 - 2. Do not use frozen materials or materials containing ice or snow. Do not place concrete on frozen subgrade or on subgrade containing frozen materials.
 - 3. Do not use calcium chloride, salt, or other materials containing antifreeze agents or chemical accelerators unless otherwise specified and approved in mixture designs.
- G. Hot-Weather Placement: Comply with ACI 301 and as follows:
 - 1. Maintain concrete temperature below 90 deg F at time of placement. Chilled mixing water or chopped ice may be used to control temperature, provided water equivalent of ice is calculated to total amount of mixing water. 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. Rough-Formed Finish: As-cast concrete texture imparted by form-facing material with tie holes and defects repaired and patched. Remove fins and other projections that exceed specified limits on formed-surface irregularities.
 - 1. Apply to concrete surfaces not exposed to public view.
- B. 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 receive a rubbed finish, or to be covered with a coating or covering material applied directly to concrete.
- C. Rubbed Finish: Apply the following to smooth-formed finished as-cast concrete where indicated:
 - 1. Smooth-Rubbed Finish: Not later than one day after form removal, moisten concrete surfaces and rub with carborundum brick or another abrasive until producing a uniform color and texture. Do not apply cement grout other than that created by the rubbing process.

- D. Related Unformed Surfaces: At tops of walls, horizontal offsets, and similar unformed surfaces adjacent to formed surfaces, strike off smooth and finish with a texture matching adjacent formed surfaces. Continue final surface treatment of formed surfaces uniformly across adjacent unformed surfaces unless otherwise indicated.

3.10 FINISHING FLOORS AND SLABS

- A. General: Comply with ACI 302.1R recommendations for screeding, restraighening, and finishing operations for concrete surfaces. Do not wet concrete surfaces.
- B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in one direction.
 - 1. Apply scratch finish to surfaces indicated.
- C. Float Finish: Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Restraighten, cut down high spots, and fill low spots. Repeat float passes and restraighening until surface is left with a uniform, smooth, granular texture.
 - 1. Apply float finish to surfaces indicated to receive trowel finish, or to be covered with fluid-applied or sheet waterproofing, built-up or membrane roofing, or sand-bed terrazzo.
- D. Trowel Finish: After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and restraighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.
 - 1. Apply a trowel finish to surfaces indicated 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 surfaces to the following tolerances, according to ASTM E 1155 , for a randomly trafficked floor surface:
 - a. Specified overall values of flatness, F(F) 35; and of levelness, F(L) 25; with minimum local values of flatness, F(F) 24; and of levelness, F(L) 17; for slabs-on-grade.
- E. Trowel and Fine-Broom Finish: Apply a first trowel finish to surfaces indicated 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.
- F. 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.
- D. Steel Pan Stairs: Provide concrete fill for steel pan stair treads, landings, and associated items. Cast-in inserts and accessories as shown on Drawings. Screed, tamp, and trowel finish concrete surfaces.

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. 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.
- C. Cure concrete according to ACI 308.1, by one or a combination of the following methods:
 - 1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
 - a. Water.
 - b. Continuous water-fog spray.
 - c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.
 - 2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches , and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape.
 - a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
 - b. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive penetrating liquid floor treatments.
 - c. Cure concrete surfaces to receive floor coverings with either a moisture-retaining cover or a curing compound that the manufacturer certifies will not interfere with bonding of floor covering used on Project.
 - 3. Curing Compound: Apply uniformly in continuous operation by power spray or roller according to manufacturer's written instructions. Recoat areas subjected to heavy rainfall within three hours after initial application. Maintain continuity of coating and repair damage during curing period.
 - a. Removal: After curing period has elapsed, remove curing compound without damaging concrete surfaces by method recommended by curing compound manufacturer unless manufacturer certifies curing compound will not interfere with bonding of floor covering used on Project.

3.13 JOINT FILLING

- A. Prepare, clean, and install joint filler according to manufacturer's written instructions.
 - 1. Defer joint filling until concrete has aged at least one month(s). Do not fill joints until construction traffic has permanently ceased.
- B. Remove dirt, debris, saw cuttings, curing compounds, and sealers from joints; leave contact faces of joint clean and dry.
- C. Install semirigid joint filler full depth in saw-cut joints and at least 2 inches deep in formed joints. Overfill joint and trim joint filler flush with top of joint after hardening.

3.14 CONCRETE SURFACE REPAIRS

- A. Defective Concrete: Repair and patch defective areas when approved by Architect. Remove and replace concrete that cannot be repaired and patched to Architect's approval.
- B. Patching Mortar: Mix dry-pack patching mortar, consisting of one part portland cement to two and one-half parts fine aggregate passing a No. 16 sieve, using only enough water for handling and placing.
- C. Repairing Formed Surfaces: Surface defects include color and texture irregularities, cracks, spalls, air bubbles, honeycombs, rock pockets, fins and other projections on the surface, and stains and other discolorations that cannot be removed by cleaning.
 - 1. Immediately after form removal, cut out honeycombs, rock pockets, and voids more than 1/2 inch in any dimension to solid concrete. Limit cut depth to 3/4 inch. Make edges of cuts perpendicular to concrete surface. Clean, dampen with water, and brush-coat holes and voids with bonding agent. Fill and compact with patching mortar before bonding agent has dried. Fill form-tie voids with patching mortar or cone plugs secured in place with bonding agent.
 - 2. Repair defects on surfaces exposed to view by blending white portland cement and standard portland cement so that, when dry, patching mortar will match surrounding color. Patch a test area at inconspicuous locations to verify mixture and color match before proceeding with patching. Compact mortar in place and strike off slightly higher than surrounding surface.
 - 3. Repair defects on concealed formed surfaces that affect concrete's durability and structural performance as determined by Architect.
- D. Repairing Unformed Surfaces: Test unformed surfaces, such as floors and slabs, for finish and verify surface tolerances specified for each surface. Correct low and high areas. Test surfaces sloped to drain for trueness of slope and smoothness; use a sloped template.
 - 1. Repair finished surfaces containing defects. Surface defects include spalls, popouts, honeycombs, rock pockets, crazing and cracks in excess of 0.01 inch wide or that penetrate to reinforcement or completely through unreinforced sections regardless of width, and other objectionable conditions.
 - 2. After concrete has cured at least 14 days, correct high areas by grinding.
 - 3. Correct localized low areas during or immediately after completing surface finishing operations by cutting out low areas and replacing with patching mortar. Finish repaired areas to blend into adjacent concrete.
 - 4. Correct other low areas scheduled to receive floor coverings with a repair underlayment. Prepare, mix, and apply repair underlayment and primer according to manufacturer's written instructions to produce a smooth, uniform, plane, and level surface. Feather edges to match adjacent floor elevations.
 - 5. Correct other low areas scheduled to remain exposed with a repair topping. Cut out low areas to ensure a minimum repair topping depth of 1/4 inch to match adjacent floor elevations. Prepare, mix, and apply repair topping and primer according to

manufacturer's written instructions to produce a smooth, uniform, plane, and level surface.

6. Repair defective areas, except random cracks and single holes 1 inch or less in diameter, by cutting out and replacing with fresh concrete. Remove defective areas with clean, square cuts and expose steel reinforcement with at least a 3/4-inch clearance all around. Dampen concrete surfaces in contact with patching concrete and apply bonding agent. Mix patching concrete of same materials and mixture as original concrete except without coarse aggregate. Place, compact, and finish to blend with adjacent finished concrete. Cure in same manner as adjacent concrete.
 7. Repair random cracks and single holes 1 inch or less in diameter with patching mortar. Groove top of cracks and cut out holes to sound concrete and clean off dust, dirt, and loose particles. Dampen cleaned concrete surfaces and apply bonding agent. Place patching mortar before bonding agent has dried. Compact patching mortar and finish to match adjacent concrete. Keep patched area continuously moist for at least 72 hours.
- E. Perform structural repairs of concrete, subject to Architect's approval, using epoxy adhesive and patching mortar.
- F. Repair materials and installation not specified above may be used, subject to Architect's approval.

3.15 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage a qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.
- B. Inspections:
1. Steel reinforcement placement.
 2. Steel reinforcement welding.
 3. Headed bolts and studs.
 4. Verification of use of required design mixture.
 5. Concrete placement, including conveying and depositing.
 6. Curing procedures and maintenance of curing temperature.
 7. Verification of concrete strength before removal of shores and forms from beams and slabs.
- C. 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. , but less than 25 cu. yd. , plus one set for each additional 50 cu. yd. or fraction thereof.
 2. Testing Frequency: Obtain at least one composite sample for each 100 cu. yd. 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 and below and when 80 deg F and above, and one test for each composite sample.

6. 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.
 7. 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. 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.
 8. 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 .
 9. 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.
 10. 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.
 11. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.
 12. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.
- D. Measure floor and slab flatness and levelness according to ASTM E 1155 within 48 hours of finishing.

END OF SECTION 03 30 00

SECTION 04 22 00 - CONCRETE UNIT MASONRY

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. Concrete masonry units.
 - 2. Mortar and grout.
 - 3. Steel reinforcing bars.
 - 4. Masonry joint reinforcement.
 - 5. Ties and anchors.
 - 6. Miscellaneous masonry accessories.
- B. Related Sections:
 - 1. Division 03 Section "Cast-in-Place Concrete" for installing dovetail slots for masonry anchors.
 - 2. Division 05 Section "Structural Steel Framing" for installing anchor sections of adjustable masonry anchors for connecting to structural-steel frame.

1.3 DEFINITIONS

- A. CMU(s): Concrete masonry unit(s).
- B. Reinforced Masonry: Masonry containing reinforcing steel in grouted cells.

1.4 PRECONSTRUCTION TESTING

- A. Preconstruction Testing Service: Owner will engage a qualified independent testing agency to perform preconstruction testing indicated below. Retesting of materials that fail to comply with specified requirements shall be done at Contractor's expense.
 - 1. Mortar Test (Property Specification): For each mix required, according to ASTM C 109/C 109M for compressive strength.
 - 2. Mortar Test (Property Specification): For each mix required, according to ASTM C 780 for compressive strength.
 - 3. Grout Test (Compressive Strength): For each mix required, according to ASTM C 1019.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: For the following:
 - 1. Masonry Units: Show sizes, profiles, coursing, and locations of special shapes.

2. Reinforcing Steel: Detail bending and placement of unit masonry reinforcing bars. Comply with ACI 315, "Details and Detailing of Concrete Reinforcement." Show elevations of reinforced walls.

1.6 INFORMATIONAL SUBMITTALS

- A. List of Materials Used in Constructing Mockups: List generic product names together with manufacturers, manufacturers' product names, model numbers, lot numbers, batch numbers, source of supply, and other information as required to identify materials used. Include mix proportions for mortar and grout and source of aggregates.
 1. Submittal is for information only. Neither receipt of list nor approval of mockup constitutes approval of deviations from the Contract Documents unless such deviations are specifically brought to the attention of Architect and approved in writing.
- B. Qualification Data: For testing agency.
- C. Material Certificates: For each type and size of the following:
 1. Masonry units.
 - a. Include data on material properties.
 2. Cementitious materials. Include brand, type, and name of manufacturer.
 3. Preblended, dry mortar mixes. Include description of type and proportions of ingredients.
 4. Grout mixes. Include description of type and proportions of ingredients.
 5. Reinforcing bars.
 6. Joint reinforcement.
 7. Anchors, ties, and metal accessories.
- D. Mix Designs: For each type of mortar and grout. Include description of type and proportions of ingredients.
 1. 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.
 2. Include test reports, according to ASTM C 1019, for grout mixes required to comply with compressive strength requirement.
- E. Cold-Weather and Hot-Weather Procedures: Detailed description of methods, materials, and equipment to be used to comply with requirements.

1.7 QUALITY ASSURANCE

- A. Testing Agency Qualifications: Qualified according to ASTM C 1093 for testing indicated.
- B. Source Limitations 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 single source from single manufacturer for each product required.
- C. Source Limitations for Mortar Materials: Obtain mortar ingredients of a uniform quality, including color for exposed masonry, from single manufacturer for each cementitious component and from single source or producer for each aggregate.
- D. Masonry Standard: Comply with ACI 530.1/ASCE 6/TMS 602 unless modified by requirements in the Contract Documents.

- E. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store masonry units on elevated platforms in a dry location. If units are not stored in an enclosed location, cover tops and sides of stacks with waterproof sheeting, securely tied. If units become wet, do not install until they are dry.
- B. Store cementitious materials on elevated platforms, under cover, and in a dry location. Do not use cementitious materials that have become damp.
- C. Store aggregates where grading and other required characteristics can be maintained and contamination avoided.
- D. Deliver preblended, dry mortar mix in moisture-resistant containers designed for use with dispensing silos. Store preblended, dry mortar mix in delivery containers on elevated platforms, under cover, and in a dry location or in covered weatherproof dispensing silos.
- E. Store masonry accessories, including metal items, to prevent corrosion and accumulation of dirt and oil.

1.9 PROJECT CONDITIONS

- A. Protection of Masonry: During construction, 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 down both sides of walls and hold cover securely in place.
- B. Do not apply uniform floor or roof loads for at least 12 hours and concentrated loads for at least three days after building masonry walls or columns.
- C. Stain Prevention: Prevent grout, mortar, and soil from staining the face of masonry to be left exposed or painted. Immediately remove grout, mortar, and soil that come in contact with such masonry.
 - 1. Protect base of walls from rain-splashed mud and from mortar splatter by spreading coverings on ground and over wall surface.
 - 2. Protect sills, ledges, and projections from mortar droppings.
 - 3. Protect surfaces of window and door frames, as well as similar products with painted and integral finishes, from mortar droppings.
 - 4. Turn scaffold boards near the wall on edge at the end of each day to prevent rain from splashing mortar and dirt onto completed masonry.
- D. Cold-Weather Requirements: Do not use frozen materials or materials mixed or coated with ice or frost. Do not build on frozen substrates. Remove and replace unit masonry damaged by frost or by freezing conditions. Comply with cold-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.
 - 1. Cold-Weather Cleaning: Use liquid cleaning methods only when air temperature is 40 deg F and higher and will remain so until masonry has dried, but not less than 7 days after completing cleaning.

- E. Hot-Weather Requirements: Comply with hot-weather construction requirements contained in ACI 530.1/ASCE 6/TMS 602.

PART 2 - PRODUCTS

2.1 MASONRY UNITS, GENERAL

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

2.2 CONCRETE MASONRY UNITS

- A. Shapes: Provide shapes indicated and as follows, with exposed surfaces matching exposed faces of adjacent units unless otherwise indicated.
 - 1. Provide special shapes for lintels, corners, jambs, sashes, movement joints, headers, bonding, and other special conditions.
 - 2. Provide square-edged units for outside corners unless otherwise indicated.
 - 3. Provide bullnose units for outside corners of exposed masonry in inmate areas.
- B. CMUs: ASTM C 90.
 - 1. Unit Compressive Strength: Provide units with minimum average net-area compressive strength of 2150 psi.
 - 2. Density Classification: Normal weight.
 - 3. Size (Width): Manufactured to dimensions 3/8 inch less than nominal dimensions.
 - 4. Exposed Faces: Provide color and texture matching the range represented by Architect's sample.
 - 5. Faces to Receive Plaster: Where units are indicated to receive a direct application of plaster, provide textured-face units made with gap-graded aggregates.

2.3 CONCRETE LINTELS

- A. General: Provide one of the following:
- B. 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 CMUs.
- C. Concrete Lintels: Precast or formed-in-place concrete lintels complying with requirements in Division 03 Section "Cast-in-Place Concrete," and with reinforcing bars indicated.

2.4 MORTAR AND GROUT MATERIALS

- A. Regional Materials: Aggregate for mortar and grout that have been extracted, harvested, or recovered, as well as manufactured, within 500 miles of Project site.

- B. Mortar Cement: ASTM C 1329.
 - 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. Lafarge North America Inc.; Lafarge Mortar Cement.
- C. Aggregate for Mortar: ASTM C 144.
 - 1. For mortar that is exposed to view, use washed aggregate consisting of natural sand or crushed stone.
 - 2. For joints less than 1/4 inch thick, use aggregate graded with 100 percent passing the No. 16 sieve.
- D. Aggregate for Grout: ASTM C 404.
- E. Water-Repellent Admixture: Liquid water-repellent mortar admixture intended for use with CMUs, containing integral water repellent by same manufacturer.
 - 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. ACM Chemistries, Inc.; RainBloc for Mortar.
 - b. BASF Aktiengesellschaft; Rheopel Mortar Admixture.
 - c. Grace Construction Products, W. R. Grace & Co. - Conn.; Dry-Block Mortar Admixture.
- F. Water: Potable.

2.5 REINFORCEMENT

- A. Uncoated Steel Reinforcing Bars: ASTM A 615/A 615M or ASTM A 996/A 996M, Grade 60 .
- B. Masonry Joint Reinforcement, General: ASTM A 951/A 951M.
 - 1. Interior Walls: Mill- galvanized, carbon steel.
 - 2. Exterior Walls: Hot-dip galvanized, carbon steel.
 - 3. Wire Size for Side Rods: 0.148-inch diameter.
 - 4. Wire Size for Cross Rods: 0.148-inch diameter.
 - 5. Wire Size for Veneer Ties: 0.148-inch diameter.
 - 6. Spacing of Cross Rods, Tabs, and Cross Ties: Not more than 16 inches o.c.
 - 7. Provide in lengths of not less than 10 feet , with prefabricated corner and tee units.
- C. Masonry Joint Reinforcement for Single-Wythe Masonry: Either ladder or truss type with single pair of side rods.

2.6 TIES AND ANCHORS

- A. Materials: Provide ties and anchors specified in this article that are made from materials that comply with the following unless otherwise indicated.
 - 1. Hot-Dip Galvanized, Carbon-Steel Wire: ASTM A 82/A 82M; with ASTM A 153/A 153M, Class B-2 coating.
 - 2. Galvanized Steel Sheet: ASTM A 653/A 653M, Commercial Steel, G60 zinc coating.
 - 3. Hot-Dip Galvanized Steel Plates, Shapes, and Bars: ASTM A 36/A 36M.
- B. Adjustable Anchors for Connecting to Structural Steel Framing: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.

1. Anchor Section for Welding to Steel Frame: Crimped 1/4-inch- diameter, hot-dip galvanized steel wire.
 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.
- C. Adjustable Anchors for Connecting to Concrete: Provide anchors that allow vertical or horizontal adjustment but resist tension and compression forces perpendicular to plane of wall.
1. Connector Section: Dovetail tabs for inserting into dovetail slots in concrete and attached to tie section; formed from 0.105-inch- thick, steel sheet, galvanized after fabrication.
 2. Tie Section: Triangular-shaped wire tie, sized to extend within 1 inch of masonry face, made from 0.187-inch- diameter, hot-dip galvanized steel wire.
 3. Corrugated Metal Ties: Metal strips not less than 7/8 inch wide with corrugations having a wavelength of 0.3 to 0.5 inch and an amplitude of 0.06 to 0.10 inch made from 0.105-inch- thick, steel sheet, galvanized after fabrication with dovetail tabs for inserting into dovetail slots in concrete and sized to extend to within 1 inch of masonry face.
- D. Rigid Anchors: Fabricate from steel bars 1-1/2 inches wide by 1/4 inch thick by 24 inches long, with ends turned up 2 inches or with cross pins unless otherwise indicated.
1. Corrosion Protection: Hot-dip galvanized to comply with ASTM A 153/A 153M.

2.7 MISCELLANEOUS ANCHORS

- A. Dovetail Slots in Concrete: Furnish dovetail slots with filler strips, of slot size indicated, fabricated from 0.034-inch , galvanized steel sheet.
- B. Postinstalled Anchors: Torque-controlled expansion anchors, heavy duty concrete screw anchors, or chemical anchors.
1. Load Capacity: Capable of sustaining, without failure, a load equal to six times the load imposed when installed in unit masonry and four times the load imposed when installed in concrete, as determined by testing according to ASTM E 488, conducted by a qualified independent testing agency.
 2. Material for Interior Locations: Carbon-steel components zinc plated to comply with ASTM B 633 or ASTM F 1941 , Class Fe/Zn 5 unless otherwise indicated.
 3. Material for Exterior Locations and Where Stainless Steel Is Indicated: Alloy Group 1 stainless-steel bolts, ASTM F 593 , and nuts, ASTM F 594 .

2.8 MISCELLANEOUS MASONRY ACCESSORIES

- A. Compressible Filler: Premolded filler strips complying with ASTM D 1056, Grade 2A1; compressible up to 35 percent; of width and thickness indicated; formulated from neoprene or PVC.
- B. Preformed Control-Joint Gaskets: Made from styrene-butadiene-rubber compound, complying with ASTM D 2000, Designation M2AA-805 or PVC, complying with ASTM D 2287, Type PVC-65406 and designed to fit standard sash block and to maintain lateral stability in masonry wall; size and configuration as indicated.
- C. Bond-Breaker Strips: Asphalt-saturated, organic roofing felt complying with ASTM D 226, Type I (No. 15 asphalt felt).
- D. Reinforcing Bar Positioners: Wire units designed to fit into mortar bed joints spanning masonry unit cells and hold reinforcing bars in center of cells. Units are formed from 0.148-inch steel wire, hot-dip galvanized after fabrication. Provide units designed for number of bars indicated.

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. Dayton Superior Corporation, Dur-O-Wal Division; D/A 810, D/A 812 or D/A 817.
 - b. Heckmann Building Products Inc.; No. 376 Rebar Positioner.
 - c. Hohmann & Barnard, Inc.; #RB or #RB-Twin Rebar Positioner.
 - d. Wire-Bond; O-Ring or Double O-Ring Rebar Positioner.

2.9 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. Use mortar cement mortar unless otherwise indicated.
 3. For exterior masonry, use mortar cement mortar.
 4. For reinforced masonry, use mortar cement mortar.
 5. Add cold-weather admixture (if used) at same rate for all mortar that will be exposed to view, regardless of weather conditions, to ensure that mortar color is consistent.
- B. Mortar for Unit Masonry: Comply with ASTM C 270, Proportion Specification. Provide the following types of mortar for applications stated unless another type is indicated.
 1. For masonry below grade or in contact with earth, use Type S.
 2. For reinforced masonry, use Type S.
 3. For mortar parge coats, use Type S.
- C. Grout for Unit Masonry: Comply with ASTM C 476.
 1. Use grout of type indicated or, if not otherwise indicated, of type (fine or coarse) that will comply with Table 1.15.1 in ACI 530.1/ASCE 6/TMS 602 for dimensions of grout spaces and pour height.
 2. Proportion grout in accordance with ASTM C 476, Table 1 or paragraph 4.2.2 for specified 28-day compressive strength indicated, but not less than 2000 psi .
 3. Provide grout with a slump of 8 to 11 inches as measured according to ASTM C 143/C 143M.

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 the Work.
 1. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of work.
 2. Verify that foundations are within tolerances specified.
 3. Verify that reinforcing dowels are properly placed.
- B. Before installation, examine rough-in and built-in construction for piping systems to verify actual locations of piping connections.
- C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Build chases and recesses to accommodate items specified in this and other Sections.
- B. Leave openings for equipment to be installed before completing masonry. After installing equipment, complete masonry to match the construction immediately adjacent to opening.
- C. Use full-size units without cutting if possible. If cutting is required to provide a continuous pattern or to fit adjoining construction, cut units with motor-driven saws; provide clean, sharp, unchipped edges. Allow units to dry before laying unless wetting of units is specified. Install cut units with cut surfaces and, where possible, cut edges concealed.

3.3 TOLERANCES

- A. Dimensions and Locations of Elements:
 - 1. For dimensions in cross section or elevation do not vary by more than plus 1/2 inch or minus 1/4 inch .
 - 2. For location of elements in plan do not vary from that indicated by more than plus or minus 1/2 inch .
 - 3. For location of elements in elevation do not vary from that indicated by more than plus or minus 1/4 inch in a story height or 1/2 inch total.
- B. Lines and Levels:
 - 1. For bed joints and top surfaces of bearing walls do not vary from level by more than 1/4 inch in 10 feet , or 1/2 inch maximum.
 - 2. For conspicuous horizontal lines, such as lintels, sills, parapets, and reveals, do not vary from level by more than 1/8 inch in 10 feet , 1/4 inch in 20 feet , or 1/2 inch maximum.
 - 3. For vertical lines and surfaces do not vary from plumb by more than 1/4 inch in 10 feet , 3/8 inch in 20 feet , or 1/2 inch maximum.
 - 4. For conspicuous vertical lines, such as external corners, door jambs, reveals, and expansion and control joints, do not vary from plumb by more than 1/8 inch in 10 feet , 1/4 inch in 20 feet , or 1/2 inch maximum.
 - 5. For lines and surfaces do not vary from straight by more than 1/4 inch in 10 feet , 3/8 inch in 20 feet , or 1/2 inch maximum.
 - 6. For vertical alignment of exposed head joints, do not vary from plumb by more than 1/4 inch in 10 feet , or 1/2 inch maximum.
- C. Joints:
 - 1. For bed joints, do not vary from thickness indicated by more than plus or minus 1/8 inch , with a maximum thickness limited to 1/2 inch .
 - 2. For exposed bed joints, do not vary from bed-joint thickness of adjacent courses by more than 1/8 inch .
 - 3. For head and collar joints, do not vary from thickness indicated by more than plus 3/8 inch or minus 1/4 inch .
 - 4. For exposed head joints, do not vary from thickness indicated by more than plus or minus 1/8 inch .

3.4 LAYING MASONRY WALLS

- A. Lay out walls in advance for accurate spacing of surface bond patterns with uniform joint thicknesses and for accurate location of openings, movement-type joints, returns, and offsets. Avoid using less-than-half-size units, particularly at corners, jambs, and, where possible, at other locations.

- B. Bond Pattern for Exposed Masonry: Unless otherwise indicated, lay exposed masonry in running bond; do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- C. Lay concealed masonry with all units in a wythe in running bond or bonded by lapping not less than 4-inches . Bond and interlock each course of each wythe at corners. Do not use units with less than nominal 4-inch horizontal face dimensions at corners or jambs.
- D. Stopping and Resuming Work: Stop work by racking back units in each course from those in course below; do not tooth. When resuming work, clean masonry surfaces that are to receive mortar before laying fresh masonry.
- E. Built-in Work: As construction progresses, build in items specified in this and other Sections. Fill in solidly with masonry around built-in items.
- F. Fill space between steel frames and masonry solidly with mortar unless otherwise indicated.
- G. Where built-in items are to be embedded in cores of hollow masonry units, place a layer of metal lath, wire mesh, or plastic mesh in the joint below and rod mortar or grout into core.
- H. Fill cores in hollow CMUs with grout 24 inches under bearing plates, beams, lintels, posts, and similar items unless otherwise indicated.
- I. Build non-load-bearing interior partitions full height of story to underside of solid floor or roof structure above unless otherwise indicated.
 - 1. Install compressible filler in joint between top of partition and underside of structure above.
 - 2. Fasten partition top anchors to structure above and build into top of partition. Grout cells of CMUs solidly around plastic tubes of anchors and push tubes down into grout to provide 1/2-inch clearance between end of anchor rod and end of tube. Space anchors 48 inches o.c. unless otherwise indicated.
 - 3. At fire-rated partitions, treat joint between top of partition and underside of structure above to comply with Division 07 Section "Fire-Resistive Joint Systems."

3.5 MORTAR BEDDING AND JOINTING

- A. Lay hollow CMUs as follows:
 - 1. With face shells fully bedded in mortar and with head joints of depth equal to bed joints.
 - 2. With webs fully bedded in mortar in all courses of piers, columns, and pilasters.
 - 3. With webs fully bedded in mortar in grouted masonry, including starting course on footings.
 - 4. With entire units, including areas under cells, fully bedded in mortar at starting course on footings where cells are not grouted.
- B. Set cast-stone trim units in full bed of mortar with full vertical joints. Fill dowel, anchor, and similar holes.
 - 1. Clean soiled surfaces with fiber brush and soap powder and rinse thoroughly with clear water.
 - 2. Allow cleaned surfaces to dry before setting.
 - 3. Wet joint surfaces thoroughly before applying mortar.
- C. Tool exposed joints slightly concave when thumbprint hard, using a jointer larger than joint thickness unless otherwise indicated.

- D. Cut joints flush for masonry walls to receive plaster or other direct-applied finishes (other than paint) unless otherwise indicated.

3.6 MASONRY JOINT REINFORCEMENT

- A. General: Install entire length of longitudinal side rods in mortar with a minimum cover of 5/8 inch on exterior side of walls, 1/2 inch elsewhere. Lap reinforcement a minimum of 6 inches .
 - 1. Space reinforcement not more than 16 inches o.c.
 - 2. Space reinforcement not more than 8 inches o.c. in foundation walls and parapet walls.
 - 3. Provide reinforcement not more than 8 inches above and below wall openings and extending 12 inches beyond openings in addition to continuous reinforcement.
- B. Interrupt joint reinforcement at control and expansion joints unless otherwise indicated.
- C. Provide continuity at wall intersections by using prefabricated T-shaped units.
- D. Provide continuity at corners by using prefabricated L-shaped units.
- E. Cut and bend reinforcing units as directed by manufacturer for continuity at returns, offsets, column fireproofing, pipe enclosures, and other special conditions.

3.7 ANCHORING MASONRY TO STRUCTURAL STEEL AND CONCRETE

- A. Anchor masonry to structural steel and concrete where masonry abuts or faces structural steel or concrete to comply with the following:
 - 1. Provide an open space not less than 1/2 inch wide between masonry and structural steel or concrete unless otherwise indicated. Keep open space free of mortar and other rigid materials.
 - 2. Anchor masonry with anchors embedded in masonry joints and attached to structure.
 - 3. Space anchors as indicated, but not more than 24 inches o.c. vertically and 36 inches o.c. horizontally.

3.8 CONTROL AND EXPANSION JOINTS

- A. General: Install control and expansion joint materials in unit masonry as masonry progresses. Do not allow materials to span control and expansion joints without provision to allow for in-plane wall or partition movement.
- B. Form control joints in concrete masonry using one of the following methods:
 - 1. Fit bond-breaker strips into hollow contour in ends of CMUs on one side of control joint. Fill resultant core with grout and rake out joints in exposed faces for application of sealant.
 - 2. Install preformed control-joint gaskets designed to fit standard sash block.
 - 3. Install interlocking units designed for control joints. Install bond-breaker strips at joint. Keep head joints free and clear of mortar or rake out joint for application of sealant.
 - 4. Install temporary foam-plastic filler in head joints and remove filler when unit masonry is complete for application of sealant.

3.9 LINTELS

- A. Provide concrete lintels where shown and where openings of more than 12 inches for brick-size units and 24 inches for block-size units are shown without structural steel or other supporting lintels.
- B. Provide minimum bearing of 8 inches at each jamb unless otherwise indicated.

3.10 REINFORCED UNIT MASONRY INSTALLATION

- A. Temporary Formwork and Shores: Construct formwork and shores as needed to support reinforced masonry elements during construction.
 - 1. Construct formwork to provide shape, line, and dimensions of completed masonry as indicated. Make forms 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 loads that may be placed on them during construction.
- B. Placing Reinforcement: Comply with requirements in ACI 530.1/ASCE 6/TMS 602.
- C. Grouting: Do not place grout until entire height of masonry to be grouted has attained enough strength to resist grout pressure.
 - 1. Comply with requirements in ACI 530.1/ASCE 6/TMS 602 for cleanouts and for grout placement, including minimum grout space and maximum pour height.
 - 2. Limit height of vertical grout pours to not more than 60 inches.

3.11 FIELD QUALITY CONTROL

- A. Testing and Inspecting: Owner will engage special inspectors to perform tests and inspections and prepare reports. Allow inspectors access to scaffolding and work areas, as needed to perform tests and inspections. Retesting of materials that fail to meet specified requirements shall be done at Contractor's expense.
- B. Inspections:
 - 1. Begin masonry construction only after inspectors have verified proportions of site-prepared mortar.
 - 2. Place grout only after inspectors have verified compliance of grout spaces and of grades, sizes, and locations of reinforcement.
 - 3. Place grout only after inspectors have verified proportions of site-prepared grout.
- C. Testing Prior to Construction: One set of tests.
- D. Testing Frequency: One set of tests for each 5000 sq. ft. of wall area or portion thereof.
- E. Concrete Masonry Unit Test: For each type of unit provided, according to ASTM C 140 for compressive strength.
- F. Mortar Aggregate Ratio Test (Proportion Specification): For each mix provided, according to ASTM C 780.

- G. Mortar Test (Property Specification): For each mix provided, according to ASTM C 780. Test mortar for mortar air content and compressive strength.
- H. Grout Test (Compressive Strength): For each mix provided, according to ASTM C 1019.
- I. Prism Test: For each type of construction provided, according to ASTM C 1314 at 7 days and at 28 days.

3.12 PARGING

- A. Parge exterior faces of below-grade masonry walls, where indicated, in 2 uniform coats to a total thickness of 3/4 inch . Dampen wall before applying first coat and scarify first coat to ensure full bond to subsequent coat.
- B. Use a steel-trowel finish to produce a smooth, flat, dense surface with a maximum surface variation of 1/8 inch per foot . Form a wash at top of parging and a cove at bottom.
- C. Damp-cure parging for at least 24 hours and protect parging until cured.

3.13 REPAIRING, POINTING, AND CLEANING

- A. Remove and replace masonry units that are loose, chipped, broken, stained, or otherwise damaged or that do not match adjoining units. Install new units to match adjoining units; install in fresh mortar, 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 sealant application, where indicated.
- C. In-Progress Cleaning: Clean unit masonry as work progresses by dry brushing to remove mortar fins and smears before 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 nonmasonry surfaces from contact with cleaner by covering them with liquid strippable masking agent or polyethylene film and waterproof masking tape.
 - 4. Wet wall surfaces with water before applying cleaners; remove cleaners promptly by rinsing surfaces thoroughly with clear water.
 - 5. Clean concrete masonry by cleaning method indicated in NCMA TEK 8-2A applicable to type of stain on exposed surfaces.

3.14 MASONRY WASTE DISPOSAL

- A. Salvageable Materials: Unless otherwise indicated, excess masonry materials are Contractor's property. At completion of unit masonry work, remove from Project site.

- B. Waste Disposal as Fill Material: Dispose of clean masonry waste, including excess or soil-contaminated sand, waste mortar, and broken masonry units, by crushing and mixing with fill material as fill is placed.
 - 1. Crush masonry waste to less than 4 inches in each dimension.
 - 2. Mix masonry waste with at least two parts of specified fill material for each part of masonry waste. Fill material is specified in Division 31 Section "Earth Moving."
 - 3. Do not dispose of masonry waste as fill within 18 inches of finished grade.
- C. Excess Masonry Waste: Remove excess clean masonry waste that cannot be used as fill, as described above, and other masonry waste, and legally dispose of off Owner's property.

END OF SECTION 04 22 00

SECTION 05 51 60 – FIXED LADDERS

PART 1 – GENERAL

SUMMARY:

Provide fixed vertical ladders where shown on the drawings.

SYSTEM DESCRIPTION:

The system is a fixed steel ladder designed to be permanently attached.

Ladder shall be designed to meet all applicable codes and OSHA requirements.

WARRANTY:

Provide warranty of one (1) year minimum against defective material and workmanship. Defective parts, if deemed so by the manufacturer, will be replaced at no charge.

PART 2 – PRODUCTS

APPROVED MANUFACTURER:

The design is based on products manufactured under COTTERMAN label, a division of material Control, Inc.

Similar products of other manufacturers that meet or exceed this specification will be considered.

MATERIALS:

Fixed walk-thru (FW) series features;

- Side rails are 1/4" x 2" x 2" steel angle
- Rungs are 3/4" diameter corrugated steel bars
- Walk-thru rails shall extend 42" above landing surface
- Finish shall be hot dip galvanized to G90 or better.

Safety Cage (SC) series features;

- Side rails are 1/4" x 2" x 2" steel angle
- Rungs are 3/4" diameter corrugated steel bars
- Safety cage of 1/4" flat steel stock and starts 6'9" above first rung and shall extend to roof hatch, cage is flaired at bottom opening for easy entry
- Finish shall be powder coated with polyester powder and baked to provide a protective color coating.

Fabrication: Ladder shall be completely fabricated, in sections if necessary, ready for installation before shipment to the site.

Location(s): FW series shall be at exteriors on roof tops and SC series shall be within the structure(s) where noted.

PART 3 – EXECUTION

INSTALLATION:

Install per the manufacturer's installation instructions in level and plumb manner, secured intervals to provide permanent, safe installation.

END OF SECTION 05 51 60

SECTION 05 12 00 - STRUCTURAL STEEL 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. Structural steel.
 - 2. Grout.
- B. Related Sections:
 - 1. Division 01 Section "Quality Requirements" for independent testing agency procedures and administrative requirements.
 - 2. Division 05 Section "Steel Decking" for field installation of shear connectors through deck.
 - 3. Division 05 Section "Metal Fabrications" for miscellaneous steel fabrications and other metal items not defined as structural steel.

1.3 DEFINITIONS

- A. Structural Steel: Elements of structural-steel frame, as classified by AISC 303, "Code of Standard Practice for Steel Buildings and Bridges."
- B. Seismic-Load-Resisting System: Elements of structural-steel frame designated as "SLRS" or along grid lines designated as "SLRS" on Drawings, including columns, beams, and braces and their connections.
- C. Heavy Sections: Rolled and built-up sections as follows:
 - 1. Shapes included in ASTM A 6/A 6M with flanges thicker than 1-1/2 inches
 - 2. Welded built-up members with plates thicker than 2 inches
 - 3. Column base plates thicker than 2 inches
- D. Protected Zone: Structural members or portions of structural members indicated as "Protected Zone" on Drawings. Connections of structural and nonstructural elements to protected zones are limited.
- E. Demand Critical Welds: Those welds, the failure of which would result in significant degradation of the strength and stiffness of the Seismic-Load-Resisting System and which are indicated as "Demand Critical" or "Seismic Critical" on Drawings.

1.4 PERFORMANCE REQUIREMENTS

- A. Moment Connections: Type FR, fully restrained.

- B. Construction: Shear wall system.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. Shop Drawings: Show fabrication of structural-steel components.
 - 1. Include details of cuts, connections, splices, camber, holes, and other pertinent data.
 - 2. Include embedment drawings.
 - 3. Indicate welds by standard AWS symbols, distinguishing between shop and field welds, and show size, length, and type of each weld. Show backing bars that are to be removed and supplemental fillet welds where backing bars are to remain.
 - 4. Indicate type, size, and length of bolts, distinguishing between shop and field bolts. Identify pretensioned and slip-critical high-strength bolted connections.
 - 5. Identify members and connections of the seismic-load-resisting system.
 - 6. Indicate locations and dimensions of protected zones.
 - 7. Identify demand critical welds.
 - 8. For structural-steel connections indicated to comply with design loads, include structural design data signed and sealed by the qualified professional engineer responsible for their preparation.
- C. Welding Procedure Specifications (WPSs) and Procedure Qualification Records (PQRs): Provide according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for each welded joint whether prequalified or qualified by testing, including the following:
 - 1. Power source (constant current or constant voltage).
 - 2. Electrode manufacturer and trade name, for demand critical welds.

1.6 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer and fabricator.
- B. Welding certificates.
- C. Mill test reports for structural steel, including chemical and physical properties.
- D. Product Test Reports: For the following:
 - 1. Bolts, nuts, and washers including mechanical properties and chemical analysis.
 - 2. Direct-tension indicators.
 - 3. Tension-control, high-strength bolt-nut-washer assemblies.
 - 4. Shear stud connectors.
 - 5. Nonshrink grout.
- E. Source quality-control reports.

1.7 QUALITY ASSURANCE

- A. Fabricator Qualifications: A qualified fabricator that participates in the AISC Quality Certification Program and is designated an AISC-Certified Plant, Category STD.
- B. Installer Qualifications: A qualified installer who participates in the AISC Quality Certification Program and is designated an AISC-Certified Erector, Category CSE.

- C. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
 - 1. Welders and welding operators performing work on bottom-flange, demand-critical welds shall pass the supplemental welder qualification testing, as required by AWS D1.8. FCAW-S and FCAW-G shall be considered separate processes for welding personnel qualification.
- D. Comply with applicable provisions of the following specifications and documents:
 - 1. AISC 303.
 - 2. AISC 341 and AISC 341s1.
 - 3. AISC 360.
 - 4. RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- E. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

- A. Store materials to permit easy access for inspection and identification. Keep steel members off ground and spaced by using pallets, dunnage, or other supports and spacers. Protect steel members and packaged materials from corrosion and deterioration.
 - 1. Do not store materials on structure in a manner that might cause distortion, damage, or overload to members or supporting structures. Repair or replace damaged materials or structures as directed.
- B. Store fasteners in a protected place in sealed containers with manufacturer's labels intact.
 - 1. Fasteners may be repackaged provided Owner's testing and inspecting agency observes repackaging and seals containers.
 - 2. Clean and relubricate bolts and nuts that become dry or rusty before use.
 - 3. Comply with manufacturers' written recommendations for cleaning and lubricating ASTM F 1852 fasteners and for retesting fasteners after lubrication.

1.9 COORDINATION

- A. Coordinate selection of shop primers with topcoats to be applied over them. Comply with paint and coating manufacturers' recommendations to ensure that shop primers and topcoats are compatible with one another.
- B. Coordinate installation of anchorage items to be embedded in or attached to other construction without delaying the Work. Provide setting diagrams, sheet metal templates, instructions, and directions for installation.

PART 2 - PRODUCTS

2.1 STRUCTURAL-STEEL MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- B. W-Shapes: ASTM A 992/A 992M.
- C. Channels, Angles, M, S-Shapes: ASTM A 36/A 36M.

- D. Plate and Bar: ASTM A 36/A 36M or ASTM A 572/A 572M, Grade 50, as indicated.
- E. Cold-Formed Hollow Structural Sections: ASTM A 500, Grade B, structural tubing.
- F. Steel Pipe: ASTM A 53/A 53M, Type E or S, Grade B.
 - 1. Weight Class: As indicated .
 - 2. Finish: Black except where indicated to be galvanized.
- G. Welding Electrodes: Comply with AWS requirements.

2.2 BOLTS, CONNECTORS, AND ANCHORS

- A. High-Strength Bolts, Nuts, and Washers: ASTM A 325 , Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade C, heavy-hex carbon-steel nuts; and ASTM F 436 , Type 1, hardened carbon-steel washers; all with plain finish.
 - 1. Direct-Tension Indicators: ASTM F 959, Type 325 , compressible-washer type with plain finish.
- B. Zinc-Coated High-Strength Bolts, Nuts, and Washers: ASTM A 325 , Type 1, heavy-hex steel structural bolts; ASTM A 563, Grade DH heavy-hex carbon-steel nuts; and ASTM F 436 , Type 1, hardened carbon-steel washers.
 - 1. Finish: Hot-dip zinc coating.
 - 2. Direct-Tension Indicators: ASTM F 959, Type 325 , compressible-washer type with mechanically deposited zinc coating finish.
- C. Tension-Control, High-Strength Bolt-Nut-Washer Assemblies: ASTM F 1852, Type 1, round head assemblies consisting of steel structural bolts with splined ends, heavy-hex carbon-steel nuts, and hardened carbon-steel washers.
 - 1. Finish: Mechanically deposited zinc coating.
- D. Shear Connectors: ASTM A 108, Grades 1015 through 1020, headed-stud type, cold-finished carbon steel; AWS D1.1/D1.1M, Type B.
- E. Unheaded Anchor Rods: ASTM F 1554, Grade 36.
 - 1. Configuration: Straight.
 - 2. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 3. Plate Washers: ASTM A 36/A 36M carbon steel.
 - 4. Washers: ASTM F 436 , Type 1, hardened carbon steel.
 - 5. Finish: Hot-dip zinc coating, ASTM A 153/A 153M, Class C.
- F. Threaded Rods: ASTM A 193/A 193M, Grade B7.
 - 1. Nuts: ASTM A 563 heavy-hex carbon steel.
 - 2. Washers: ASTM F 436 , Type 1, hardened carbon steel.
 - 3. Finish: Plain, except hot-dip zinc coating, ASTM A 153/A 153M, Class C where exposed to exterior conditions.

2.3 GROUT

- A. Nonmetallic, Shrinkage-Resistant Grout: ASTM C 1107, factory-packaged, nonmetallic aggregate grout, noncorrosive and nonstaining, mixed with water to consistency suitable for application and a 30-minute working time.

2.4 FABRICATION

- A. Structural Steel: Fabricate and assemble in shop to greatest extent possible. Fabricate according to AISC's "Code of Standard Practice for Steel Buildings and Bridges" and AISC 360.
 - 1. Camber structural-steel members where indicated.
 - 2. Fabricate beams with rolling camber up.
 - 3. Identify high-strength structural steel according to ASTM A 6/A 6M and maintain markings until structural steel has been erected.
 - 4. Mark and match-mark materials for field assembly.
- B. Thermal Cutting: Perform thermal cutting by machine to greatest extent possible.
 - 1. Plane thermally cut edges to be welded to comply with requirements in AWS D1.1/D1.1M.
- C. Bolt Holes: Cut, drill, mechanically thermal cut, or punch standard bolt holes perpendicular to metal surfaces.
- D. Finishing: Accurately finish ends of columns and other members transmitting bearing loads.
- E. Cleaning: Clean and prepare steel surfaces that are to remain unpainted according to SSPC-SP 2, "Hand Tool Cleaning."
- F. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.
- G. Holes: Provide holes required for securing other work to structural steel and for other work to pass through steel framing members.
 - 1. Cut, drill, or punch holes perpendicular to steel surfaces. Do not enlarge holes by burning.
 - 2. Baseplate Holes: Cut, drill, mechanically thermal cut, or punch holes perpendicular to steel surfaces.
 - 3. Weld threaded nuts to framing and other specialty items indicated to receive other work.

2.5 SHOP CONNECTIONS

- A. High-Strength Bolts: Shop install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened, unless indicated otherwise.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC 303 for mill material.

2.6 GALVANIZING

- A. Hot-Dip Galvanized Finish: Apply zinc coating by the hot-dip process to structural steel according to ASTM A 123/A 123M.
 - 1. Fill vent and drain holes that will be exposed in the finished Work unless they will function as weep holes, by plugging with zinc solder and filing off smooth.
 - 2. Galvanize lintels and shelf angles attached to structural-steel frame and located in exterior walls.

2.7 SOURCE QUALITY CONTROL

- A. Testing Agency: Owner will engage an independent testing and inspecting agency to perform shop tests and inspections and prepare test reports.
 - 1. Provide testing agency with access to places where structural-steel work is being fabricated or produced to perform tests and inspections.
- B. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.
- C. Bolted Connections: Shop-bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- D. Welded Connections: In addition to visual inspection, shop-welded connections will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - 1. Radiographic Inspection: ASTM E 94.
 - 2. Liquid Penetrant Method: ASTM E 165.
 - 3. Magnetic Particle Inspection: ASTM E 709.
 - 4. Ultrasonic Inspection: ASTM E 164.
- E. In addition to visual inspection, shop-welded shear connectors will be tested and inspected according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Bend tests will be performed if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Tests will be conducted on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Verify, with steel Erector present, elevations of concrete- and masonry-bearing surfaces and locations of anchor rods, bearing plates, and other embedments for compliance with requirements.
 - 1. Prepare a certified survey of bearing surfaces, anchor rods, bearing plates, and other embedments showing dimensions, locations, angles, and elevations.
 - 2. Submit survey results to the Architect for review prior to commencing installation.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Provide temporary shores, guys, braces, and other supports during erection to keep structural steel secure, plumb, and in alignment against temporary construction loads and loads equal in intensity to design loads. Remove temporary supports when permanent structural steel, connections, and bracing are in place unless otherwise indicated.
 - 1. Do not remove temporary shoring supporting composite deck construction until cast-in-place concrete has attained its design compressive strength.

3.3 ERECTION

- A. Set structural steel accurately in locations and to elevations indicated and according to AISC 303 and AISC 360.
- B. Base Bearing Plates: Clean concrete- and masonry-bearing surfaces of bond-reducing materials, and roughen surfaces prior to setting plates. Clean bottom surface of plates.
 - 1. Set plates for structural members on wedges, shims, or setting nuts as required.
 - 2. Weld plate washers to top of baseplate.
 - 3. Snug-tighten anchor rods after supported members have been positioned and plumbed. Do not remove wedges or shims but, if protruding, cut off flush with edge of plate before packing with grout.
 - 4. Promptly pack grout solidly between bearing surfaces and plates so no voids remain. Neatly finish exposed surfaces; protect grout and allow to cure. Comply with manufacturer's written installation instructions for shrinkage-resistant grouts.
- C. Maintain erection tolerances of structural steel within AISC's "Code of Standard Practice for Steel Buildings and Bridges."
- D. Align and adjust various members that form part of complete frame or structure before permanently fastening. Before assembly, clean bearing surfaces and other surfaces that will be in permanent contact with members. Perform necessary adjustments to compensate for discrepancies in elevations and alignment.
 - 1. Level and plumb individual members of structure.
 - 2. Make allowances for difference between temperature at time of erection and mean temperature when structure is completed and in service.
- E. Splice members only where indicated.
- F. Do not use thermal cutting during erection unless approved by Architect. Finish thermally cut sections within smoothness limits in AWS D1.1/D1.1M.
- G. Do not enlarge unfair holes in members by burning or using drift pins. Ream holes that must be enlarged to admit bolts.
- H. Shear Connectors: Prepare steel surfaces as recommended by manufacturer of shear connectors. Use automatic end welding of headed-stud shear connectors according to AWS D1.1/D1.1M and manufacturer's written instructions.

3.4 FIELD CONNECTIONS

- A. High-Strength Bolts: Install high-strength bolts according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts" for type of bolt and type of joint specified.
 - 1. Joint Type: Snug tightened, unless indicated otherwise.
- B. Weld Connections: Comply with AWS D1.1/D1.1M for tolerances, appearances, welding procedure specifications, weld quality, and methods used in correcting welding work.
 - 1. Comply with AISC 303 and AISC 360 for bearing, alignment, adequacy of temporary connections, and removal of paint on surfaces adjacent to field welds.
 - 2. Remove backing bars or runoff tabs where indicated, back gouge, and grind steel smooth.
 - 3. Assemble and weld built-up sections by methods that will maintain true alignment of axes without exceeding tolerances in AISC's "Code of Standard Practice for Steel Buildings and Bridges" for mill material.

3.5 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and high-strength bolted connections.
- B. Bolted Connections: Bolted connections will be inspected according to RCSC's "Specification for Structural Joints Using ASTM A 325 or A 490 Bolts."
- C. Welded Connections: Field welds will be visually inspected according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, field welds will be tested and inspected according to AWS D1.1/D1.1M and the following inspection procedures, at testing agency's option:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709; performed on root pass and on finished weld. Cracks or zones of incomplete fusion or penetration will not be accepted.
 - c. Ultrasonic Inspection: ASTM E 164.
 - d. Radiographic Inspection: ASTM E 94.
- D. In addition to visual inspection, test and inspect field-welded shear connectors according to requirements in AWS D1.1/D1.1M for stud welding and as follows:
 - 1. Perform bend tests if visual inspections reveal either a less-than-continuous 360-degree flash or welding repairs to any shear connector.
 - 2. Conduct tests on additional shear connectors if weld fracture occurs on shear connectors already tested, according to requirements in AWS D1.1/D1.1M.
- E. Correct deficiencies in Work that test reports and inspections indicate does not comply with the Contract Documents.

3.6 REPAIRS AND PROTECTION

- A. Galvanized Surfaces: Clean areas where galvanizing is damaged or missing and repair galvanizing to comply with ASTM A 780.

END OF SECTION 05 12 00

SECTION 05 21 00 - STEEL JOIST 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. K-series steel joists.
 - 2. KCS-type K-series steel joists.
 - 3. K-series steel joist substitutes.
 - 4. LH- and DLH-series long-span steel joists.
 - 5. Joist accessories.
- B. Related Requirements:
 - 1. Division 03 Section "Cast-in-Place Concrete" for installing bearing plates in concrete.
 - 2. Division 04 Section "Unit Masonry" for installing bearing plates in unit masonry.
 - 3. Division 05 Section "Structural Steel Framing" for field-welded shear connectors.

1.3 DEFINITIONS

- A. SJI's "Specifications": Steel Joist Institute's "Standard Specifications, Load Tables and Weight Tables for Steel Joists and Joist Girders."
- B. Special Joists: Steel joists or joist girders requiring modification by manufacturer to support nonuniform, unequal, or special loading conditions that invalidate load tables in SJI's "Specifications."

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of joist, accessory, and product.
- B. LEED Submittals:
 - 1. Product Data for Credit MR 4: For products having recycled content, documentation indicating percentages by weight of postconsumer and preconsumer recycled content. Include statement indicating cost for each product having recycled content.
- C. Shop Drawings:
 - 1. Include layout, designation, number, type, location, and spacing of joists.
 - 2. Include joining and anchorage details, bracing, bridging, and joist accessories; splice and connection locations and details; and attachments to other construction.
 - 3. Indicate locations and details of bearing plates to be embedded in other construction.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For manufacturer.
- B. Welding certificates.
- C. Manufacturer certificates.
- D. Comprehensive engineering analysis of special joists signed and sealed by the qualified professional engineer responsible for its preparation.

1.6 QUALITY ASSURANCE

- A. Manufacturer Qualifications: A manufacturer certified by SJI to manufacture joists complying with applicable standard specifications and load tables in SJI's "Specifications."
 - 1. Manufacturer's responsibilities include providing professional engineering services for designing special joists to comply with performance requirements.
- B. Welding Qualifications: Qualify field-welding procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Deliver, store, and handle joists as recommended in SJI's "Specifications."
- B. Protect joists from corrosion, deformation, and other damage during delivery, storage, and handling.

1.8 SEQUENCING

- A. Deliver steel bearing plates to be built into cast-in-place concrete and masonry construction.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide special joists and connections capable of withstanding design loads indicated.
 - 1. Use ASD; data are given at service-load level.
 - 2. Design special joists to withstand design loads with live-load deflections no greater than the following:
 - a. Roof Joists: Vertical deflection of 1/360 of the span.
- B. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.

2.2 K-SERIES STEEL JOISTS

- A. Manufacture steel joists of type indicated according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members, underslung ends, and parallel top chord.

1. Joist Type: K-series steel joists and KCS-type K-series steel joists.
- B. Steel Joist Substitutes: Manufacture according to "Standard Specifications for Open Web Steel Joists, K-Series" in SJI's "Specifications," with steel-angle or -channel members.
- C. Provide holes in chord members for connecting and securing other construction to joists.
- D. Top-Chord Extensions: Extend top chords of joists with SJI's Type S top-chord extensions where indicated, complying with SJI's "Specifications."
- E. Extended Ends: Extend bearing ends of joists with SJI's Type R extended ends where indicated, complying with SJI's "Specifications."
- F. Camber joists according to SJI's "Specifications."
- G. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches .

2.3 LONG-SPAN STEEL JOISTS

- A. Manufacture steel joists according to "Standard Specifications for Longspan Steel Joists, LH-Series and Deep Longspan Steel Joists, DLH-Series" in SJI's "Specifications," with steel-angle top- and bottom-chord members; of joist type and end and top-chord arrangements as indicated.
- B. Provide holes in chord members for connecting and securing other construction to joists.
- C. Camber long-span steel joists according to SJI's "Specifications."
- D. Equip bearing ends of joists with manufacturer's standard beveled ends or sloped shoes if joist slope exceeds 1/4 inch per 12 inches .

2.4 PRIMERS

- A. Primer: SSPC-Paint 15, or manufacturer's standard shop primer complying with performance requirements in SSPC-Paint 15.

2.5 JOIST ACCESSORIES

- A. Bridging: Provide bridging anchors and number of rows of horizontal or diagonal bridging of material, size, and type required by SJI's "Specifications" for type of joist, chord size, spacing, and span. Furnish additional erection bridging if required for stability.
- B. Fabricate steel bearing plates from ASTM A 36/A 36M steel with integral anchorages of sizes and thicknesses indicated. Hot-dip zinc coat according to ASTM A 123/A 123M.
- C. Furnish ceiling extensions, either extended bottom-chord elements or a separate extension unit of enough strength to support ceiling construction. Extend ends to within 1/2 inch of finished wall surface unless otherwise indicated.
- D. Welding Electrodes: Comply with AWS standards.

- E. Galvanizing Repair Paint: MPI#18, MPI#19, or SSPC-Paint 20.
- F. Furnish miscellaneous accessories including splice plates and bolts required by joist manufacturer to complete joist assembly.

2.6 CLEANING AND SHOP PAINTING

- A. Clean and remove loose scale, heavy rust, and other foreign materials from fabricated joists and accessories by hand-tool cleaning, SSPC-SP 2 or power-tool cleaning, SSPC-SP 3.
- B. Do not prime paint joists and accessories to receive sprayed fire-resistive materials.
- C. Apply one coat of shop primer to joists and joist accessories to be primed to provide a continuous, dry paint film not less than 1 mil thick.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 INSTALLATION

- A. Do not install joists until supporting construction is in place and secured.
- B. Install joists and accessories plumb, square, and true to line; securely fasten to supporting construction according to SJL's "Specifications," joist manufacturer's written recommendations, and requirements in this Section.
 - 1. Before installation, splice joists delivered to Project site in more than one piece.
 - 2. Space, adjust, and align joists accurately in location before permanently fastening.
 - 3. Install temporary bracing and erection bridging, connections, and anchors to ensure that joists are stabilized during construction.
 - 4. Delay rigidly connecting bottom-chord extensions to columns or supports until dead loads are applied.
- C. Field weld joists to supporting steel bearing plates and framework. Coordinate welding sequence and procedure with placement of joists. Comply with AWS requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
- D. Install and connect bridging concurrently with joist erection, before construction loads are applied. Anchor ends of bridging lines at top and bottom chords if terminating at walls or beams.

3.3 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified independent testing and inspecting agency to inspect field welds and to perform field tests and inspections and prepare test and inspection reports.
- B. Visually inspect field welds according to AWS D1.1/D1.1M.
 - 1. In addition to visual inspection, test field welds according to AWS D1.1/D1.1M and the following procedures, as applicable:
 - a. Liquid Penetrant Inspection: ASTM E 165.
 - b. Magnetic Particle Inspection: ASTM E 709.
 - c. Ultrasonic Testing: ASTM E 164.
 - d. Radiographic Testing: ASTM E 94.
- C. Correct deficiencies in Work that test and inspection reports have indicated are not in compliance with specified requirements.
- D. Perform additional testing to determine compliance of corrected Work with specified requirements.

3.4 PROTECTION

- A. Repair damaged galvanized coatings on galvanized items with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Touchup Painting: After installation, promptly clean, prepare, and prime or reprime field connections, rust spots, and abraded surfaces of prime-painted joists, bearing plates, abutting structural steel, and accessories.
- C.
 - 1. Clean and prepare surfaces by hand-tool cleaning according to SSPC-SP 2, or power-tool cleaning according to SSPC-SP 3.
 - 2. Apply a compatible primer of same type as primer used on adjacent surfaces.
- D. Touchup Painting: Cleaning and touchup painting are specified in Division 09 painting Sections.
- E. Provide final protection and maintain conditions, in a manner acceptable to the manufacturer and the installer, that ensure that joists and accessories are without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 21 00

SECTION 05 31 00 - STEEL DECKING

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. Roof deck.
- B. Related Requirements:
 - 1. Division 03 Section "Cast-in-Place Concrete" for normal-weight and lightweight structural concrete fill over steel deck.
 - 2. Division 03 Section "Lightweight Insulating Concrete" for lightweight insulating concrete fill over steel deck.
 - 3. Division 05 Section "Structural Steel Framing" for shop- and field-welded shear connectors.
 - 4. Division 05 Section "Metal Fabrications" for framing deck openings with miscellaneous steel shapes.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of deck, accessory, and product indicated.
- B. Shop Drawings:
 - 1. Include layout and types of deck panels, anchorage details, reinforcing channels, pans, cut deck openings, special jointing, accessories, and attachments to other construction.

1.4 INFORMATIONAL SUBMITTALS

- A. Welding certificates.
- B. Product Certificates: For each type of steel deck.
- C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that each of the following complies with requirements:
 - 1. Power-actuated mechanical fasteners.
- D. Evaluation Reports: For steel deck.

1.5 QUALITY ASSURANCE

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

- B. Welding Qualifications: Qualify procedures and personnel according to AWS D1.3, "Structural Welding Code - Sheet Steel."
- C. FM Global Listing: Provide steel roof deck evaluated by FM Global and listed in its "Approval Guide, Building Materials" for Class 1 fire rating and Class 1-90 windstorm ratings.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Protect steel deck from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Stack steel deck on platforms or pallets and slope to provide drainage. Protect with a waterproof covering and ventilate to avoid condensation.
 - 1. Protect and ventilate acoustical cellular roof deck with factory-installed insulation to maintain insulation free of moisture.

PART 2 - PRODUCTS

2.1 PERFORMANCE REQUIREMENTS

- A. AISI Specifications: Comply with calculated structural characteristics of steel deck according to AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members."
- B. 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.
- C. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer recycled content not less than 25 percent.
- D. Low-Emitting Materials: Paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.2 ROOF DECK

- 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. ASC Profiles, Inc.; a Blue Scope Steel company.
 - 2. Canam United States; Canam Group Inc.
 - 3. CMC Joist & Deck.
 - 4. Consolidated Systems, Inc.; Metal Dek Group.
 - 5. Cordeck.
 - 6. DACS, Inc.
 - 7. Epic Metals Corporation.
 - 8. Marlyn Steel Decks, Inc.
 - 9. New Millennium Building Systems, LLC.
 - 10. Nucor Corp.; Vulcraft Group.
 - 11. Roof Deck, Inc.

12. Valley Joist; Subsidiary of EBSCO Industries, Inc.
13. Verco Manufacturing Co.
14. Wheeling Corrugating Company; Div. of Wheeling-Pittsburgh Steel Corporation.

- B. Roof Deck: Fabricate panels, with venting if required by lightweight roof insulation manufacturer, without top-flange stiffening grooves, to comply with "SDI Specifications and Commentary for Steel Roof Deck," in SDI Publication No. 31, and with the following:
1. Galvanized-Steel Sheet: ASTM A 653/A 653M, Structural Steel (SS), Grade 40, G90 zinc coating.
 2. Deck Profile: As indicated.
 3. Profile Depth: As indicated.
 4. Design Uncoated-Steel Thickness: As indicated.
 5. Design Uncoated-Steel Thicknesses; Deck Unit/Bottom Plate: As indicated.
 6. Span Condition: Triple span or more.
 7. Side Laps: Overlapped or interlocking seam at Contractor's option.
 8. Vent Slot Area: Manufacturer's standard vent slots providing 1-1/2 percent open area, if required by insulating light weight concrete supplier.

2.3 ACCESSORIES

- A. General: Provide manufacturer's standard accessory materials for deck that comply with requirements indicated.
- B. Mechanical Fasteners: Corrosion-resistant, low-velocity, power-actuated or pneumatically driven carbon-steel fasteners; or self-drilling, self-threading screws.
- C. Side-Lap Fasteners: Corrosion-resistant, hexagonal washer head; self-drilling, carbon-steel screws, No. 10 minimum diameter.
- D. Flexible Closure Strips: Vulcanized, closed-cell, synthetic rubber.
- E. Miscellaneous Sheet Metal Deck Accessories: Steel sheet, minimum yield strength of 33,000 psi , not less than 0.0359-inch design uncoated thickness, of same material and finish as deck; of profile indicated or required for application.
- F. Pour Stops and Girder Fillers: Steel sheet, minimum yield strength of 33,000 psi , of same material and finish as deck, and of thickness and profile recommended by SDI Publication No. 31 for overhang and slab depth.
- G. Column Closures, End Closures, Z-Closures, and Cover Plates: Steel sheet, of same material, finish, and thickness as deck unless otherwise indicated.
- H. Galvanizing Repair Paint: SSPC-Paint 20 or MIL-P-21035B, with dry film containing a minimum of 94 percent zinc dust by weight.
- I. Repair Paint: Manufacturer's standard rust-inhibitive primer of same color as primer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine supporting frame and field conditions for compliance with requirements for installation tolerances and other conditions affecting performance.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

- A. Install deck panels and accessories according to applicable specifications and commentary in SDI Publication No. 31, manufacturer's written instructions, and requirements in this Section.
- B. Install temporary shoring before placing deck panels if required to meet deflection limitations.
- C. Locate deck bundles to prevent overloading of supporting members.
- D. Place deck panels on supporting frame and adjust to final position with ends accurately aligned and bearing on supporting frame before being permanently fastened. Do not stretch or contract side-lap interlocks.
- E. Place deck panels flat and square and fasten to supporting frame without warp or deflection.
- F. Cut and neatly fit deck panels and accessories around openings and other work projecting through or adjacent to deck.
- G. Provide additional reinforcement and closure pieces at openings as required for strength, continuity of deck, and support of other work.
- H. Comply with AWS requirements and procedures for manual shielded metal arc welding, appearance and quality of welds, and methods used for correcting welding work.
- I. Mechanical fasteners may be used in lieu of welding to fasten deck. Locate mechanical fasteners and install according to deck manufacturer's written instructions.

3.3 ROOF-DECK INSTALLATION

- A. Fasten roof-deck panels to steel supporting members by arc spot (puddle) welds of the surface diameter indicated or arc seam welds with an equal perimeter that is not less than 1-1/2 inches long, and as follows:
 - 1. Weld Diameter: 5/8 inch, nominal.
 - 2. Weld Spacing: Weld edge and interior ribs of deck units with a minimum of two welds per deck unit at each support. Space welds as indicated.
- B. Side-Lap and Perimeter Edge Fastening: Fasten side laps of panels between supports, at intervals not exceeding the lesser of 1/2 of the span or 36 inches , and as follows:
 - 1. Mechanically fasten with self-drilling, No. 10 diameter or larger, carbon-steel screws.
- C. Perimeter Edge Fastening: Fasten perimeter edges of panels along supports with 5/8 inch diameter puddle welds at intervals not exceeding the 12 inches on center for Zone 1, 8 inches on center for Zone 2, and 6 inches on center for Zone 3.
- D. End Bearing: Install deck ends over supporting frame with a minimum end bearing of 1-1/2 inches , with end joints as follows:
 - 1. End Joints: Lapped 2 inches minimum or butted at Contractor's option.

- E. Miscellaneous Roof-Deck Accessories: Install ridge and valley plates, finish strips, end closures, and reinforcing channels according to deck manufacturer's written instructions. Weld or mechanically fasten to substrate to provide a complete deck installation.
 - 1. Weld cover plates at changes in direction of roof-deck panels unless otherwise indicated.
- F. Flexible Closure Strips: Install flexible closure strips over partitions, walls, and where indicated. Install with adhesive according to manufacturer's written instructions to ensure complete closure.

3.4 FIELD QUALITY CONTROL

- A. Testing Agency: Owner will engage a qualified testing agency to perform tests and inspections.
- B. Field welds will be subject to inspection.
- C. Testing agency will report inspection results promptly and in writing to Contractor and Architect.
- D. Remove and replace work that does not comply with specified requirements.
- E. Additional inspecting, at Contractor's expense, will be performed to determine compliance of corrected work with specified requirements.

3.5 PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on both surfaces of deck with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.
- B. Provide final protection and maintain conditions to ensure that steel deck is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 31 00

SECTION 05 40 00 - 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. This Section includes the following:
 - 1. Exterior non-load-bearing wall framing.
- B. Related Sections include the following:
 - 1. Division 05 Section "Metal Fabrications" for masonry shelf angles and connections.

1.3 PERFORMANCE REQUIREMENTS

- A. Structural Performance: Provide cold-formed metal 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 Non-Load-Bearing Framing: Horizontal deflection of 1/600 of the wall height.
 - 3. Design framing systems to provide for movement of framing members 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 70 deg F .
- B. Cold-Formed Steel Framing, General: Design according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Headers: Design according to AISI's "Standard for Cold-Formed Steel Framing - Header Design."
 - 2. Design exterior non-load-bearing wall framing to accommodate horizontal deflection without regard for contribution of sheathing materials.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of cold-formed metal framing product and accessory indicated.
- B. Shop Drawings: Show layout, spacings, sizes, thicknesses, and types of cold-formed metal framing; fabrication; and fastening and anchorage details, including mechanical fasteners. Show reinforcing channels, opening framing, supplemental framing, strapping, bracing, bridging, splices, accessories, connection details, and attachment to adjoining work.
 - 1. For cold-formed metal framing indicated to comply with design loads, include structural analysis data signed and sealed by the qualified professional engineer responsible for their preparation.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For professional engineer.
- B. Welding certificates.
- C. Product Test Reports: From a qualified testing agency, unless otherwise stated, indicating that each of the following complies with requirements, based on evaluation of comprehensive tests for current products:
 - 1. Steel sheet.
 - 2. Expansion anchors.
 - 3. Power-actuated anchors.
 - 4. Mechanical fasteners.
 - 5. Vertical deflection clips.
 - 6. Horizontal drift deflection clips
 - 7. Miscellaneous structural clips and accessories.
- D. Research/Evaluation Reports: For cold-formed metal framing.

1.6 QUALITY ASSURANCE

- A. Engineering Responsibility: Preparation of Shop Drawings, design calculations, and other structural data by a qualified professional engineer.
- B. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of cold-formed metal framing that are similar to those indicated for this Project in material, design, and extent.
- C. Testing Agency Qualifications: An independent testing agency, acceptable to authorities having jurisdiction, qualified according to ASTM E 329 to conduct the testing indicated.
- D. 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, ductility, and metallic-coating thickness.
- E. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code--Steel," and AWS D1.3, "Structural Welding Code--Sheet Steel."
- F. Fire-Test-Response Characteristics: Where indicated, provide cold-formed metal framing identical to that of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.
- G. AISI Specifications and Standards: Comply with AISI's "North American Specification for the Design of Cold-Formed Steel Structural Members" and its "Standard for Cold-Formed Steel Framing - General Provisions."
 - 1. Comply with AISI's "Standard for Cold-Formed Steel Framing - Header Design."
- H. Comply with AISI's "Standard for Cold-Formed Steel Framing - Prescriptive Method for One and Two Family Dwellings."
- I. Preinstallation Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination."

1.7 DELIVERY, STORAGE, AND HANDLING

- A. Protect cold-formed metal framing from corrosion, deformation, and other damage during delivery, storage, and handling.
- B. Store cold-formed metal framing, protect with a waterproof covering, and ventilate to avoid condensation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering cold-formed metal framing that may be incorporated into the Work include, but are not limited to, the following:
 - 1. Allied Studco.
 - 2. AllSteel Products, Inc.
 - 3. California Expanded Metal Products Company.
 - 4. Clark Steel Framing.
 - 5. Consolidated Fabricators Corp.; Building Products Division.
 - 6. Craco Metals Manufacturing, LLC.
 - 7. Custom Stud, Inc.
 - 8. Dale/Incor.
 - 9. Design Shapes in Steel.
 - 10. Dietrich Metal Framing; a Worthington Industries Company.
 - 11. Formetal Co. Inc. (The).
 - 12. Innovative Steel Systems.
 - 13. MarinoWare; a division of Ware Industries.
 - 14. Quail Run Building Materials, Inc.
 - 15. SCAFCO Corporation.
 - 16. Southeastern Stud & Components, Inc.
 - 17. Steel Construction Systems.
 - 18. Steeler, Inc.
 - 19. Super Stud Building Products, Inc.
 - 20. United Metal Products, Inc.

2.2 MATERIALS

- A. Recycled Content of Steel Products: Postconsumer recycled content plus one-half of preconsumer 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: ST50H.
 - 2. Coating: G90 or equivalent.
- C. Steel Sheet for Vertical Deflection Clips: ASTM A 653/A 653M, structural steel, zinc coated, of grade and coating as follows:
 - 1. Grade: 50 , Class 1 or 2.
 - 2. Coating: G90 .

2.3 EXTERIOR NON-LOAD-BEARING WALL FRAMING

- A. Steel Studs: Manufacturer's standard C-shaped steel studs, of web depths indicated, punched, with stiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: As indicated.
 - 2. Flange Width: As indicated.
- B. Steel Track: Manufacturer's standard U-shaped steel track, of web depths indicated, unpunched, with unstiffened flanges, and as follows:
 - 1. Minimum Base-Metal Thickness: Matching steel studs, unless indicated otherwise.
 - 2. Flange Width: As indicated.

2.4 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, knee braces, and girts.
 - 9. Joist hangers and end closures.
 - 10. Hole reinforcing plates.
 - 11. Backer plates.

2.5 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 hex-headed 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 capability to sustain, without failure, a load equal to 5 times design load, as determined by testing per ASTM E 488 conducted by a qualified independent testing agency.
- D. Power-Actuated Anchors: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with capability to sustain, without failure, a load equal to 10 times design load, as determined by testing per ASTM E 1190 conducted by a qualified independent 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.

2.6 MISCELLANEOUS MATERIALS

- A. Galvanizing Repair Paint: SSPC-Paint 20 or DOD-P-21035.
- B. Nonmetallic, Nonshrink Grout: Premixed, nonmetallic, noncorrosive, nonstaining grout containing selected silica sands, portland cement, shrinkage-compensating agents, and plasticizing and water-reducing agents, complying with ASTM C 1107, with fluid consistency and 30-minute working time.
- C. Shims: Load bearing, high-density multimonomer plastic, nonleaching.
- D. Sealer Gaskets: Closed-cell neoprene foam, 1/4 inch thick, selected from manufacturer's standard widths to match width of bottom track or rim track members.

2.7 FABRICATION

- A. Fabricate cold-formed metal 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 metal framing members by welding, screw fastening, clinch fastening, or riveting as standard with fabricator. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, with screw penetrating joined members by not less than three exposed screw threads.
 - 4. Fasten other materials to cold-formed metal framing by welding, bolting, 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 and as follows:
 - 1. Spacing: Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.
 - 2. Squareness: Fabricate each cold-formed metal framing assembly to a maximum out-of-square tolerance of 1/8 inch .

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.
 - 1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

- A. Install load bearing shims or grout between the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations to ensure a uniform bearing surface on supporting concrete or masonry construction.
- B. Install sealer gaskets to isolate the underside of wall bottom track or rim track and the top of foundation wall or slab at stud or joist locations.

3.3 INSTALLATION, GENERAL

- A. Cold-formed metal framing may be shop or field fabricated for installation, or it may be field assembled.
- B. Install cold-formed metal framing according to AISI's "Standard for Cold-Formed Steel Framing - General Provisions" 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 .
- D. Install cold-formed metal 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 metal framing members by welding, screw fastening, clinch fastening, or riveting. Wire tying of framing members is not permitted.
 - a. Comply with AWS D1.3 requirements and procedures for welding, appearance and quality of welds, and methods used in correcting welding work.
 - b. Locate mechanical fasteners and install according to Shop Drawings, 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 and control joints with cold-formed metal framing. Independently frame both sides of joints.
- H. Install insulation, specified in Division 07 Section "Thermal Insulation," in built-up exterior framing members, such as headers, sills, boxed joists, and multiple studs at openings, that are inaccessible on completion of framing work.
- I. Fasten hole reinforcing plate over web penetrations that exceed size of manufacturer's standard punched openings.
- J. Erection Tolerances: Install cold-formed metal framing level, plumb, and true to line to a maximum allowable tolerance variation of 1/8 inch in 10 feet and as follows:

1. Space individual framing members no more than plus or minus 1/8 inch from plan location. Cumulative error shall not exceed minimum fastening requirements of sheathing or other finishing materials.

3.4 EXTERIOR NON-LOAD-BEARING WALL INSTALLATION

- A. Install continuous tracks sized to match studs. Align tracks accurately and securely anchor to supporting structure as indicated.
- B. Fasten both flanges of studs to top and bottom track, unless otherwise indicated. Space studs as follows:
 1. Stud Spacing: As indicated.
- C. Set studs plumb, except as needed for diagonal bracing or required for nonplumb walls or warped surfaces and similar requirements.
- D. Install horizontal bridging in wall studs, spaced in rows indicated on Shop Drawings but not more than 48 inches apart. Fasten at each stud intersection.
 1. Top Bridging for Single Deflection Track: Install row of horizontal bridging within 12 inches of single deflection track. Install a combination of flat, taut, steel sheet straps of width and thickness indicated and stud or stud-track solid blocking of width and thickness matching studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 - a. Install solid blocking at centers indicated.
 2. Bridging: Cold-rolled steel channel, welded or mechanically fastened to webs of punched studs.
 3. Bridging: Combination of flat, taut, steel sheet straps of width and thickness indicated and stud-track solid blocking of width and thickness to match studs. Fasten flat straps to stud flanges and secure solid blocking to stud webs or flanges.
 4. Bridging: Proprietary bridging bars installed according to manufacturer's written instructions.
- E. Install miscellaneous framing and connections, including stud kickers, web stiffeners, clip angles, continuous angles, anchors, fasteners, and stud girts, to provide a complete and stable wall-framing system.

3.5 FIELD QUALITY CONTROL

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

3.6 REPAIRS AND PROTECTION

- A. Galvanizing Repairs: Prepare and repair damaged galvanized coatings on fabricated and installed cold-formed metal 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 metal framing is without damage or deterioration at time of Substantial Completion.

END OF SECTION 05 40 00

SECTION 06 10 53 - ROUGH CARPENTRY

PART 1 - GENERAL

Rough carpentry: Includes carpentry work not specified as part of other sections and which is generally not exposed, except as otherwise indicated.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide product data on chemical and pressure treated wood to the Architect for review.

QUALITY ASSURANCE:

Fire-Retardant Marking: Where required by code, mark each unit of fire-retardant treated lumber and plywood with classification marking of Underwriters Laboratory, Inc., or other testing and inspecting agency acceptable to authorities having jurisdiction. Place marking on surfaces which will not be exposed after installation.

PART 2 - PRODUCTS

LUMBER DESCRIPTION:

Sizes: Lumber shall be dressed to conform to PS 20 and unless otherwise specified, all lumber shall be surfaced four sides (S4S).

Size references, unless otherwise noted, are nominal sizes; actual sizes shall be within manufacturing tolerances allowed by the standard under which it is produced.

Lumber Types: All shall be Southern Pine or Douglas Fir.

CONCEALED BLOCKING:

Lumber shall be #2 Southern Pine or #2 Douglas Fir having a maximum moisture content of 19 percent, stamped "Dry".

In non-combustible building types, provide fire-retardant-treated plywood, sheet metal or other FBC approved material.

PRESERVATIVE TREATED BLOCKING/GROUNDS:

Moisture Treatment: In accordance with the latest publications of The American Wood Preservers Institute.

Lumber in contact with masonry or concrete shall be pressure preservative treated #2 Southern Pine or #2 Douglas Fir.

Water-borne salt preservatives for painted, stained or exposed natural wood.

AWPB LP-2 for above ground use, AWPB LB-22 for ground contact application.

Lumber redried to maximum moisture content of 19 percent, stamped "DRY".

Edge Treatment: Brush-coat surfaces of lumber sawed or cut after treatment with same preservative used originally.

PART 3 - EXECUTION

All rough carpentry work shall conform to the requirements of the Florida Building Code, latest edition or that noted herein or on the drawings, whichever is more stringent.

GENERAL APPLICATION:

The contractor shall coordinate the location and application of rough carpentry work with all other trades to assure that the installation of finish work may be properly executed to fulfill the design requirements.

Check all shop and contract drawings before initiating work to verify locations of supports and joints in connection with other work.

Apply all rough carpentry work in conjunction with the rough hardware, fastening devices and miscellaneous materials noted in Section 06 11 00.

WOOD GROUNDS:

Location: Install permanent and temporary wood grounds as indicated for proper execution of work of all trades. Remove temporary grounds when they are no longer required.

Back Prime: Prime all preservative treated wood with bituminous dampproofing compound as specified in Section 07 11 13, where it will be in contact with any ferrous metals.

Fastening: Except as otherwise required for special locations, form ground of kiln-dried, softwood, 1 1/2" wide, and of thickness to properly align related items of work. Securely fasten grounds into position by means of power-actuated fasteners, annealed wire, nails, brads, bolts, or other methods that will provide maximum results and corrosion resistance, particularly with preservative treated wood.

Ground Anchorage: Hardened corrosion resistant hot dip galvanized steel or stainless steel; nails, expansion bolts, thru bolts, metal plugs, or metal inserts, as most appropriate for each type of masonry or concrete construction shall be used.

WOOD BLOCKING:

Location: Install all wood blocking as required to provide anchorage for other materials. Form to shapes and sizes as indicated or as may be required to accomplish a particular installation. Form blocking of minimum 2" thick material.

Roofing: Form blocking in conjunction with flashings, gutters and gravel stops to shapes as detailed. Stagger built-up boards a minimum of 18" between ends. Anchor with thru bolts, embed bolts, countersunk bolts, including washers and nuts at 16" c.c. in staggered fashion with 2 fasteners at end of boards. Fastener pullout resistance to be not less than 400 lb./fastener. Wood shall be pressure treated, creosote not allowed. Wood shall be No. 2 or better Southern yellow pine, kiln dried, salt pressure-treated in compliance with Fed. Specification TT-550, TT-W-517 and LP-2 of AMPI standards at a minimum.

Anchorage: Wedge, anchor and align blocking to provide a rigid and secure installation of both blocking and other work related thereto.

END OF SECTION 06 10 53

SECTION 06 11 00 - ROUGH HARDWARE

PART 1 - GENERAL

Rough hardware, fastening devices and accessory products shall generally be as manufactured by HECKMAN BUILDING PRODUCTS, INC., Chicago, Illinois or by CLEVELAND STEEL SPECIALTY, Cleveland, Ohio, and shall conform to the Federal Specifications listed herein. Products of this section for all carpentry and woodwork shall be of the type and size best suited for its intended use and as recommended by the Architectural Woodwork Institute (AWI) of America.

PART 2 - PRODUCTS

Rough hardware and fastening devices shall include, but not be limited to the following:

Bolts: Machine, lag, toggle and anchor types, FS FF-B-575C and FS FF-B-584D
Lag Screws and Bolts: FS FF-S-325
Expansion Shields: FS FF-B-561C
Nuts and Washers: FS FF-N-836C
Wood Screws: FS FF-S-111C
Nails and Staples: Common and annular, FS FF-N-105B
Toggle Bolts: FS FF-B-588C
Metal Nailing Disks: 30 ga. min. sheet metal flat caps, 1" diameter minimum

In general, all steel hardware shall be ASTM A 1 or A 36 and all rough hardware and fastening devices to be used at exterior locations or in conjunction with preservative treated wood shall be hot dip galvanized or stainless steel.

Related products for miscellaneous uses include:

Mastic and Adhesives
Building Paper: Kraft or rosin types
Building Felt: Asphalt saturated, ASTM 0226, #15
Back Prime: Use bituminous dampproofing compound per specifications section 07 11 13
Films and Moisture Barriers: Polyethylene sheet
Joint Compounds, Wood Putty

Other products as specified under other sections, as recommended by the manufacturer, may also be used provide all comply with the Florida Building Code, latest edition and are suitably corrosion resistant for long life in keeping with the location used.

PART 3 - EXECUTION

Install and use all fastening devices in accordance with the manufacturers recommendations.

END OF SECTION 06 11 00

SECTION 07 21 00 - BATT INSULATION

PART 1 - GENERAL

DESCRIPTION OF WORK:

Batt insulation shall be furnished and installed in ceiling and wall locations as shown on the drawings. Sizes shown on drawings.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide product data for review by the Architect.

PART 2 - PRODUCTS

Faced Mineral Fiber Blanket/Batt Insulation: Thermal insulation produced by combining mineral fibers of type described below with thermosetting resins to comply with ASTM C 665 for Type III, Un-faced Class A blankets with a flame spread of 25 or less.

Mineral Fiber Type: Fibers manufactured from glass.

Combustion Characteristics: Unfaced blanket/batt passes ASTM E 136 test.

Surface Burning Characteristics: Maximum flame spread and smoke developed values of 25 and 50, respectively.

Auxiliary Insulating Materials:

Adhesive for Bonding Insulation: Type recommended by insulation manufacturer, and complying with fire-resistance requirements. Mechanical Anchors: Type and size shown or, if not shown, as recommended by insulation manufacturer for type of application and condition of substrate.

Mastic Sealer: Type recommended by insulation manufacturer for bonding edge joints between units and filling voids in work.

PART 3 - EXECUTION

All insulation shall be installed in a snug, continuous and secure manner (stapled) whether between roof members, or wall frame or furring members. The entire ceiling and exterior wall spaces adjacent to conditioned spaces shall be filled with the insulation material specified.

The insulation shall be installed after all electric wiring, plumbing, and other concealed work is in place; areas around electrical outlets, pipes, and all other protruding objects shall be snugly fitted.

Tape unsealed edges of insulation to adjacent roof and wall members in a continuous and secure manner. Where manufacturer's vapor barrier attached to fiberglass installation cannot be or is not installed continuously and sealed; provide an independent non-combustible secondary, vapor retarder membrane, i.e.: foil, fiberglass sheet, etc.; which shall be installed continuously and sealed at all edges.

END OF SECTION 07 21 00

SECTION 07 24 00 SUBSTRATE SHEATHING

PART 1 - GENERAL

SCOPE OF WORK:

Provide substrate siding at the wall areas to receive new stucco exterior finish.

SUBMITTALS:

In accordance with Section 01 33 00 - Submittals, provide product data and manufacturer's installation instructions.

Include data to confirm product complies with the Florida Building Code relative to a Florida Product Approval for wind loading.

PART 2 - PRODUCTS

Substrate sheathing shall be that as manufactured by USG United States Gypsum Co., (800) 950-3839, www.usg.com or equal approved by the architect per Section 01 60 00, Substitutions

Substrate Sheathing shall be Aqua Tough of 5/8" thickness.

Fasteners shall be of size as recommended by siding manufacturer and shall be hot dip galvanized or similar non-corrosive type as approved by the architect.

PART 3 - EXECUTION

Install substrate sheathing in strict accordance with manufacturer's written instructions, the Florida Product Approval, and as approved by the architect.

END OF SECTION 07 24 00

SECTION 07 52 16 - STYRENE-BUTADIENE-STYRENE (SBS) MODIFIED BITUMINOUS MEMBRANE ROOFING

PART 1 – GENERAL

SUMMARY OF THE WORK:

The work includes SBS-modified bituminous membrane roofing on flat (1/4" per foot slope) roof areas with rigid insulation on concrete roof deck or steel deck substrate.

RELATED WORK SPECIFIED ELSEWHERE:

Division 03 "Precast Concrete & Concrete Topping"

Division 05 Section "Steel Decking"

Division 06 Section "Miscellaneous Rough Carpentry" for wood nailers, cants, curbs, and blocking

Division 07 Section "Sheet Metal Flashing and Trim" for metal roof penetration flashings, flashings, and counterflashings

Division 22 Section "Storm Drainage Piping Specialties" for roof drains

REFERENCES:

Roofing Terminology: Refer to the following publications for definitions of roofing work related terms in this Section:

- ASTM D 1079 "Terminology Relating to Roofing and Waterproofing"
- Glossary of NRCA's "The NRCA Roofing and Waterproofing Manual"
- Roof Consultants Institute "Glossary of Roofing Terms" for definition of terms related to roofing work in this Section.

Sheet Metal Terminology and Techniques: SMACNA Architectural Sheet Metal Manual

DESIGN CRITERIA:

General: Installed roofing membrane system shall remain watertight; and resist specified wind uplift pressures, thermally induced movement, and exposure to weather without failure.

Material Compatibility: Roofing materials shall be compatible with one another under conditions of service and application required, as demonstrated by roofing system manufacturer based on testing and field experience.

Wind Uplift Performance: Roofing system shall be identical to systems that have been successfully tested by a qualified testing and inspecting agency to resist wind uplift pressure calculated in accordance with ASCE-7 -10 to meet the Florida Building Code Approvals. The following wind uplift pressures were provided by TLC Engineering. The following roof assembly meets the Florida Building Code with the Exterior Research and Design, LLC Trinity Evaluation Report J8230.03.08-R4 for FL2948-R6, System No. S-7.

- Field-of-Roof Uplift Pressure: -55.0 lbf/sq. ft. (kN/sq. m)
- Perimeter Uplift Pressure: -92.2 lbf/sq. ft. (kN/sq. m)
- Corner Uplift Pressure: -138.8 lbf/sq. ft. (kN/sq. m)

SUBMITTALS:

Product Data: Manufacturer's data sheets for each product to be provided.

Detail Drawings: Provide roofing system plans, elevations, sections, details, and details attachment to other Work, including:

- Base flashings, cants, and membrane terminations.
- Tapered insulation, including slopes.
- Crickets, saddles, and tapered edge strips, including slopes.
- Insulation fastening patterns.

Verification Samples: Provide for each product specified.

Maintenance Data: Refer to Johns Manville's latest published documents on www.specJM.com.

Guarantees: Special guarantees specified in this Section.

QUALITY ASSURANCE:

Installer Qualifications: A qualified firm that is approved, authorized, or licensed by roofing system manufacturer to install manufacturer's product and that is eligible to receive the specified manufacturer's guarantee.

Manufacturer Qualifications: A qualified manufacturer that has Florida Building Code for roofing system identical to that used for this Project.

Testing Agency Qualifications: An independent testing agency with the experience and capability to conduct the testing indicated, as documented according to ASTM E 548.

Test Reports:

- Roof drain and leader test or submit plumber's verification.
- Core cut (if requested).
- Roof deck fastener pullout test.

Moisture Survey: Submit prior to installation, results of a non-destructive moisture test of roof system completed by approved third party. Utilize one of the approved methods:

- Infrared Thermography
- Nuclear Backscatter

Source Limitations: Obtain all components from the single source roofing system manufacturer guaranteeing the roofing system. All products used in the system shall be labeled by the single source roofing manufacturer issuing the guarantee.

Provide evidence of CERTA training for any installer of torch-applied modified bitumen membrane. Copies of certifications are required prior to award and must be maintained on the jobsite for inspection at any time.

Fire-Test-Response Characteristics: Provide roofing materials with the fire-test-response characteristics indicated as determined by testing identical products per test method below by UL, or another testing and inspecting agency acceptable to authorities having jurisdiction. Materials shall be identified with appropriate markings of applicable testing and inspecting agency.

- Exterior Fire-Test Exposure: Class [A](#); ASTM E 108, for application and roof slopes indicated.
- Fire-Resistance Ratings: ASTM E 119, for fire-resistance-rated roof assemblies of which roofing system is a part.

DELIVERY, STORAGE, AND HANDLING:

Deliver roofing materials in original containers with seals unbroken and labeled with manufacturer's name, product brand name and type, date of manufacture, and directions for storage.

Store liquid materials in their original undamaged containers in a clean, dry, protected location and within the temperature range required by roofing system manufacturer.

Protect roof insulation materials from physical damage and from deterioration by sunlight, moisture, soiling, and other sources. Comply with insulation manufacturer's written instructions for handling, storing, and protecting during installation.

Handle and store roofing materials and place equipment in a manner to avoid permanent deflection of deck.

PROJECT CONDITIONS:

Weather Limitations: Proceed with installation only when current and forecasted weather conditions permit roofing system to be installed in accordance with manufacturer's written instructions and guarantee requirements.

GUARANTEE:

Provide manufacturer's system guarantee equal to Johns Manville's Peak Advantage No Dollar Limit Roofing System Guarantee.

- Single-Source special guarantee includes roofing plies, base flashings, liquid applied flashing, roofing membrane accessories, [granule surfaced roofing membrane] [roof insulation], [fasteners], [cover board], [substrate board], [vapor retarder], [walkway products], [manufacturer's expansion joints], [manufacturer's edge metal products], and other single-source components of roofing system marketed by the manufacturer.
- Guarantee Period: 20 years from date of Substantial Completion.

Installer's Guarantee: Submit roofing Installer's guarantee, signed by Installer, covering Work of this Section, including all components of roofing system, for the following guarantee period:

- Guarantee Period: Five Years from date of Substantial Completion.

PART 2 – PRODUCTS:

SBS-MODIFIED ASPHALT-SHEET MATERIALS:

Roofing Membrane Sheet: [ASTM D 6164, Grade S, Type I, polyester-reinforced], SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified. Basis of Design: [\[DynaWeld 180 S\]](#)

Roofing Membrane Cap Sheet: [ASTM D 6164, Grade G, Type [I] or [II], polyester-reinforced], SBS-modified asphalt sheet; granular surfaced; suitable for application method specified. Basis of Design: [\[DynaWeld Cap 180 FR\]](#)

BASE FLASHING SHEET MATERIALS – SBS:

Backer Sheet: [ASTM D 6164, Grade S, Type I, polyester-reinforced], SBS-modified asphalt sheet; smooth surfaced; suitable for application method specified. Basis of Design: [[DynaLastic 180 S](#)]

Flashing Sheet: [ASTM D 6164, Grade G, Type II, polyester-reinforced], SBS-modified asphalt sheet; granular surfaced; suitable for application method specified. Basis of Design:] [[DynaWeld Cap 180 FR](#)]

Liquid Applied Flashing: A liquid and fabric reinforced flashing system created with a stitchbonded polyester scrim and a two-component, moisture cured, elastomeric, liquid applied flashing material, consisting of an asphalt extended urethane base material and an activator. Basis of Design: [PermaFlash System](#)

AUXILIARY ROOFING MEMBRANE – BITUMINOUS:

General: Auxiliary materials recommended by roofing system manufacturer for intended use and compatible with built-up roofing.

Asphalt Primer: ASTM D 41. Basis of Design: [Asphalt Primer](#)

Cold-Applied Flashing Adhesive: Roofing system manufacturer's asphalt-based, two-component, asbestos-free, trowel-grade, cold-applied adhesive specially formulated for compatibility and use with flashing applications. Basis of Design: [MBR Flashing Cement](#)

Mastic Sealant: As required by Johns Manville.

Fasteners: Factory-coated steel fasteners and metal or plastic plates meeting corrosion-resistance provisions in FMG 4470, designed for fastening roofing membrane components to substrate, tested by manufacturer for required pullout strength, and provided by the roofing system manufacturer. Basis of Design: [UltraFast Fasteners and Plates](#)

Roofing Granules: Ceramic-coated roofing granules matching specified cap sheet, provided by roofing system manufacturer.

Coating: Acrylic elastomeric coating with unique bleed-blocking properties particularly well suited for coating over asphalt surfaces. Basis of Design: [JM CR Seam Coating](#)

Miscellaneous Accessories: Provide miscellaneous accessories recommended by roofing system manufacturer.

AUXILIARY ROOFING SYSTEM COMPONENTS:

Fascia System: Manufacturer's factory fabricated fascia consisting of a base piece and a snap-on cover. Provide product manufactured and marketed by single-source membrane supplier that is included in the No Dollar Limit guarantee. Basis of Design: [Presto-Tite Fascia](#)

Metal Flashing Sheet: Metal flashing sheet is specified in Division 07 Section "Sheet Metal Flashing and Trim."

WALKWAYS:

Walkway Pads: Mineral-granule-surfaced, reinforced modified asphalt composition, slip-resisting pads, manufactured as a traffic pad for foot traffic provided by roofing system manufacturer, with a pad size of 32 inch x 32 inch. Basis of Design: [Johns Manville DynaTred](#)

COVER BOARD:

Gypsum Board: ASTM C1278, non-faced, gypsum and cellulose fiber substrate, 1/2 inch (13 mm) thick.
Basis of Design: JM [Securock](#) Gypsum-Fiber Roof Board

ROOF INSULATION:

General: Preformed roof insulation boards that comply with requirements and referenced standards, selected from manufacturer's standard sizes and of thicknesses indicated.

Polyisocyanurate Board Insulation: ASTM C 1289, Type II, Basis of Design: [ENRGY 3](#)

- Provide insulation package with R Value greater than R-38
- Install no boards thicker than 2.0". If insulation package required is thicker than 2.0", install in multiple layers.

TAPERED INSULATION:

Tapered Insulation: ASTM C 1289, provide factory-tapered insulation boards fabricated to slope of 1/4 inch per 12 inches (1:48), unless otherwise indicated. Basis of Design: [Tapered ENRGY 3](#)

INSULATION ACCESSORIES:

General: Roof insulation accessories recommended by insulation manufacturer for intended use and compatible with membrane roofing.

Provide factory preformed saddles, crickets, tapered edge strips, and other insulation shapes where indicated for sloping to drain. Fabricate to slopes indicated. Basis of Design: [Tapered Pre-Cut Cricket](#)

Urethane Adhesive: Manufacturer's two component urethane adhesive formulated to adhere insulation to substrate. Basis of Design: [JM Two-Part Urethane Insulation Adhesive](#)

Wood Nailer Strips: Comply with requirements in Division 06 Section "Miscellaneous Rough Carpentry."

PART 3 – EXECUTION

EXAMINATION:

Examine substrates, areas, and conditions for compliance with requirements affecting performance of roofing system:

Proceed with installation only after unsatisfactory conditions have been corrected.

PREPARATION:

Clean and remove from substrate sharp projections, dust, debris, moisture, and other substances detrimental to roofing installation in accordance with roofing system manufacturer's written instructions.

Prevent materials from entering and clogging roof drains and conductors and from spilling or migrating onto surfaces of other construction.

Prime surface of concrete deck with asphalt primer at a rate recommended by roofing manufacturer and allow primer to dry.

Proceed with installation only after unsatisfactory conditions have been corrected.

INSULATION INSTALLATION:

Coordinate installation of roof system components so insulation and cover board is not exposed to precipitation or left exposed at the end of the workday.

Comply with roofing system manufacturer's written instructions for installation of roof insulation and cover board.

Insulation Cant Strips: Install and secure preformed 45-degree insulation cant strips at junctures of roofing membrane system with vertical surfaces or angle changes greater than 45 degrees per manufacturer's instruction.

Install tapered insulation under area of roofing to conform to slopes indicated.

Install insulation boards with long joints in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with like material.

Install one or more layers of insulation under area of roofing to achieve required thickness. Where overall thickness is 2.0 inches or greater, install 2 or more layers with joints of each succeeding layer staggered from joints of previous layer a minimum of 6 inches (150 mm) in each direction.

Trim surface of insulation boards where necessary at roof drains so completed surface is flush and does not restrict flow of water.

Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

Mechanically Fastened to Steel Deck with Subsequent Layers Adhered Insulation: Secure first layer of insulation to deck using mechanical fasteners specifically designed and sized for fastening specified board-type to steel deck type.

- Fasten first layer according to requirements in Florida Building Code Approval for specified Windstorm Resistance Classification.
- Fasten first layer of insulation with 16 fasteners in the field, 28 fasteners at the perimeter, and 39 fasteners in the corners to resist uplift pressure.
- Install subsequent layers in a two-part urethane adhesive according to roofing system manufacturer's instruction.

Adhered Insulation on Concrete Deck: Install each layer of insulation and cover board and adhere to substrate as follows:

- Install each layer in a two-part urethane adhesive in continuous 3/4 inch wide ribbons, 12 inches o.c. in the field, 6 inches o.c. at the perimeter, and 4 inches o.c. in the corners.

Proceed with installation only after unsatisfactory conditions have been corrected.

COVER BOARD INSTALLATION:

Coordinate installing membrane roofing system components so cover board is not exposed to precipitation or left exposed at the end of the workday.

Comply with membrane roofing system manufacturer's written instructions for installing roof cover board.

Install cover board with long joints of cover board in a continuous straight line with end joints staggered between rows, abutting edges and ends between boards. Fill gaps exceeding 1/4 inch (6 mm) with cover board.

- Cut and fit cover board within 1/4 inch (6 mm) of nailers, projections, and penetrations.

Trim surface of cover board where necessary at roof drains so completed surface is flush and does not restrict flow of water.

- Install tapered edge strips at perimeter edges of roof that do not terminate at vertical surfaces.

Adhered Cover Board: Adhere cover board to substrate as follows:

- Install in a two-part urethane adhesive according to roofing system manufacturer's instruction.

Proceed with installation only after unsatisfactory conditions have been corrected.

ROOFING MEMBRANE INSTALLATION, GENERAL:

Install roofing membrane in accordance with roofing system manufacturer's written instructions, applicable recommendations of the roofing manufacturer and requirements in this Section.

Start installation of roofing membrane in presence of roofing system manufacturer's technical personnel.

Where roof slope exceeds 1/2 inch per 12 inches (1:24, contact the membrane manufacturer for installation instructions regarding installation direction and backnailing

Cooperate with testing and inspecting agencies engaged or required to perform services for installing roofing system.

Coordinate installing roofing system so insulation and other components of the roofing membrane system not permanently exposed are not subjected to precipitation or left uncovered at the end of the workday or when rain is imminent.

- Provide tie-offs at end of each day's work to cover exposed roofing membrane sheets and insulation with a course of coated felt set in roofing cement or hot roofing asphalt with joints and edges sealed.
- Complete terminations and base flashings and provide temporary seals to prevent water from entering completed sections of roofing system.
- Remove and discard temporary seals before beginning work on adjoining roofing.

Substrate-Joint Penetrations: Prevent roofing asphalt from penetrating substrate joints, entering building, or damaging roofing system components or adjacent building construction.

Proceed with installation only after unsatisfactory conditions have been corrected.

SBS-MODIFIED BITUMINOUS MEMBRANE INSTALLATION:

Install one modified bituminous roofing membrane sheet and a cap sheet according to roofing manufacturer's written instructions, starting at low point of roofing system. Extend roofing membrane sheets over and terminate beyond cants, installing as follows:

- Torch apply to substrate according to roofing system manufacturer's instruction.
- Unroll roofing membrane sheets and allow them to relax for minimum time period required by manufacturer.

Laps: Accurately align roofing membrane sheets, without stretching, and maintain uniform side and end laps. Stagger end laps. Completely bond and seal laps, leaving no voids.

- Repair tears and voids in laps and lapped seams not completely sealed.
- Apply roofing granules to cover exuded bead at laps while bead is hot.

Install roofing membrane sheets so side and end laps shed water.

Proceed with installation only after unsatisfactory conditions have been corrected.

FLASHING AND STRIPPING INSTALLATION:

Install base flashing over cant strips and other sloping and vertical surfaces, at roof edges, and at penetrations through roof, and secure to substrates according to roofing system manufacturer's written instructions and as follows:

- Prime substrates with asphalt primer if required by roofing system manufacturer.
- Backer Sheet Application: Install backer sheet and torch apply substrate as required by roofing system manufacturer.
- Flashing Sheet Application: Torch apply flashing sheet to substrate as required by roofing system manufacturer.

Extend base flashing up walls or parapets a minimum of 8 inches (200 mm) above roofing membrane and 4 inches (100 mm) onto field of roofing membrane.

Mechanically fasten top of base flashing securely at terminations and perimeter of roofing.

- Seal top termination of base flashing with a strip of glass-fiber fabric set in MBR Flashing cement.

Roof Drains: Flash drain using PermaFlash system. Clamp roofing membrane, flashing, and stripping into roof-drain clamping ring.

- Install stripping according to roofing system manufacturer's written instructions.

Proceed with installation only after unsatisfactory conditions have been corrected.

WALKWAY INSTALLATION:

Walkway Pads: Install walkway pads using units of size indicated or, if not indicated, of manufacturer's standard size according to walkway pad manufacturer's written instructions.

Walkway Cap Sheet Strips: Install roofing membrane walkway cap sheet strips over roofing by torch application. – SBS

Proceed with installation only after unsatisfactory conditions have been corrected.

FIELD QUALITY CONTROL:

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

Roof Inspection: Arrange for roofing system manufacturer's Registered Roof Observer (RRO) to inspect roofing installation at start up and upon completion and submit report to Architect.

Repair or remove and replace components of roofing system where test results or inspections indicate that they do not comply with specified requirements.

Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

PROTECTION AND CLEANING:

Protect roofing system from damage and wear during remainder of construction period.

Clean overspray and spillage from adjacent construction using cleaning agents and procedures recommended by manufacturer of affected construction.

END OF SECTION 07 52 16

SECTION 07 60 00 - METAL FLASHING AND TRIM

PART 1 - GENERAL

DESCRIPTION OF WORK:

Where indicated in the drawings and specified herein, flashing and trim items are to be fabricated of metal sheet of the types and sizes designated or as otherwise required for sound, weather and dust tight joints. All flashing and accessories or other items essential to the completeness of the sheet metal installation, though not specifically shown or called out, are to be furnished. Metal flashing and trim shall be manufactured in compliance with the standards of the SHEET METAL and AIR CONDITIONING CONTRACTORS NATIONAL ASSOCIATION, INC. (SMACNA) Architectural Sheet Metal Manual.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide product data for premanufactured items and shop drawings for all fabricated items for review by the Architect.

PART 2 - PRODUCTS

METAL TYPES:

The type and locations of the various kinds, gauges, thickness and finish of sheet metal to be used is specified hereinafter under the individual items.

Where sheet metal is indicated on drawings and kind and type of metal is not specified or noted, it shall be aluminum, gauge as specified in the SMACNA Manual for the particular function. In some instances, for roof related items, i.e.: coping, flashing, counterflashing and gravel stop galvanized iron, cold rolled copper and stainless steel may be called for. It is advisable that other roofing specification sections and the Division 7 Project Details at the back of the spec. book be reviewed.

Miscellaneous aluminum sheet or flashing shall conform to ASTM 5005-0 and I-114 and SMACNA Manual.

Lead flashings and accessories shall conform to FS QQ-L-201 F(2), Grade B, weighing 4 lbs. per square foot, and shall be used at vent stack pipe flashings and other locations where lead flashing is detailed or typically specified.

Sheet metal gauge or weights listed are minimum. Where size of item requires heavier material, gauges shall be in accordance with the SMACNA Manual.

MINIMUM GAUGES FOR METAL COPING, COUNTERFLASHING AND GRAVEL STOP

EXPOSED FACE WITHOUT BRAKES EXCEPT DRIP EDGE	ALUMINUM NOT APPROVED FOR GRAVEL STOP
4" TO 6" FACE	.040" (18 GA.) FM 1-90
6" TO 8" FACE	.050" (16 GA.) FM 1-90
8" TO 10" FACE	.064" (14 GA.) FM 1-90
10" TO 15" FACE	.080" (12 GA.) FM 1-90 EXTRUDED ONLY

NOTES: CLEATS SHALL BE 1 GAUGE HEAVIER THAN FASCIA METAL
USE 1 GAUGE HEAVIER FOR FM 1-90 APPLICATIONS. REFER TO FM FOR SPECIFIC
WIND RESISTANCE REQUIREMENTS FOR METAL WORK.

GENERAL FLASHING AND TRIM:

Location: Wall edge, wall caps, openings in walls, door and window sill and head sections; above all lintels, ledges, shelf angles, and where otherwise indicated on the drawings and standard details at rear of specification book.

Materials: Unless otherwise noted, above wall flashing and trim is to be aluminum. Treat with bituminous coating on back side where required at contents with dissimilar metals. Refer also to Division 4 for masonry wall flashing.

Size, configuration: See drawings.

Location: As shown on drawings.

Material: Aluminum conforming to ASTM 500-0 and I-114.

Components: Gutter and leader shapes and joints.
Aluminum formed joints and corner covers.

Dimensions: Gutter 4" ht. x 5" wide with 4" x 4" downspouts or as shown in the drawings; Edgings, see drawings; Valleys as recommended by roofing manufacturer.

Gauge: .040" alum. minimum, continuous cleats if .050" alum. minimum.

Finish: Baked enamel, color to be selected by Architect, non-directional texture.

FASTENING MATERIALS:

General: Fastening materials not specified for a particular sheet metal application shall be of the type best suited for the intended purpose. All such items shall be of the same material, or shall be compatible to the base material to which applied, and the gauges shall conform to recognized industry standards of sheet metal practice. Prefabricated items shall be in accordance with manufacturer's written instructions/specifications.

Aluminum Fasteners:

Rivets: ASTM Specification B316, alloy 1100, 5052, 5056, 6053, or 6061, appropriate temper unless specified.

Screws, Bolts, Nuts and Wire: ASTM Specification B211, alloy 1100, 5052, or 60601, appropriate temper, unless otherwise specified.

Nails, Fasteners: Nails shall be minimum 12 gauge flat head, barbed, annular or screw type, of sufficient length to penetrate backing at least 1". Use only soft iron rivets having rust-resistive coating, galvanized nails, and cadmium plated screws and washers in connection with galvanized iron and steel.

Sealing Compounds: In general, sealing compounds referred to herein are specified under Section 07900, Sealants.

Bituminous Plastic Cement: Type 1 with roofing felts.

Plastic Handsetting Sealant: Type as recommended by the aluminum producer.

Accessories: All accessories or other items essential to the completeness of the sheet metal installation, though not specifically shown or specified, shall be provided as required and recommended by SMACNA.

PART 3 - EXECUTION

JOINTS AND CONSTRUCTION:

Exposed edges of sheet metal shall be folded back to form 3/4" - 1" wide hem on the side concealed from view.

Unless otherwise indicated, all fastenings shall be concealed.

Flashing and trim are to be accurately formed with sharp and true angles and edges from standard stock lengths, 10' long typical.

Expansion/contraction joints are to be provided as required, generally at 32' intervals.

Joint Types:

- End Laps: 4", minimum, sealed with plastic cement.
- Butt Joints: Cover or backing, 4" to each side.
- Flat Sheet: Locked seams with sealant.
- Corners: Miter cuts or covered by formed piece.

Cleats or continuous edge strips are to be used at exposed edges and eaves.

Weatherproofing: Finish joints in all flashing watertight and weathertight, and fabricated lap seams in the direction of flow.

APPLICATION:

Sheet metal flashings and trims are to be applied as indicated or required throughout the project building and shall be installed according to standard, approved sheet metal practices. Prefabricated/manufactured items shall be installed per manufacturer's written instructions.

In general, sheet metal work shall include, but not be limited to the following items:

Flashing at roof penetrations.

Gravel stop at parapet and roof edge.

Trim or flashing at the perimeter of fascia structure and siding, windows, doors, roof edges, etc.

FABRICATION/INSTALLATION:

Forming: The flashings shall be formed to the required shapes before installation. Corners shall be factory-formed with joints not less than 12" from the angle. Gravel stop and counter-flashing shall provide a spring action against base flashing.

Shape: Form metal edging and flashing to shape, size and details indicated from one-piece material of suitable width and standard stock lengths. Generally not less than 10' long.

Head and Sill Flashing: Flashing shall start 1/2" from outside face of wall, then through the wall turning up at the inside not less than 2" and extend 8" on each side of the opening.

Prefabricated Items: Prefabricated items, such as gutters, leaders, flashing retainer, etc., shall be installed in strict accordance with manufacturer's instructions and recommendations.

Protection from Contact or Dissimilar Materials:

Aluminum shall not contact other metals, except zinc or zinc coating. Where aluminum contacts another metal, the dissimilar metal shall be painted with a prime coat of zinc-chromate primer or a coat of alkali-resistant, heavy-bodied bituminous paint.

All metals in contact with stucco, concrete or other masonry materials shall be painted with alkali-resistant coatings such as heavy-bodied bituminous paint.

Wood or other absorptive materials that may become repeatedly wet and in contact with metal shall be painted with two coats of aluminum paint or a coat of heavy-bodied bituminous paint.

Dissimilar metal shall be painted with a non-lead-pigmented paint, if drainage from it passes over aluminum.

Cleaning: All exposed sheet metal work shall be cleaned at completion of installation. Grease and oil films, handling marks, contamination from steel wool, filing sand drilling debris shall be removed, and the work scrubbed clean. All exposed metal surfaces shall be free of dents, creases, waves, scratch marks, and solder or weld marks.

END OF SECTION 07 60 00

SECTION 07 84 10 – FIRE RATED PENETRATIONS & JOINTS

PART 1 – GENERAL

DESCRIPTION OF WORK:

The contractor shall enlist the services of a subcontractor or subcontractors skilled in the installation and sealing of penetration thru fire rated floors, walls and any other rated construction joints/penetrations to complete the installation of all rated penetrations in this project. This section shall apply to all other sections, where consistent with the intent herein.

All subcontractors (i.e.: mechanical, electrical, door installer and etc.) shall follow the procedures required herein and shall provide submittals if they intend to self-perform the installation of any rated penetration.

SUBMITTALS:

In accordance with section 01 33 00, provide product data, installation instructions and samples of all products to be used. Include U.L. (or other code approved agency) details or data for each type of penetration and bind into booklet.

CERTIFICATION:

Submit written certification(s) that the contractor or subcontractor has inspected each and every installation of all penetrations thru fire (or smoke) rated partitions/construction.

PART 2 – PRODUCTS

MATERIALS:

Foamed-In-Place Fire-Stopping Sealant: Two-part, foamed-in-place, silicone sealant formulated for use as part of a through-penetration fire-stop system for filling openings around cables, conduit, pipes and similar penetrations through walls and floors, with fire-resistance rating indicated per ASTM E 814, listed by U.L. or other testing and inspecting agency acceptable to authorities having jurisdiction.

One-Part Fire-Stopping Sealant: One part elastomeric sealant formulated for use as part of a through-penetration fire-stop system for sealing openings around cables, conduit, pipes and similar penetrations through walls and floors, listed by U.L. or other testing and inspecting agency acceptable to authorities having jurisdiction.

Accessory Materials: Forming, joint fillers, packing, sleeves and other accessory materials as required for installation of fire/smoke stopping sealants.

PART 3 – EXECUTION

Install sealant, etc. and accessories per the U.L. (or other) design written instructions.

END OF SECTION 07 84 10

SECTION 07 90 00 - JOINT SEALERS

PART 1 - GENERAL

Provide joint sealers at interior and exterior locations throughout the project to insure a fully sealed water and air tight structure. Additionally, to provide for the sealing of fire/smoke rated assemblies. Carefully review other sections of the project specifications for required sealant joints not specifically shown on the drawings or noted herein.

QUALITY ASSURANCE:

Preconstruction Field Tests: Prior to installation of joint sealers, field-test their adhesion to joint substrates as recommended in ASTM C 962.

Warranty: Provide only products which are warranted by manufacturer for a period of 20 years.

It is anticipated that a firm who specializes in the sealing (installation and product types) of buildings will be secured by the general contractor/CM to complete the work of this section.

SUBMITTALS:

In addition to product and warranty data submit the following:

Samples of each type and color of joint sealer for this work.

Schedule of sealants to be used clearly identifying where each type is to be installed. Refer to example Joint Sealant Schedule at end of this section. The contractor or sealant's subcontractor shall prepare a schedule, even if products will be provided by others, and submit it for review. He shall coordinate the work of other trades and assure all products are compatible.

PART 2 - PRODUCTS

Compatibility: Provide joint sealers, joint fillers and other related materials that are compatible with one another and with joint substrates under service and application conditions, as demonstrated by testing and field experience.

Color: Provide color of exposed joint sealers as selected by Architect.

Elastomeric Sealant Standard: Provide manufacturer's standard chemically curing, elastomeric sealant of base polymer indicated, complying with ASTM C 920 requirements.

One-Part Mildew-Resistant Silicone Sealant: Type S; Grade NS; Class 25; Uses NT, G, A, and O; intended for sealing interior joints with nonporous substrates exposed to moisture.

One-Part Nonsag Urethane Sealant: Type S; Grade NS; Class 25; Uses NT, M, A and O.

Acrylic Sealant: Manufacturer's standard one-part nonsag, solvent-release- curing, acrylic terpolymer sealant complying with ASTM C 920 for Type S; Grade NS; Uses NT, M, G, A and O; except for selected test properties which are revised as follows:

Heat-aged hardness:	40 - 50
Weight loss:	15%
Max. cyclic movement capability (Class):	+/- 7 1/2%

Acoustical Sealant for Concealed Joints: Manufacturer's standard, nondrying, nonhardening, nonskinning, nonstaining, gunnable, synthetic rubber sealant recommended for sealing interior concealed joints to reduce transmission of airborne sound.

Cork Joint Filler: Preformed strips complying with ASTM D 1752 for Type II.

Sponge Rubber Joint Filler: Preformed strips of composition below, complying with ASTM D 1751:

Asphalt saturated fiberboard.

Sealant Backings, General: Non-staining; compatible with joint substrates, sealants, primers and other joint fillers; approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

Plastic Foam Joint-Fillers: Preformed, compressible, resilient, non-waxing, non-extruding strips of plastic foam of closed-cell polyethylene foam, non-gassing, and of size, shape and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

Elastomeric Tubing Joint-Fillers: Neoprene, butyl or EPDM tubing complying with ASTM D 1056, non-absorbent to water and gas, capable of remaining resilient at temperatures down to -26 degrees F. (-32 degrees C). Provide products with low compression set and size and shape to provide a secondary seal, to control sealant depth and otherwise contribute to optimum sealant performance.

Bond-Breaker Tape: Polyethylene tape or other plastic tape as recommended by sealant manufacturer for preventing bond between sealant and joint filler or other materials at back (3rd) surface of joint.

Primer: Type as recommended by joint sealer manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint sealer-substrate and field tests.

Accessory Materials for Fire-Stopping Sealants: Forming, joint-fillers, packing and other accessory materials as required for installation of fire-stopping sealants.

PART 3 - EXECUTION

INSTALLATION OF JOINT SEALERS:

General: Comply with joint sealer manufacturer's printed installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

Sealant shall be installed at all necessary locations to insure a water and air tight structure, and where required as part of rated separations. The following schedule is a guide and shall not be a means of limiting the sealant locations.

JOINT SEALER SCHEDULE (GENERAL):

DESCRIPTION OF JOINT CONSTRUCTION AND LOCATION WHERE SEALANT IS
TYPICALLY APPLIED

JOINT SEALERS (GENERAL)

(SEE NOTE BELOW)

One-Part Non-Sag Urethane Sealant

Exterior and interior joints in vertical
surfaces of concrete and masonry;

	between concrete masonry or stone; between metal and concrete, mortar or stone; perimeters of metal frames in exterior walls; overhead or ceiling joints; and on interior of glazed curtain wall.
One-Part Mildew-Resistant Silicone Sealant	Interior joints in vertical surfaces of ceramic tile in toilet rooms, showers, and kitchens.
Acrylic-Emulsion or Latex Sealant	Interior joints in field-painted vertical and over-head surfaces at perimeter of elevator door frames, hollow metal door frames, gypsum drywall, plaster and concrete or concrete masonry; and all other interior locations not indicated otherwise.

Note: Install sealant indicated in joints fitting descriptions and locations listed.

Elastomeric Sealant Installation Standard: Comply with recommendations of ASTM C 962 for use of joint sealants as applicable to materials, applications and conditions indicated.

Latex Sealant Installation Standard: Comply with requirements of ASTM C 790 for use of latex sealants.

Acoustical Sealant Application Standard: Comply with recommendations of ASTM C 919 for use of joint sealants in acoustical applications as applicable to materials, applications and conditions indicated.

Installations of Sealant Backings: Install sealant backings to comply with the following requirements:

Install joint-fillers to provide support of sealants during application and at position required to produce the cross-sectional shapes and depths of installed sealants relative to joint widths which allow optimum sealant movement capability.

Do not leave gaps between ends of joint-fillers.

Do not stretch, twist, puncture or tear joint-fillers.

Remove absorbent joint-fillers which have become wet prior to sealant application and replace with dry material.

Install bond breaker tape between sealants and joint-fillers, compression seals or back of joints where required to prevent third-side adhesion of sealant to back of joint.

Install compressible seals serving as sealant backings to comply with requirements indicated above for joint fillers.

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 substrates, completely filling recesses provided for each joint configuration and providing uniform, cross-sectional shapes and depths relative to joint widths which allow optimum sealant movement capability.

Tooling of Nonsag Sealants: Immediately after sealant application and prior to time skinning or curing begins, tool sealants to form smooth, uniform beads of a concave joint configuration per Figure 6A in ASTM C 962, to eliminate air pockets and to ensure contact and adhesion of sealant with sides of joint. Remove excess sealants from surfaces adjacent to joint. Do not use tooling agents which discolor sealants or adjacent surfaces or are not approved by sealant manufacturer.

PROTECTION AND CLEANING:

Protect joint sealers during and after curing period from contact with contaminating substances or from damage resulting from construction operations or other causes so that they are without deterioration or damage at time of substantial completion. If, despite such protection, damage or deterioration occurs, cut out and remove damaged or deteriorated joint sealers immediately and reseal joints with new materials to produce joint sealer installations with repaired areas indistinguishable from original work.

Clean off excess sealants or sealant smears adjacent to joints as work progresses by methods and with cleaning materials approved by manufacturers of joint sealers and of products in which joints occur.

END OF SECTION 07 90 00

SECTION 08 10 00 - HOLLOW METAL FRAMES

PART 1 - GENERAL

DESCRIPTION OF WORK:

All door and window frames scheduled, or otherwise detailed as hollow metal shall be standard steel frames as furnished by an established manufacturer who regularly engages in the fabrication of such metal components. All metal frames shall be of the types and sizes shown on the drawings and in the door schedule and shall include all standard accessory items. The work includes label frames, see schedule.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide shop drawings, product data, warranty, certifications and tests. Exterior frames shall be certified along with the doors confirming compliance with the Florida Building Code Product Approval. Submit copy of product approval.

PART 2 - PRODUCTS

MATERIALS:

Frames shall be made of commercial grade cold-rolled steel conforming to ASTM designation A-366.

Frame Gauge: Oversize frames shall be formed from 12 gauge steel sheet, all other frames shall be formed from No. 14 gauge steel sheet.

All frames not scheduled to receive weatherstripping shall be equipped with rubber bumpers or silencers on the strike jamb of single doors (minimum 3/jamb) and on the head member of double doors (one/door leaf).

CONSTRUCTION:

Size: All metal door and window frames shall be accurately fabricated to the sizes and shapes shown on the drawings. Frames shall be custom-made units to match the new doors or to fit existing openings where noted.

Shape: Frames shall typically have double rabbeted and cased opening profiles, depth as shown on the drawings, with 2" faces and 1/2" returns typical.

Minimum depths of stops shall be 5/8" or as required for U.L. labeled doors and standard width for all stops shall be in accordance with detail drawings.

Joints: All frames shall be welded unit type with head and jamb members mitered, continuously welded and ground smooth. Door frames shall be provided with steel bottom spreader.

All finished work shall be strong and rigid, neat in appearance, square, true, and free of defects, warp, or buckle. Members shall be clean cut, straight, and of uniform profile throughout their lengths.

HARDWARE PROVISIONS:

Frames shall be prepared at the factory for the installation of hardware. Frames shall be mortised, reinforced, drilled and tapped to templates for all mortised hardware.

Frames shall be mortised for template type hinges conforming to CS 9-65, see hardware schedule.

Minimum thickness of hardware reinforcement plates shall be as follows:

Hinge and pivot reinforcements: No. 7 gauge

Strike, flush bolt, closer and other surface mounted hardware: No. 12 gauge

Dust covers, at all hardware cutouts: No. 24 gauge

ANCHORS:

Wall Anchors: Metal anchors of shapes and sizes required for the adjoining type of wall construction shall be provided as required.

Fabricate jamb anchors of steel, not lighter than the gauge used for frame.

Locate anchors on jambs near the top and bottom of each frame and at intermediate points not over 24" apart.

Provide for securing anchors to wood studs with 1/4" round head machine or wood screws.

Floor Anchors: Floor anchors shall be welded inside each jamb, with holes provided for floor anchorage. Minimum thickness shall be No. 14 gauge.

STOPS AND BEADS:

Metal glazing beads shall be furnished with the hollow metal frames at window openings and other locations where beads are indicated in hollow metal frames.

Drill and tap frames to receive the type of glazing beads, stops and gaskets required.

FINISHES:

After fabrication, before priming, all tool marks and surface imperfections shall be removed, and exposed faces of all welded joints shall be dressed smooth.

All frames shall be galvanized, A60 rating, and shall then be chemically treated to insure maximum paint adhesion and shall be coated on all accessible surfaces with a rust-inhibitive primer. Insides of all frames to be grouted shall also be factory coated with a bituminous water resistant paint.

All frames shall be cleaned, bonderized and shop primed to receive finish painting (Section 09 91 00).

PART 3 - EXECUTION

Frames shall be securely installed according to publication #105 by Steel Door Institute.

Frames shall be carefully plumbed and aligned. Brace frames until permanent anchors are set. Anchor base of frames to floor with non-corrosive expansion bolts or with power fasteners. Grout solid all frames in masonry or concrete walls.

END OF SECTION 08 10 00

SECTION 08 20 00 - WOOD DOORS

PART 1 -GENERAL

SECTION INCLUDES:

Wood doors and transom panels; flush and flush glazed configuration; fire-rated and non-rated as applicable

REFERENCES:

ASTM E90 — Measurement of Airborne Sound Transmission Loss of Building Partitions.

ASTM E152 — Methods of Fire Tests of Door Assemblies.

ASTM E413 — Classification for Determination of Sound Transmission Class.

AWI — Architectural Woodwork Institute Quality Standards.

NFPA 80 — National Fire Protection Association Pamphlet 80 Fire Doors and Windows.

NFPA 252 — National Fire Protection Association Standard Method of Fire Tests for Door Assemblies.

UL 10B — Underwriters Laboratories Fire Tests of Door Assemblies.

DOOR AND PANEL DESCRIPTION:

Flush Interior Doors (Non-rated)

Flush Interior Doors (Fire-Rated)

SUBMITTALS:

Submit under provisions of Section 01 33 00.

Shop Drawings: Illustrate door opening criteria, elevations, sizes, types, swings, undercuts required, special beveling, special blocking for hardware, identify cutouts for glazing, louvers, etc.

Product Data: Indicate door core materials and construction; veneer species, type and characteristics; factory machining criteria and factory finishing criteria.

Samples: Submit one samples of door veneer, 6 X 6 inch in size illustrating wood grain, stain color and sheen or decorative laminate pattern and color as applicable and per Architect's instructions.

REGULATORY REQUIREMENTS:

Fire-Rated Door and Panel Construction: Shall conform to required codes, including ASTM E152, NFPA 252, UL 10B, WHI as applicable.

Installed Door and Panel Assembly: Shall conform to NFPA 80 for fire-rated class as scheduled.

DELIVERY, STORAGE AND HANDLING:

Accept doors at job site in manufacturer's standard packaging. Inspect for damage.

Do not store in damp or wet areas. Cover stored doors with opaque covering material where sunlight might bleach veneer. Seal top and bottom edges if stored more than one week.

Break seal at job site to permit ventilation.

WARRANTY:

Provide manufacturer's warranty including replacement, refinishing and rehanging for the "Life of Original Installation" (unlimited lifetime).

Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 - PRODUCTS

AWI QUALITY STANDARDS:

AWI Quality Standards, Section 1300; core and facing qualities as specified below.

Supply all doors from same manufacturer.

DOOR CORE CONSTRUCTION:

Core (Solid, Non-Rated): AWI Section 1300: Glued Block SLC-7; staved wood, kiln dried softwood, one species per core.

Core (Solid, Fire-Rated): AWI Section 1300: Doors rated 45 minutes or higher shall be 5 ply with mineral core and treated rails for 60 minute or greater rating.

Stiles and Rails: Hardwood treated for rated doors.

DOOR FACING

Veneer (Flush Interior Doors): AWI Type, Premium quality, 1/32 to 1/41 inch (0.8 to 0.62 mm) thick mechanically spliced Birch species wood, rotary cut with pair matched grain, and end matched transoms, as applicable for transparent finish.

Exposed Vertical Edges: Hardwood for transparent finish.

ADHESIVES:

Facing Adhesive: Type I — waterproof

ACCESSORIES:

Vision Frames in Rated Doors: Wood veneer wrapped metal, of same species as facing.

Vision Frames in Non-Rated Doors: Wood of same species as door facing; shape; mitered corners; prepared for countersink style tamper proof screws.

FABRICATION:

Fabricate fire-rated and non-rated doors in accordance with specified manufacturers' and UL requirements.

Meeting Edges for Fire-Rated Double Doors: Steel, T shaped astragal, wood veneer wrapped of same species as facing, overlapping and recessed at face edge, specifically for double doors.

Provide non-rated flush doors with stiles of wood species to match face veneer.

Bond stiles and rails to cores. Sand for uniform thickness.

Factory sand assembled door leaf.

Factory machine doors for finish hardware in accordance with hardware requirements and dimensions. Do not machine for surface hardware.

Factory cut lite and louver openings.

Factory fit doors for frame opening dimensions identified on shop drawings.

Cut and configure exterior door edge to receive recessed weather stripping devices as applicable, see Hardware Schedule.

Provide inner blocks at lock edge and top of door for closer for hardware reinforcement as recommended by door manufacturer.

FINISH:

Factory finish doors in accordance with AWI Quality Standards Section 1500, catalyzed conversion varnish; stain color and sheen to match the existing wood doors elsewhere in the existing building. Wrap and protect door during shipment and on site storage prior to installation.

PART 3 - EXECUTION

EXAMINATION:

Verify that opening sizes and tolerances are acceptable. Do not install doors in frame openings that are not plumb or are out of tolerance for size or alignment.

INSTALLATION:

Install fire-rated and non-rated doors in accordance with AWI Quality Standard, NFPA 80 and to UL requirements. Trim non-rated door width by cutting equally on both jamb edges.

Trim door height by cutting bottom edges to a maximum of 3/4 inch (19 mm). Trim fire-rated door height at bottom edge only, in accordance with fire-rating requirements.

Pilot drill screw and bolt holes using templates provided. Machine cut for hinges and closers. Core for handsets and cylinders.

Coordinate installation of doors with installation of frames and hardware identified in the Door - Window Schedule, Section 08999. Coordinate installation of glass and glazing specified in Section 08 80 00 and Schedule, Section 08 99 99.

ADJUSTING:

Adjust door for smooth and balanced door movement.

END OF SECTION 08 20 00

SECTION 08 41 13 - ALUMINUM FIXED STOREFRONT WINDOWS

PART 1 - GENERAL

DESCRIPTION OF WORK:

Extent of aluminum storefront windows is indicated on drawings and schedules.

SYSTEM PERFORMANCES:

Thermal Movement: Allow for expansion and contraction resulting from ambient temperature range of 120 deg. F. (49 deg. C.).

Wind Loading: Provide capacity to withstand loading, per the loading noted on the windload charts found on the structural drawings.

Transmission Characteristics of Fixed Framing: Comply with requirements indicated below for transmission characteristics and test methods.

- Air and Water Leakages: Air infiltration of not more than 0.06 CFM per sq. ft. of fixed area per ASTM E 283 and no uncontrolled water penetration per ASTM E 331 at pressure differential of 6.24 psf (excluding operable door edges).

QUALITY ASSURANCE:

Drawings: Plans, elevations and details show spacings of members as well as profile and similar dimensional requirements of aluminum entrances and storefront work. Minor deviations will be accepted in order to utilize manufacturer's standard products when, in Architect's sole judgments, such deviations do not materially detract from design concept of intended performances.

TESTING AND PERFORMANCE REQUIREMENTS:

Test Units: All tests, unless otherwise noted, shall conform to the static, cyclic, air and water tests as set forth by the Florida Building Code, latest edition.

SUBMITTALS:

Provide submittals in accordance with Section 01 33 00 and include shop drawings, product data, samples and certified test data indicating compliance with the Building Code impact resistance requirements.

SPECIAL PROJECT WARRANTY:

Provide written warranty signed by Manufacturer, Installer, and Contractor, agreeing to replace aluminum storefront windows which fail in materials or workmanship within time period as indicated below. Failure of materials or workmanship includes excessive leakage or air infiltration, excessive deflections, faulty operation of entrances, deterioration of finish or construction in excess of normal weathering, and defects in hardware, weatherstripping, and other components of the work.

- Time Period: 3 years from date of substantial completion.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS:

Manufacturer: Subject to compliance with requirements, provide products of one of the following:

Kawneer Company, Inc.*
Vistawall Architectural Products
YKK Architectural Products

*Drawings are based on Kawneer's 350 medium stile aluminum entrance and "IR 500" storefront system for "windborne debris" installations. Another equivalent standard system will be considered when differences do not materially detract from design concept or intended performances, as judged solely by the Architect.

MATERIALS AND ACCESSORIES:

Aluminum Members: Alloy and temper recommended by manufacturer for strength, corrosion resistance, and application of required finish; ASTM B 221 for extrusions, ASTM B 209 for sheet/plate.

Fasteners: Aluminum, non-magnetic stainless steel, or other materials warranted by manufacturer to be noncorrosive and compatible with aluminum components.

- Do not use exposed fasteners except where unavoidable for application of hardware. Match finish of adjoining metal and provide Phillips flat-head machine screws for any unavoidable exposed fasteners.

Concealed Flashing: Dead-soft stainless steel, 26 gage minimum, or extruded aluminum, 0.062" minimum, of an alloy and type selected by manufacturer for compatibility with ASTM A 386.

Concrete/Masonry Inserts: Cast-iron, malleable iron, or hot-dip galvanized steel complying with ASTM A 386.

Bituminous Coatings: Cold-applied asphalt mastic complying with SSPC-PS 12, compounded for 30-mil thickness per coat.

Compression Weatherstripping: Manufacturer's standard replaceable stripping of either molded neoprene gaskets complying with ASTM D 2000 or molded PVC gaskets complying with ASTM D 2287.

Sliding Weatherstripping: Manufacturer's standard replaceable stripping of wool, polypropylene, or nylon woven pile, with nylon fabric or aluminum strip backing, complying with AAMA 701.2.

GLASS:

Provide SAF-GLAS 9/16" impact resistant glass by Security Impact Glass or equal as minimally required to meet the certified testing data.

FABRICATION:

Prefabrication: To greatest extent possible, complete fabrication, assembly, finishing, hardware application, and other work before shipment to project site.

Welding: Comply with AWS recommendations to avoid discoloration; grind exposed welds smooth and restore mechanical finish.

Reinforcing: Install reinforcing as necessary for performance requirements; separate dissimilar metals with bituminous paint or other separator which will prevent corrosion.

Fasteners: Conceal fasteners wherever possible.

STOREFRONT FRAMING SYSTEM:

General: Provide inside-outside matched resilient flush-glazed system with provisions for glass replacement. Shop-fabricate and preassemble frame components where possible. System is detailed around Kawneer IR-500, 2 1/2" x 5" framing typically.

FINISHES:

Anodized Aluminum Finishes: Class 2 Clear Anodized Coating: AA-M12C22A31 (match existing)

PART 3 - EXECUTION

PREPARATION:

Take field measurements prior to preparation of shop drawings and fabrication, to ensure proper fitting of work.

INSTALLATION:

Comply with manufacturer's instructions and recommendations for installation of aluminum entrances and storefronts.

Set units plumb, level, and true to line, without warp or rack of framing members, doors, or panels. Anchor securely in place, separating aluminum and other corrodible metal surfaces from sources of corrosion or electrolytic action at points of contact with other materials.

Set sill members and other members in bed of sealant as indicated, or with joint fillers or gaskets as indicated to provide weathertight construction. Aluminum sills to be continuously soldered and sealed. Comply with requirements of Division 7 for sealants, fillers, and gaskets.

ADJUST AND CLEAN:

Adjust operating hardware to function properly, without binding, and to prevent tight fit at contact points and weatherstripping.

Clean complete system, inside and out, promptly after erection and installation of glass and sealants. Remove excess glazing and joint sealants, dirt, and other substances from aluminum surfaces.

END OF SECTION 08 41 13

SECTION 08 71 00 - FINISH HARDWARE

PART 1 - GENERAL

DESCRIPTION OF WORK:

Types of finish hardware required is indicated by manufacturer, in schedules on the construction drawings.

Types of finish hardware required include the following:

Hinges; Pivots; Lock cylinders and keys; Lock and latch sets; Bolts; Exit devices; Push/pull units; Closers; Miscellaneous door control devices; Door trim units; Protection plates; Weatherstripping for exterior doors; Sound stripping for interior doors; and Thresholds.

Hardware for aluminum, special entrance or other doors are specified elsewhere in Division 8.

QUALITY ASSURANCE:

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.

Wind-borne Debris Rating for Exterior Doors: In accordance with current Florida Building Codes, exterior door, frame and hardware are to be tested for wind resistance and damage by wind-borne debris. Only those materials meeting the requirements of the test and codes shall be provided for exterior openings for this work. Proof shall be provided in the form of test results signed by a Licensed Florida Engineer.

Specific hardware types are typically noted in the Door-Window Schedule shown on the drawings or the Specifications. Alternative hardware types or manufacturers providing products equal to or exceeding the specified quality will be considered only during the bid period prior to seven (7) days of the bid date.

Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and governing building code requirements. Provide only hardware which has been tested and listed by UL or FM for types and sizes of doors required and complies with requirements of door and door frame labels.

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".

Typically where fire-rated assemblies are noted, the contractor shall provide all necessary additional hardware and seals whether scheduled or not, to meet NFPA No. 80. In addition, it is the responsibility of the hardware supplier to furnish the proper hardware that is required for all openings, whether or not herein detailed. The hardware supplier shall supply all necessary accessories as drop plates, proper length strikes, and correct size protective plates to meet the requirements for proper operation and function of the hardware.

Where required, the contractor shall provide hardware meeting ANSI A117.1, Specifications for Making Buildings and Facilities Accessible to and Usable by Physically Handicapped People.

Products Requiring Electrical Connection: Listed and classified by Underwriter's Laboratories Inc. (UL) as suitable for the purpose specified and indicated.

SUBMITTALS:

In accordance with Section 01 33 00, Submittal, provide product data and hardware schedule. Include:

Type, style, function, size, and finish of each hardware item.

Name and manufacturer of each item.

Fastenings and other pertinent information.

Location of hardware set cross-referenced to indications on drawings both on floor plans and in door and frame schedule.

Explanation of all abbreviations, symbols, codes, etc. contained in schedule.

Mounting locations for hardware.

Door and frame sizes and materials.

Keying information.

Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

Samples: Prior to submittal of the final hardware schedule and prior to final ordering of finish hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule. Samples will be returned to the supplier.

Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Check shop drawings of such other work, to confirm that adequate provisions are made for proper location and installation of hardware.

Wiring Diagrams: Furnish complete wiring diagrams and any other electrical information direct from the manufacturer if required.

Manufacturer's Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and all weather and sound control hardware.

For Exterior Door Hardware: Submit data indicating compliance with impact, static, cyclic and air test as set forth by the Florida Building Code, latest edition. This data may take the form of test data and reports. All items shall be signed and sealed by an engineer registered in the State of Florida if required by code.

OPERATION AND MAINTENANCE DATA:

Submit under provisions of Section 01 77 00.

Operations and Maintenance Data: At the completion of the job, furnish to the architect the required copies of an Owner's Operation and Maintenance Manual. The manual shall consist of the following:

- Maintenance instructions for each item of hardware.
- Catalog pages for each product
- Data of operating and adjusting hardware

- Lubrication requirements
- Inspection procedures related to preventative maintenance
- Name and phone number of distributor of hardware
- Name and phone number of manufacturer of hardware
- Parts list for each product
- Copy of final as installed hardware schedule
- Copy of final keying and bitting schedule

QUALIFICATIONS:

Manufacturer: Products furnished in the work of this section shall be by a company specializing in manufacturing the products specified in this section with three years documented experience.

Hardware Supplier: The company furnishing the materials under this section shall be a recognized architectural door hardware supplier with a successful in-service performance for supplying door hardware in this geographic area for a period of no less than three years.

WARRANTY:

Warrant door closers against failure due to defective materials and workmanship for a period of ten (10) years. Closers judged defective during this period shall be replaced or repaired at no cost to the owner.

Warrant mechanical exit devices against failure due to defective materials and workmanship for a period of three (3) years. Exit devices judged defective during this period shall be replaced or repaired at no cost to the owner.

The hardware supplier shall provide in writing that all additional materials furnished under this section shall be free from defects in material and workmanship for a period of one year from date of substantial completion of work.

PART 2 - PRODUCTS

MANUFACTURERS:

Reference to specific proprietary products are used to establish the minimum standards of quality to be allowed. Unless otherwise approved by the architect, provide only the products specified in the schedule 'legend' with the Door Schedule on the construction drawings. A request made to furnish a substitute product must be submitted in writing to the architect a minimum of fourteen (14) days prior to the scheduled bid date. The submittal shall include technical data including cut sheets which fully explain the proposed product and how it is different from the product specified. Provide the manufacturer's standard warranty information with the submittal.

GENERAL:

All door hardware shall be new and free from defects affecting the service ability and appearance. All parts shall be properly fitted and work smoothly without unnecessary play.

All door hardware for metal doors and frames shall be installed to template locations, and furnished with the proper fasteners to give complete and satisfactory installation.

Furnish all hardware with the necessary screws, shields, bolts, and other fasteners of suitable size and type to anchor the hardware in position for long life under hard use. Provide concealed fasteners.

Use of self-tapping or sheet metal type screws is prohibited except for application of flush mounted protective plates (flat goods).

Fasteners exposed to the weather shall be of non-ferrous metal or of stainless steel.

MATERIALS AND FABRICATION:

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.

Base Metal: 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 by applicable ANSI A156 series standard for each type hardware item and with ANSI A156.18 for finish designations indicated.

Provide concealed fastener for hardware units which are exposed when door is closed. Do not use thru-bolts for installation, where bolt head or nut on opposite face is exposed in other work.

Tools and Maintenance Instructions for Maintenance: Furnish a complete set of specialized tools and maintenance instructions as needed for Owner's continued adjustment, maintenance, and removal and replacement of finish hardware. The hardware shall include all necessary screws, bolts, expansion shields and other devices necessary for the proper application of the hardware.

HINGES, BUTTS, AND PIVOTS:

Manufacturer: McKinley, Hager or equivalent

Construction: Ball bearing, standard weight

Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

Screws: See above, "General".

Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:

Steel Hinges: Steel pins

Non-ferrous Hinges: Stainless steel pins

Exterior Doors: Non-removable pins

Out-swing Corridor Doors: Non-removable pins

Interior Doors: Non-rising pins

Tips: Flat button and matching plug, finished to match leaves, except where hospital tip (HT) indicated.

Number of hinges: Provide number of hinges indicated but not less than 3 hinges for door leaf for doors 90" or less in height and one additional hinge for each 30" of additional height.

Size: Not less than that specified in schedule. Provide larger size per manufacturer's recommendations for large, oversized or special doors (i.e., X-ray). Provide pivots where applicable and approved by Architect.

Provide hinges with sufficient throw to clear the wall condition and trim when opening to 180 degrees.

LOCK CYLINDERS AND KEYING:

General: Supplier will meet with Owner's Facility representative, not Architect-Engineer, to finalize keying requirements and submit final instructions in writing thru the Architect.

Manufacturers: Refer to schedule on the drawings and provide "Schlage", per local district requirements.

Existing System: Provide new to match existing Master Grand Master system.

Equip locks with cylinders for interchangeable-core pin tumbler inserts. Furnish temporary inserts for the construction period only, and remove these when directed and install cores to match Owner approved keying schedule. Do not install finish cores for Contractor and subcontractors use.

Metals: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.

All locksets shall meet or exceed ANSI 156.2, Grade I, Series 4000, and ANSI A117.1 Accessibility Code.

All levers shall be knurled in areas of hazard in accordance with the State of Florida Accessibility Requirements.

Comply with Owner's instructions for master keying and, except as otherwise indicated, provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

All key blanks shall be "Primus" blanks whether or not lock has a "Primus" cylinder.

Key Material: Provide keys of nickel silver only.

Key Quantity: Furnish 3 change keys for each lock; 5 master keys for each master system; and 5 grand master keys for each grandmaster system.

Deliver keys to Owner's representative and obtain signed receipt for each delivery. Forward copy of receipt to Architect.

Provide a key control system including envelopes, labels, tags with self-locking key clips, receipt forms, 3-way visible card index, temporary markers, permanent markers, and standard metal cabinet, all as recommended by system manufacturer, with capacity for 150% of the number of locks required for the project. Provide hinged-panel type cabinet, for wall mounting.

LOCKS, LATCHES, AND BOLTS:

Manufacturers: Same as for previous paragraph, "Lock Cylinders".

Strikes: Provide manufacturer's standard wrought box strike for each latch or lock bolt, with curved lip extended to protect frame, finished to match hardware set.

Lock Throw: Provide 5/8" minimum throw of latch and deadbolt used on pairs of doors. Comply with UL requirements for throw of bolts and latch bolts on rated fire openings and for exterior doors in windborne debris locales.

Provide 1/2" minimum throw on other latch and deadlock bolts.

Flush Bolt: Minimum of 1/2" diameter rods of brass, bronze or stainless steel, with minimum 12" long rod for doors up to 7'0" in height. Provide longer rods as necessary for doors exceeding 7'0" in height. Provide "dust proof" strikes at floor strikes for all flush or other bolts. Furnish flush bolts in pairs (top and bottom of door). Flush bolts shall have a minimum 5/8 inch throw and a 7/8 inch vertical adjustment.

Exit Device Dogging: Except on fire-rated doors, wherever closers are provided on doors equipped with exit devices, equip the units with keyed dogging device to hold the push bar down and the latch bolt in the open position.

Rabbeted Doors: Where rabbeted door stiles are indicated, provide special rabbeted front on lock and latch units and bolts.

EXIT DEVICES:

Manufacturer: Refer to schedule on the drawings and provide product(s) by "Von Duprin", per local requirements.

Construction: Horizontal push bar of extruded aluminum with steel channel reinforcement. Chassis of heavy duty extruded aluminum. Plastic touch pads are not acceptable. Latch bolts shall have a self-lubricating coating to reduce wear. Plated or plastic coated latch bolts are not acceptable. All strikes shall be of stainless steel roller type construction.

Rating: All devices shall be U.L. rated.

Coordination: Where knob, lever or thumb lever set is specified for outside side of door leaf; the knob and/or lever shall activate the latch assembly.

All exit devices shall incorporate a fluid dampener which decelerates the touch pad on it's return stroke, and thus eliminates the noise associated with exit device operation.

A representative of the manufacturer shall inspect and adjust as necessary all exit devices at substantial completion of the work.

PUSH/PULL UNITS:

Manufacturer: Refer to schedule on the drawings and when not listed, Hager or equal.

Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation; through-bolted for matched pairs, but not for single units. The door pull shall be installed using thru bolts. The head of the thru bolt shall be countersunk on the opposite side of the door from the pull when using a push plate. Do not drill the push plate for the thru bolt to extend thru.

All push plates, kick plates, and armor plates shall be constructed from .05 inch (US 18 ga.) stainless steel (US32D).

All flat goods shall be delivered to the job site with a protective vinyl covering over the entire finished surface. This protective covering shall be removed after the plate has been properly installed on the door.

CLOSERS AND DOOR CONTROL DEVICES:

Manufacturer: Refer to schedule on the drawings and provide Corbin or equal.

Size of Units: Except as otherwise specifically indicated, comply with the manufacturer's recommendations for size of door control unit, depending upon size of door, exposure to weather and anticipated frequency of use.

Provide fully concealed closers when possible; where not, provide parallel arms for all overhead closers.

Closers shall be fully hydraulic, full rack and pinion action with a high strength cast iron cylinder.

Hydraulic fluid shall be type requiring no seasonal adjustment for temperatures 120 degrees F (40 degrees C) to 30 degrees F (-35 degrees C).

Hydraulic regulation shall be tamper-proof, non-critical screw valves, adjustable only with a hex wrench. Closers shall have separate adjustment for latch speed, general closing speed, and hydraulic back check.

All closers mounted with parallel arm mounting shall have forged main and forearm. All closers mounted with regular arm mounting shall have solid forged main arm and adjustable fore arm.

All door closers shall be tested to ANSI/BHMA A156.4 test requirements by a BHMA certified testing laboratory. Upon the request of the architect, a written certification showing successful completion of a minimum of 10,000,000 cycles must be provided.

Closers on exterior doors shall meet the 8.5 pound opening force requirement, and interior closers shall meet the 5 pound opening force requirement in accordance with the State of Florida Accessibility Code Manual. Note: Life Safety NFPA 101 and NFPA 80 supersede.

A representative of the manufacturer shall inspect and adjust as necessary all closers at substantial completion of the work.

DOOR TRIM UNITS:

Manufacturer: Refer to schedule on the drawings and when not listed, provide Hager, or equal.

Fasteners: Provide manufacturer's standard exposed fasteners for door trim units (kick plates, edge trim, viewers, knockers, mail drops, door stops and similar units); either machine screws or self-tapping screw.

Fabricate edge trim of stainless steel, not more than 1/2" nor less than 1/16" smaller in length than door dimension.

Fabricate protection plates (armor, kick, or mop) not more than 1 1/2" less than door width on stop side and not more than 1/2" less than door width on pull side, x the height of 8".

Metal plates: Stainless steel, 0.50" (U.S. 18 gauge).

Door stops: Shall be type that are wall mounted at knob/lever height unless no wall is present, then use floor mounted type. Wall type shall have grey neoprene rubber depressed in center for screw set. Floor type shall be solid rubber, half circle set in metal frame and attached to floor.

SILENCERS:

Provide silencers on all door frames where required.

Furnish three (3) silencers on all single openings, and two (2) silencers on all pair of door openings.

WEATHERSTRIPPING:

Manufacturers: Zero International, Pemko, or equal.

General: Except as otherwise indicated, provide continuous weatherstripping at each edge of every exterior door leaf. Provide smoke seals as required for all labeled doors. Provide type, sizes, and profiles shown or scheduled. Provide non-corrosive fasteners as recommended by manufacturer for application indicated.

Replaceable Seal Strips: Provide only those units where resilient or flexible seal strip is easily replaceable and readily available from stocks maintained by manufacturer.

Weatherstripping at Jambs and Heads: Provide bumper-type resilient insert and metal retainer strips, surface-applied unless shown as mortised or semi-mortised, of following metal, finish, and resilient bumper material:

Extruded aluminum in finish to match door/frames, 0.05" minimum thickness of main walls and flanges.

Flexible bulb or loop insert of vinyl, conforming to MIL R 6055, Class II, Grade 40.

THRESHOLDS:

Manufacturer: Zero International, Pemko, or equal.

General: Except as otherwise indicated provide standard metal threshold unit of type, size, and profile as shown or scheduled.

Exterior Hinged/Pivoted Doors: Provide units not less than 4" wide, formed to accommodate change in floor elevation where indicated, fabricated to accommodate door hardware and to fit door frames, and as follows:

For out-swinging doors provide rabbeted type units with replaceable weatherstrip insert in stop.

HARDWARE FINISHES:

For this work provide finish scheduled in Section 08 99 99 and when not listed;

Exterior use: 630, US 32D - stainless steel metal,

Interior use: 626, US 26D

Other items are specified, submit to Architect for approval.

Provide matching finished for hardware units at each door or opening, to the greatest extent possible, and except as otherwise indicated. Reduce differences in color and textures as much as commercially possible where the base metal or metal forming process is different for individual units of hardware exposed at the same door or opening. In general, match items to the manufacturer's standard finish for the latch and lock set (or push-pull units if no latch-lock sets) for color and texture.

Provide finishes which match those established by BHMA or, if none established, match the Architect's sample.

Provide quality of finish, including thickness of plating or coating (if any), composition, hardness and other qualities complying with manufacturer's standards, but in no case less than specified for the applicable units of hardware by referenced standards.

Provide protective lacquer coating on all exposed hardware finishes of brass, bronze, and aluminum, except as otherwise indicated.

The designations used in schedules and elsewhere to indicate hardware finishes are those listed in ANSI A156.18 "Materials & Finishes Standard", including coordination with the traditional U.S. finishes shown by certain manufacturers for their products.

PART 3 - EXECUTION

INSTALLATION:

Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute; and, as required by the Florida BBBS Accessibility Requirements Manual and ANSI A117.1 latest edition, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect.

Install each hardware item in compliance with the manufacturer's instructions and recommendations. Wherever cutting and fitting is required to install hardware onto or into surfaces which are later to be painted or finished in another way, coordinate removal, storage and reinstallation or application of surface protections with finishing work specified in the Division-9 sections. Do not install surface-mounted items until finishes have been completed on the substrate.

Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

Drill and countersink units which are not factory-prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

Set thresholds for exterior doors in full bed of butyl-rubber or polyisobutylene mastic sealant.

ADJUST AND CLEAN:

Adjust and check each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which can not be adjusted to operate freely and smoothly as intended for the application made. Clean adjacent surfaces soiled by hardware installation.

Final Adjustment: Wherever hardware installation is made more than one month prior to acceptance or occupancy of a space or area, return to the work during the week prior to acceptance or occupancy, and make final check and adjustment of all hardware items in such space or area. Clean operating items as necessary to restore proper function and finish of hardware and doors. Adjust door control devices to compensate for final operation of heating and ventilating equipment.

Instruct Owner's Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

Continued Maintenance Service: Approximately six months after the acceptance of hardware in 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.

END OF SECTION 08 71 00

SECTION 08 80 00 - GLASS AND GLAZING

PART 1 - GENERAL

DESCRIPTION OF WORK:

Glass and glazing materials in windows and doors, see doors and windows schedules.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide product data submit the following:

Samples of each glass indicated, except for clear single pane units; and of each type of sealant or gasket exposed to view.

Certificates of compliance from glass and glazing materials manufacturers.

Test reports for sealant-substrate adhesion and sealant compatibility.

For laminated glass, provide certified test data to verify compliance with the large missile impact and cyclical wind loading requirements of the new Florida Building Code, and to insure product is part of a window system which has been tested. Submit the Florida Product Approval Number for same. Or, if acceptable with the local code authority, provide Miami-Dade County Code acceptance approval.

QUALITY ASSURANCE:

Glazing Standard: Comply with FGMA "Glazing Manual" and "Sealant Manual".

Safety Glazing Standard: Comply with ANSI Z97.1 and testing requirements of 16 CFR Part 1201 for category II materials.

Fire Resistance Rated Clear Glass: Provide UL labeled and listed products, identical with those tested per ASTM E 163 (UL 9), ANSI Z97.1 for impact.

PART 2 - PRODUCTS

Glass Manufacturers: Subject to compliance with requirements, provide products by one of the following, other manufacturers may be considered:

Ford Glass Div.
LOF Glass, Inc.
PPG Industries Inc.
Technical Glass Products
Glasslam, N.G.I., Inc.

Sizes: Fabricate glass of thicknesses indicated or required to comply with expected loading and to sizes required for glazing openings indicated, with edge clearances and tolerances complying with recommendations of glass manufacturer.

Primary Glass Products: Comply with ASTM C 1036 for the following:

Clear Float Glass: Type I, Class 1, Quality q3.

Fire Rated Clear Impact Resistant Glass: Firelite or Firelite Plus, 1/4" thick, as mfg. by Tech. Glass Products.

Uncoated Heat-Treated Glass Products: Comply with ASTM C 1048 and with manufacturing process indicated for the following:

- Clear Tempered Float Glass: Kind FT, Condition A, Type I, Class 1, Quality q3.

Laminated Glass: Provide Safety - Plus products by Glasslam, N.G.I., Inc. in 3/8", 1/2" or thickness required. Provide verification product passes the Large Missile Impact test as approved by the New Florida Building Code.

Glazing Sealant: Comply with sealant and glass manufacturers for selection of glass sealants which suit project application and installation conditions and which are compatible with surfaces contacted. Provide color of exposed sealants indicated or as selected by Architect.

Dense Elastomeric Compression Seal Gaskets: ASTM C 864, extruded or molded neoprene, EPDM, or thermoplastic polyolefin rubber.

Cellular Elastomeric Preformed Gaskets: ASTM C 509, Type II, black; extruded or molded neoprene.

Cleaners, Primers and Sealers: Type recommended by manufacturer of sealants/gaskets.

Blocks and Spacers: Neoprene, EPDM or silicone as required for compatibility with glazing sealants; of 80 to 90 Shore A hardness for setting blocks and, for spacers and edge blocks, of hardness recommended by glass and sealant manufacturer for application indicated.

Compressible Filler Rods: Closed-cell or waterproof-jacketed rod stock of synthetic rubber or plastic foam, 5-10 psi compression strength for 25% compression.

PART 3 - EXECUTION

General: Comply with referenced FGMA standards and instructions of manufacturers of glass, glazing sealants, and gaskets, to achieve airtight and watertight performance, and to minimize breakage.

Protect glass from edge damage during handling and installation. Inspect glass during installation and discard pieces with edge damage that could affect glass performance.

Set units of glass in each series with uniformity of pattern, draw, bow and similar characteristics.

Protect glass from contact with contaminating substances resulting from construction operations; remove any such substances by method approved by glass manufacturer.

Wash glass on both faces not more than 4 days prior to date scheduled for inspections intended to establish date of substantial completion. Wash glass by method recommended by glass manufacturer.

END OF SECTION 08 80 00

SECTION 08 91 19 – FIXED LOUVERS

PART 1 - GENERAL

DESCRIPTION OF WORK:

The extent of fixed louvers is indicated on drawings, including indications of sizes and locations.

Types of louvers include: Extruded aluminum louvers near peak of raised metal sloped roof areas.

QUALITY ASSURANCE:

Performance Requirements: Where louvers are indicated to comply with specific performance requirements, provide units whose performance ratings have been determined in compliance with Air Movement and Control Association (AMCA) Standard 500 and in a simulated HEVAC test that utilizes wind, system air-flow and rain effects.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide product data, certified test data, which confirms compliance with test protocols associated to the Florida Product Approval including PA-100A, PA-201, PA-202 and PA-203, shop drawings, and connections to adjoining work for review by the Architect.

Louvers shall be fabricated and installed in accordance with the manufacturer's recommendations to meet Product Approval installation data.

PART 2 - PRODUCTS

MANUFACTURER:

Subject to compliance with requirements, provide products by Ruskin (www.ruskin.com). Similar products by other manufacturers which meet or exceed these specification will be considered per Section 01 60 00, Products and Substitutions.

MATERIALS:

Aluminum Extrusions: ASTM B 221, Alloy 6063-T52.

Fastenings: Use same material as items fastened, unless otherwise indicated. Fasteners for exterior applications may be hot-dip galvanized, stainless steel or aluminum. Provide types, gages and lengths to suit unit installation conditions. Use Phillips flat-head machine screws for exposed fasteners, unless otherwise indicated.

Anchors and Inserts: Use non-ferrous metal or hot-dip galvanized anchors and inserts for exterior installations and elsewhere are required for corrosion resistance. Use steel or lead expansion bolt devices for drilled-in-place anchors.

Bituminous Paint: SSPC-Paint 12 (cold-applied asphalt mastic).

FABRICATION, GENERAL:

Provide louvers and accessories of design, materials, sizes, depth, arrangement, and metal thicknesses as required for optimum performance with respect to airflow; restrictive water penetration blade; strength; durability; and uniform appearance.

Fabricate frames including integral sills to suit adjacent construction with tolerances for installation, including application of sealants in joints between louvers and adjoining work.

Include supports, anchorages, and accessories required for complete assembly.

Provide vertical mullions of type and at spacings not further apart than recommended by manufacturer. At horizontal joints between louver units provide horizontal mullions except where continuous vertical assemblies are indicated.

Provide sill extensions and loose sills made of same material as louvers, where indicated, or required for drainage to exterior and to prevent water penetrating to interior.

Join frame members to one another and to stationary louver blades by welding, except where indicated otherwise or where field bolted connections between frame members are made necessary by size of louvers. Maintain equal blade spacing, including separation between blades and frames at head and sill, to produce uniform appearance.

STATIONARY EXTRUDED WALL ALUMINUM LOUVERS:

Basis of Design: Model EME6625 by Ruskin, Kansas City, MO is the basis of design. Any or equal must provide equal or better results for free area and wind driven water penetration to be considered.

LOUVER SCREENS:

Provide removable screens for exterior louvers at exterior faces.

Fabricate screen frames of same metal and finish as louver units to which secured, unless otherwise indicated.

- Provide rewirable frames consisting of formed or extruded metal with a driven spline or insert for securing screen mesh.

Use insect screens of 0.011" aluminum wire.

METAL FINISHES:

Comply with NAAMM "Metal Finished Manual" for finish designations and application recommendations, except as otherwise indicated.

Aluminum Finishes: High-Performance Coating: AA-C12C42R1x, Inhibitive thermo-cured primer, 0.2 mil minimum dry film thickness, and thermo-cured fluorocarbon coating containing "Kynar 500" resin, 1.0 mil minimum dry film thickness, or clear Class II anodize coating.

MISCELLANEOUS ACCESSORIES:

Provide all fasteners, adhesives and fittings necessary for a complete installation.

At the back side of the louver, provide a metal pan (scoop) as shown in the drawing. Metal shall be aluminum sheet installed to drain back to and out of the louver.

PART 3 - EXECUTION

INSTALLATION:

Install all subflashings.

Locate and place louver units plumb, level and in proper alignment with adjacent work.

Use concealed anchorages wherever possible. Provide brass or lead washers fitted to screws where required to protect metal surfaces and to make a weathertight connection.

Form tight joints with exposed connections accurately fitted together. Provide reveals and openings for sealants and joint fillers.

Repair finishes damaged by cutting, welding, soldering and grinding operations require for fitting and jointing. Restore finishes so there is no evidence of corrective work. Return items which can not be refinished in field to shop, make required alterations, and refinish entire unit, or provide new units, at Contractor's option.

Protect non-ferrous metal surfaces from corrosion or galvanic action by application of a heavy coating of bituminous paint on surfaces which will be in contact with concrete, masonry or dissimilar metals.

Provide concealed gaskets, flashings, joint fillers, and insulations, and install as work progresses to make installations weathertight.

Refer to Division 7 sections for sealants in connection with installations of louvers.

END OF SECTION 08 91 19

SECTION 09 12 00 - CEILING SUSPENSION SYSTEMS

PART 1 GENERAL

DESCRIPTION OF WORK:

Provide suspension systems for exposed grid suspension systems, and concealed suspension system for interior gypsum board ceilings. Refer to drawings and finish schedule, section 09 99 99.

Materials and equipment furnished and installed under other Divisions/ Sections, but related to this section:

- Luminaires, ballasts, lenses, lamps: Division 26 - Electrical/Lighting.
- Air diffusers, return air grilles: Division 23 - Mechanical.
- Gypsum Wall Board: Section 09 29 00
- Acoustical Ceiling Panels: Section 09 51 20

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide shop drawings, product data and samples for review by the Architect.

Give careful consideration to expansion contraction of large expanses of solid ceilings which would require control of expansion and contraction. Provide shop drawings to indicate proposed joint locations including the necessary joint types.

PART 2 - PRODUCTS

EXPOSED GRID SUSPENSION SYSTEMS (FOR ACOUSTICAL LAY-IN PANELS):

Design: Suspension systems shall be designed to comply with ASTM C635 and to support lay-in units with deflection of suspension members not to exceed 1/360 of span of member.

Components: Systems shall consist of main support tees, cross tees, splice clips, wall angles, hold-down clips, and all miscellaneous moldings.

- Main Tees: 15/16 exposed flange, integral reverse splice, cross tee holes 6" o.c.
- Cross Tees: 15/16 exposed flange, interlocking tee web, lower flange extended and offset to provide a flush, level appearance.
- Wall Molding: Channel or angle shape, hemmed edges, 1" exposed face or 9/16" narrow grid as the case may be, see Section 09512, Ceiling Panels.

Systems:

- Location: Use in conjunction with 2' x 2' lay-in acoustic panels.
- Type: Exposed tee grid (two-way).
- Construction: Double web tee design with bulb and hemmed edges.
- Material: Commercial quality cold rolled steel.
- Color/Finish: To be selected by Architect.
- Pattern: 2' x 2' layout as indicated on drawings/schedules.

Clips for securing hangers to steel structural members shall be of a type to develop fully the strength of the hanger, and shall be approved by the Architect.

Wire: Minimum No. 12 gauge galvanized steel wire.

SUSPENSION SYSTEM FOR GYPSUM BOARD CEILINGS:

Design Loads: The suspension system shall support the ceiling assembly as shown on drawings or as specified herein, with a maximum deflection of 1/360 of the span.

Components: System shall consist of main support tees, cross tees, splice clips, wall angles, hold down clips, and all miscellaneous moldings.

- Main tees: 1 1/2" flange with a rolled cap, cross-tee holes located a minimum 8" o.c., hanger holes located on 2" centers, and with an integral reversible holding mechanism.
- Cross tees: 1 1/2" flange with a rolled cap, and web extended and formed to provide a positive mechanical interlock with main tees.
- Wall track: Formed in a channel shape with 1 9/16" I.D. and 1" legs.
- Vertical Suspension Rod: Of same material as tees, used in lieu of wire in exterior soffit conditions.

System:

- Location: Use in conjunction with gypsum board and F.R. gypsum board.
System concealed from view.
- Construction: Double web tee design with bulb and hemmed edges.
- Material: Commercial quality cold rolled steel.
- Pattern: 1'4" x 4'0" maximum size of grid layout, unless larger is required at light fixture(s).

Fire rated system shall be similar to standard system but include fire expansion details and shall be labeled by UL for rated assembly.

Clip for securing hangers to steel structural members shall be of a type to develop fully the strength of the hanger.

Wire shall be a minimum of No. 12 (0.106" diameter) galvanized steel wire.

OTHER MATERIALS:

Provide all other trim, including clips, wire ties, fasteners, expansion/control joints, brackets, support yokes, anchor straps, personnel and visual access panels, etc., not specifically mentioned herein, but required for a complete, and secure installation of work under this and related sections.

PART 3 - EXECUTION

COORDINATION:

Grid systems and tile lines are primarily modular ceiling systems to which other Divisions/Sections must work. Protrusions of other Divisions/Sections must be symmetrically and consistently placed with respect to grid systems and/or tile lines.

Erect suspension grillage and/or grid systems, suspended from structure above and provide any necessary sub-suspension systems to avoid work of other Divisions/Sections, and appropriate edge and other trim. Construct all required fascias and soffits. If main runners occur normal to joists, install hangers from joist to top chords.

Cooperate with other Divisions/Sections in construction of grid system so that work of others which penetrates grid system is centered in panels. Random placement of work of other Divisions/Sections will not be accepted.

GENERAL:

Lay out major grid lines at given elevations. Unless otherwise shown, center systems in space with grid parallel with walls.

Secure an inspection and approval of Architect; make any necessary adjustments and proceed with installation after receipt of approval.

Erect grid systems so that joints occur at grid member intersections; systems must have all joists neatly cut, well trimmed, and closely fit.

Comply with all requirements of ASTM C636 and U.L. directory when specific rated ceiling systems are indicated. Comply with more stringent requirements noted herein or on the drawings.

TOLERANCES:

Flatness: Maximum deviation from true plane at required elevation; 1/4" in any space and 1/8" in any 12'0".

Parallelness: Maximum deviation from required grid; 1/4" in entire space.

Bow: Maximum; 1/360 span.

SUPPORT:

Where hangers fall at structural members, secure hanger wire around or to structural member.

Provide adequate support and backing for surface mounted fixtures/devices.

Place channel supports for ceiling supply air diffusers.

Erect trusses for luminaires support.

Wire hangers must be securely attached to structure. Grid members for finished ceiling are then to be installed as required following required codes, regulations and manufacturer's instructions.

Fire rated gypsum board ceiling must retain its integrity. Any penetrations must be taped, patched and/or sealed to retain rating.

END OF SECTION 09 12 00

SECTION 09 12 50 - INTERIOR NON-BEARING METAL FRAMING

PART 1 - GENERAL

DESCRIPTION OF WORK:

The work includes the items specified herein and/or shown in the drawings for interior non-bearing metal studs, framing and furring.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide product data for review by the architect.

QUALITY ASSURANCE:

Fire Resistance Rating: Where metal studs or furring are identified as a part of fire rated construction provide materials and installations which are identical to those assemblies tested per ASTM E119 and by fire testing laboratories acceptable to authorities having jurisdiction at the project location.

Provide rated fire resistance assemblies identical to those listed in the latest U.L. "Fire Resistance Directory."

Comply with "Gypsum Construction Handbook" published by United States Gypsum Co.

PART 2 - PRODUCTS/MATERIALS

STUDS, FRAMING AND FURRING:

Comply with ASTM C645 and provide minimum 22 gage thick base metal material, or greater where local codes or manufacturers written literature require it even though not specifically designated herein or detailed on the drawings.

Depth of Section: 3 5/8" minimum depth of section unless specifically detailed as less; greater where noted, or required for height or lateral stability, or as recommended by manufacturer's written literature.

Runners: Match studs with type as recommended in manufacturer's literature for floor, ceiling or vertical abutment conditions, including that for deflection.

Furring sections for this work shall be 'Z' zee shaped.

Depth of furring section shall be 1 1/2" minimum or of a size required to match insulation thickness.

All members shall be galvanized, A60 minimally.

FASTENERS:

Comply with type and size as recommended in manufacturer's literature for substrate and application indicated.

PART 3 - EXECUTION

INSTALLATION OF METAL SUPPORT SYSTEMS:

General:

Metal Support Installation Standard: Comply with ASTM C754.

Do not bridge building expansion joints with support system; frame both sides of joints with furring and other support as indicated.

Wall/Partition Support Systems:

Install supplementary framing, blocking and bracing at termination in the work and for support of fixtures, equipment, services, heavy trim, grab bars, toilet accessories, furnishings and similar work, to comply with applicable published recommendations of gypsum board manufacturer or if not available, of "Gypsum Construction Handbook" published by United States Gypsum Co.

Isolate stud system from transfer of structural loading to system, both horizontally and vertically. Provide slip or cushioned type joints to attain lateral support and avoid axial loading.

Install runner tracks at floors, ceiling and structural walls and columns where gypsum drywall stud system abuts other work, except as otherwise indicated. Set track on 2X pressure treated wood plate also coated with dampproofing at toilet or wet areas. Set track in two strips of sealant at all other locations.

Extend partition stud system through acoustical ceilings and elsewhere at minimum of 4'0" intervals to the structural support.

Space all members at 16" o.c., unless otherwise indicated.

Frame door openings to comply with details indicated or to comply with applicable published recommendations of gypsum board manufacturer, or if not available, of "Gypsum Construction Handbook" published by United States Gypsum Co. Attach vertical studs at jambs with screws either directly to frames or to jamb anchor clips on door frames; install runner track section (for jack studs) at head and secure to jamb studs.

- Extend vertical jamb studs through suspended ceilings and attach to underside of floor or roof structure above, unless otherwise indicated.

Frame openings other than door openings to comply with details indicated or if not indicated, in same manner as required for door openings; and install framing below sills of openings to match framing required above door heads.

Space wall furring members 16" o.c., unless otherwise indicated.

END OF SECTION 09 12 50

SECTION 09 24 00 - LATH AND STUCCO

PART 1 GENERAL

SCOPE OF WORK:

Provide metal furring, lathing and Portland cement stucco.

QUALITY ASSURANCE:

Single Source Responsibility: Obtain gypsum lath and stucco from a single manufacturer.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide product data for cementitious materials and all accessories. Provide 24" x 24" mock-up samples of textures for review and approval by Architect.

DELIVERY, STORAGE AND HANDLING:

Deliver materials in original packages, containers or bundles bearing brand name and identification of manufacturer.

Store materials inside, under cover and in manner to keep them dry, protected from weather, direct sunlight, surface contamination, aging, corrosion, and damage from construction traffic and other causes. Neatly stack gypsum lath flat to prevent deformation.

PROJECT CONDITIONS:

Environmental Requirements: Comply with requirements of referenced application standards and recommendations of materials manufacturer for environmental conditions before, during, and after application of stucco.

Cold Weather Protection: When ambient outdoor temperatures are below 55 degrees F (13 degrees C), maintain continuous uniform temperature of not less than 55 degrees F (13 degrees C), nor more than 70 degrees F (21 degrees C), for not less than 1 week prior to beginning stucco application, during its application, and until stucco is dry but for not less than one week after application is complete.

Ventilation: Ventilate building spaces as required to remove water in excess of that required for hydration of stucco. Begin ventilation immediately after stucco is applied and continue until it sets.

Protect contiguous work from soiling, spattering, moisture deterioration and other harmful effects which might result from plastering.

PART 2 - PRODUCTS

MANUFACTURERS:

Provide products by a recognized manufacturer whose products comply with the referenced materials and application standards as noted herein or intended for a complete guaranteed installation.

MATERIALS:

Expanded Metal Lath: ASTM C 647, fabricated from zinc-coated (galvanized) steel sheet of type and configuration indicated below:

Self-Furring Diamond Mesh Lath: 3.4 lbs. per sq. yd.

Paper Backing for Diamond Mesh Lath: FS UU-B-790, Type I, Grade D, Style 2; provide where indicated.

3.8" Rib Lath: 3.4 lbs. per sq. yd.

Lath Attachment Devices: Of materials and type required by standard and recommended by lath manufacturer for application indicated.

Base Coat Cements:

- Portland Cement, ASTM C150, Type I or III

Finish Coat:

- Portland Cement, ASTM C150, Type 1

- Finishing Hydrate Limes: ASTM C 206, Type S.

Aggregates for Base Coat:

- Sand aggregate, per ASTM C35 unless otherwise indicated.

Aggregates for Finish Coat Stucco with Floated Finish:

- Sand aggregate, per ASTM C35, graded per ASTM C842

Water for Mixing and Finishing Stucco: Drinkable, free of substances deleterious to plaster or lath.

Hanger Anchorage Devices: Screws, concrete inserts or other devices appropriate for anchorage to the form of structural framing indicated and whose suitability for use intended has been proven through standard construction practices or certified test data. Use only long life corrosion resistant devices.

Size devices to develop full strength of hanger but not less than 3 times calculated hanger loading, except size direct pullout concrete inserts for 5 x calculated hanger loading.

Bonding compound: ASTM C 631.

ACCESSORIES:

Provide type recommended by lath manufacturer and as shown on the drawings.

Provide zinc alloy units including corner beads, casing beads, base screeds, cornerite, stripite, control joints and scoring beads. Vinyl (PVC) accessories will be considered. Zinc coated steel is not acceptable.

Provide extruded aluminum reveals and trim of size and thickness noted or required by the installation called for on all drawings. Reveal shall be equal to the Fry Channel Screed as

manufactured by The Fry Reglet Co. Extruded aluminum, concealed fastening, caulked joints, color of reveal per architect, factory applied.

MIXES AND COMPOSITIONS:

General: Comply with ASTM C 926 for Portland cement plaster base and finish coat mixes as applicable to plaster bases, materials and other requirements and indicated.

Portland Cement Stucco Base Coat Mixes and Compositions: Proportion materials for respective base coats in parts by volume for cementitious materials and in parts by volume per sum of cementitious materials for aggregates to comply with the following requirements for each method of application and plaster base indicated. Adjust mix proportions below within limits specified to attain workability.

Three-Coat Work Over Metal Lath: Base coats as indicated below:

- Scratch Coat: 1 part Portland cement, 2 1/2 - 4 parts sand
- Brown Coat: 1 part Portland cement, 3 - 5 parts sand

Three-Coat Work over Concrete and Concrete Unit Masonry: Base coat as indicated below:

- Scratch Coat: 1 part Portland cement, 2 1/2 - 4 parts sand
- Brown Coat: 1 part Portland cement, 3 - 5 parts sand.

Skim coat plaster/stucco where noted shall be a minimum 3/8" Portland cement and sand finish coat of a texture as specified by Architect.

Finish Coats: Proportion materials for finish coats to comply with stucco manufacturer directions and ASTM C 842.

Finish textures shall be smooth sand finish.

PART 3 - EXECUTION

PREPARATION AND INSTALLATION:

Interior Lathing and Furring Installation Standard: Install lathing and furring materials indicated for gypsum plaster to comply with ASTM C 841.

Portland Cement Stucco Application Standard: Apply Portland cement concrete stucco materials, compositions, and mixes to comply with ASTM C 926.

Number of Coats: Apply Portland cement plaster, of composition indicated, to comply with the following requirements:

- Use three-coat work over lath bases (interior and exterior applications)
- Use three-coat work over concrete and unit masonry (exterior applications)
- Use two-coat work over concrete and unit masonry (interior applications)

Apply bond coat to concrete (cast-in-place or precast) when surface complies with ASTM C 926 for stucco bonded direct to solid base.

Moist cure Portland cement stucco base and finish coats to comply with ASTM C 926, including recommendations for time between coats and curing in "Annex A2 Design Considerations".

CUTTING AND PATCHING:

Cut, patch, point-up and repair plaster as necessary to accommodate other work and to repair cracks, dents and imperfections. Repair or replace work to eliminate blisters, buckles, excessive crazing and check cracking, dry-outs, efflorescence, sweat-outs and similar defects, and where bond to the substrate has failed.

Sand smooth-troweled finishes lightly to remove trowel marks and arises.

CLEANING AND PROTECTION:

Remove temporary protection and enclosure of other work. Promptly remove stucco from door frames, windows, and other surfaces which are not to be stuccoed. Repair floors, walls and other surfaces which have been stained, marred or otherwise damaged during the stucco work. When work is completed, remove unused materials, containers and equipment and clean floors of stucco debris.

Provide final protection and maintain conditions, in a manner suitable to Installer, which ensure work being without damage or deterioration at time of substantial completion.

END OF SECTION 09 24 00

SECTION 09 29 00 - GYPSUM DRYWALL

PART 1 GENERAL

DESCRIPTION OF WORK:

Provide gypsum board where noted herein, in the finish schedule and details. The work includes drywall finishing. Refer to section 09 29 10 Tile Backer Board for special wallboard to be used behind ceramic tile.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide product data and drawings.

When not shown, prepare shop drawings which will locate expansion control per USG recommendations.

PROJECT CONDITIONS:

Interior drywall shall not be stored on the site or installed until building roof and walls are in place.

PART 2 - PRODUCTS

MANUFACTURER:

Gypsum wallboard and general drywall system materials shall be products equivalent to those manufactured by UNITED STATES GYPSUM (USG), Chicago, Illinois, Gold Bond Products, Louisiana Pacific Corp. and the Ameray Corporation of Randolph, New Jersey. Gypsum wallboard products shall be of the types described herein and the drywall system shall further include all other accessory items required for a complete installation.

GYPSUM WALLBOARD:

All wallboard shall be furnished in 48" widths with tapered edges, in lengths as great as practicable to minimize number of joints. Wallboard shall be 5/8" thick minimum unless otherwise noted.

Regular Gypsum Wallboard: Wallboard shall be in accordance with ASTM C36 and FS SS-L-30C, Type III, Grade R, Class 1.

Moisture Resistant Gypsum Wallboard: Wallboard shall conform to ASTM C630 and FS SS-L-30D, Type VII, Grade 'R' or 'X' where core and both faces are specially treated.

Location: Bathroom and toilet walls (adjacent to tile areas) and ceilings; between base and upper cabinets at sink areas; and, other similar locations.

Type "X" Gypsum Panels for Fire-Resistant Rated Assemblies: Wallboard shall conform to ASTM C36 and FS-SS-L-30C Type III, Grade X, where core is specially treated highly resistant to fire.

High Impact Resistant Gypsum Wallboard Panels: Impact resistant wallboard which conforms to ASTM C36 and C1396, FS-SS-L-30D, Type III Grade X (Gypsum Tough Rock).

OTHER MATERIALS:

Drywall Accessories: Provide miscellaneous shapes to finish drywall board installation; this includes but is not limited to corner beads, 'J' beads, reveals, control joints, drywall expansion joints, radius corners, etc. These items shall be incorporated into the finishing (tape and mud) process unless identified otherwise.

For metal framing: 1" USG brand screws, Type S bugle head or equal conforming to ASTM C646 or ASTM C1002.

For masonry and concrete application: Drywall adhesive shall be USG ready-to-use durabond adhesive of the appropriate type, complying with ASTM C557-73.

Jointing: Joint tape shall be perforated, reinforced tape conforming to ASTM C475-70 and FS SS-J-570A, Type II.

Joint compound shall be ready mixed conforming to ASTM C475-70 ready-mixed and FS SS-J-570A, Type I.

Metal corner beads, "J" beads casings, control joints (USG #093) shall be galvanized steel, sizes and shapes as required and conforming to ASTM A525.

Sealants: Water resistant sealant required, similar to USG sheetrock brand W/R sealant.

Acoustic sealant; highly elastic; permanently flexible, non-staining, water base caulking supplied by gypsum wallboard manufacturer.

Vinyl foam tape to be supplied as required in conjunction with the drywall adhesives.

Finish: Provide a semi-course orange peel or splatter texture substrate for painting system using a spray applied latex based coating on the drywall. Confirm texture with architect before starting.

PART 3 - EXECUTION

GENERAL:

All applications and workmanship shall be in accordance with ANSI A97.1 and the manufacturer's written instructions.

LOCATION:

Gypsum wallboard types shall be applied where noted herein, or in the finish schedule and wall details.

Use abuse resistant wallboard on corridor walls in the classrooms addition attached to the Theatre.

Gypsum wallboard shall be applied to suspended ceiling systems or joists as indicated in finish schedule or the drawings.

COORDINATION:

Coordinate application of drywall system with trades for metal or wood framing, suspended ceilings, and furring.

Coordinate installation of gypsum wallboard with work of other trades in regard to mechanical and electrical fixtures and provisions, acoustical and building insulation, backing or anchors for support of specialty items, etc.

INSTALLATION TECHNIQUES:

Install wallboards on walls in vertical fashion, horizontal installation will not be accepted unless specifically accepted by the architect. Use longest boards available from manufacturer.

Neatly fit ends and edges of wallboard without forcing.

Support ends and edges of wallboard panels on framing or furring members.

Cut and fit gypsum wallboard by scoring and breaking, or by sawing, working from face side.

Smooth cut edges and ends of gypsum wallboard to achieve neat joining.

Where core of wallboard is exposed by cut-out or trimming, seal with approved sealer.

Arrange joints on opposite sides of partitions to occur on different framing members.

Trim/Beads: Cover wallboard end joint at dissimilar surfaces with a metal trim strip against a continuous bead of caulking.

Install "J" bead, corner bead, expansion bead or other trim as detailed or appropriate.

Reinforce and finish internal corners with tape and compound.

Apply trim to exposed corners and edges.

Attachment: Attach single layer of wallboard to metal framing support with USG Type S drywall screws at corners, spaced 12" o.c. in field of board and 8" o.c. along vertical abutting edges.

Where wallboard is called out on the drawings to be applied directly to concrete or unit masonry, walls shall receive drywall adhesive prior to application of wallboard, according to manufacturer's recommendations for a secure and lasting installation.

JOINT TREATMENT:

Mix and use joint finishing materials in accordance with manufacturer's recommendations.

Allow a minimum drying time of 24 hours between coats.

Sand as necessary after each application without scuffing paper surface of board.

Apply at least two filler coats of joint compound to all screw depressions, holes and flanges or corner beads and other trim.

Apply finish coat and extend beyond filler coats, feather to smooth uniform finish, sand and prepare surface for finishing.

Where pipes, conduits, ducts, electrical devices and other items penetrate wallboard, caulk as described in Section 07 90 00, Sealants and Caulking. Assure all layout and locations of such are complete prior to application.

FINISHES:

Orange peel or splatter substrate prior to painting. Confirm architect's approval with sample prior to start. Mix and use finishing materials in accordance with manufacturer's recommendation.

Allow a minimum drying time of 24 hours between applications.

Apply only to drywall which has been taped and sanded smooth.

Apply uniform texture coat.

Note: The texture finish may also be applied to concrete masonry, stuccoed concrete masonry, or poured concrete walls. See finish schedule in section 09 99 99 for locations.

DAMAGES:

Small holes, punctures by fasteners and surface tears shall be dressed with joint compound and tape.

Large areas of drywall (over 1 s.f.) that have fractures, torn paper surfaces, water damage, broken core, etc., shall be rejected and replaced, or repaired to the satisfaction of the Architect.

Remove damaged boards, cracked or broken in handling or application and replace with new material.

END OF SECTION 09 29 00

SECTION 09 31 00 - CULTURED MARBLE

PART 1 GENERAL

DESCRIPTION OF WORK:

The product described herein shall be cultured marble manufactured in accordance with specification of the Cultured Marble Institute. All products shall be labeled as manufactured according to the standards of the CMI.

Cultured marble products for this work include Window Sills and Ledges.

SUBMITTALS:

In accordance with Section 01 33 00, Submittals, provide product data for review by the Architect.

PART 2 - PRODUCTS

CULTURED MARBLE:

Composition: 80% granular marble and 20% polyester resin cured to a strong and rigid state.

Finished surfaces: Coating of approximately 20 mil (wet gauge) thickness of clear sanitary gel coat.

WINDOW SILLS AND LEDGES:

Style: Bullnose Cornish sill

Size: Minimum 5/8" thickness, by width and lengths required for the project. Overhanging bullnose section approx. 1 1/2".

Color: Shall be selected by the Architect.

OTHER MATERIALS:

Adhesives: As recommended by the manufacturer.

Metal anchor clips: Galvanized, 20 gage steel.

PART 3 - EXECUTION

General: Products shall be pre-sized and factory cut ready for installation.

Install and secure sill in accordance with the manufacturer's recommendations.

COORDINATION:

Field measure for all installations. Coordinate size and installation with manufacturer of the base cabinet.

END OF SECTION 09 31 00

SECTION 09 51 13 - ACOUSTICAL CEILING PANELS

PART 1 GENERAL

DESCRIPTION OF WORK:

The work includes lay-in ceiling panels as herein described on the drawings or scheduled under 09999 - Finish Schedule.

SUBMITTALS AND EXTRA STOCK:

In accordance with Section 01 33 00, Submittals, provide product data for review by the Architect.

Provide one carton for up to first 50 cartons and one for each additional 50 or fewer cartons thereafter.

WARRANTY:

Panels shall be warranted to be free of sagging and warping for a period of 10 years as a result of the extreme environmental conditions which are expected in the project location and for workmanship or material defects.

PART 2 - PRODUCTS

MANUFACTURER:

For the purpose of designating type and quality for the work under this section, drawings and specifications are based on products furnished by the Armstrong Contact Interiors. Equivalent products by other manufacturers will be considered prior to bid and in accordance with Section 01600 Products and Substitutions. For all products under this section, manufacturer must supply evidence of compatibility between acoustical materials and suspension systems (see Section 09120).

ACOUSTICAL PANELS:

Style: 'Fine Fissured', medium texture with antimicrobial treatment

Designation: Mineral fiber - face painted with vinyl latex paint

Type: Grid Panel, lay-in, square edge

Size: 24" X 48" X 5/8" - see drawings and schedule for locations throughout the building

Acoustical Properties: NRC: .65 minimum CAC: 40 minimum

Light Reflectance: LR 0.84

Flame Spread: Class A, 0-25 (ASTM E-1264)

Style: 'Stratus', course texture with antimicrobial treatment

Designation: Mineral fiber, face painted with vinyl latex paint

Type: Grid panel lay-in

Size: 24" X 24" X 3/4" – see dwgs. & schedule for select locations within the admin offices areas

Edge: Angled tegular

Acoustical Properties: NRC: .70 CAC: 25 minimum

Light Reflectance: LR 0.73

Flame Spread: Class A, 0-25, UL Label (ASTM E-84)

Weight: 1.20 lb./sq. ft.

PART 3 - EXECUTION

PANEL ERECTION:

Re-examine and adjust suspension systems so that acoustical panels can be installed and subsequently lifted or fitted in place from underside without contact to suspension systems (hanger wires, etc.)

Install acoustical panels and necessary trim taking care not to damage or smudge panels, trim, or grid systems.

Make necessary cut-outs in panels for penetrating devices.

Apply hold-down clips to fire rated panels for anchorages to grid. Provide access systems and identify location by acceptable means.

END OF SECTION 09 51 13

SECTION 09 65 60 – RESILIENT TERRAZZO TILE

PART 1 – GENERAL

SECTION INCLUDES:

Marble terrazzo tile and accessories

REFERENCES:

- ASTM C 109/C 109M - Standard Test Method for Compressive Strength of Hydraulic Cement Mortars (Using 2-in. or 50-mm Cube Specimens).
- ASTM D 695 - Standard Test Method for Compressive Properties of Rigid Plastics.
- ASTM D 2047 - Standard Test Method for Static Coefficient of Polish-Coated Floor Surfaces as Measured by the James Machine.
- ASTM D 2240 - Standard Test Method for Rubber Property--Durometer Hardness.
- ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
- ASTM E 648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source.
- ASTM E 662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials.
- ASTM F 510 - Standard Test Method for Resistance to Abrasion of Resilient Floor Coverings Using an Abrader with a Grit Feed Method.
- ASTM F 540 - Standard Test Method for Squareness of Resilient Floor Tile by Dial Gage Method.
- ASTM F 925 - Standard Test Method for Resistance to Chemicals of Resilient Sheet Flooring.
- ASTM F 970 - Standard Test Method for Static Load Limit.
- ASTM F 1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride.
- MIL D-3134 - Deck Covering Materials; Revision J, Addendum 1.
- ASTM E492-09 – Standard Test Method for Laboratory Measurement of Impact Sound Transmission through Floor-Ceiling Assemblies Using the Tapping Machine
- ASTM E989-06 – Standard Classification for determination of Impact Insulation Class
- ASTM E90-09 – Standard Test Method for Laboratory Measurements of Airborne Sound Transmission Loss of Building Partitions and Elements
- ASTM E413-10 – Classification for Rating Sound Insulation

SYSTEM DESCRIPTION:

Performance Requirements of Terrazzo Tiles:

- Abrasion Resistance: Maximum 0.0196 cubic centimeters volume loss, when tested in accordance with ASTM F 510, Taber abrader, S-39 wheels, at 500 cycles with 1000 gram load.
- Compressive Strength: Between 2900 and 5000 psi (20 and 34.5 MPa), when tested in accordance with ASTM C 109/C 109M or ASTM D 695.
- Static Load Limit: 0.0007 inch (0.012 mm) maximum indentation, when tested in accordance with ASTM F 970 at 125 pounds (57 kg).
- Hardness: When tested in accordance with ASTM D 2240:
 - Matrix: Shore D 78, minimum.
 - Aggregate: Between Barcol 55 and 100.
- Coefficient of Friction: Greater than 0.7, average 0.74, when tested in accordance with ASTM D 2047.
- Flame Spread Index: 15, maximum, when tested in accordance with ASTM E 84.
- Smoke Density: Specific optical density, when tested in accordance with ASTM E 662, of 231.76 (smoldering) and 292.05 (flaming).

- Critical Radiant Flux: Minimum of 0.93 watt/cubic centimeter (Class 1) when tested in accordance with ASTM E 648.
- Chemical Resistance: No change or surface attack, color change, or swelling, when tested in accordance with ASTM F 925.
- Oil Resistance: Complying with MIL D-3134.
- Corrosion Resistance: Complying with MIL D-3134.
- Electrical Conductance: Nonconductive.
- Squareness: 0.003 inch (0.076 mm) out of square, maximum, when measured in accordance with ASTM F 540.
- Acoustical Testing:
 - -ASTM E492-09/ASTM E989-06 (IIC) = 43dB
 - -ASTM E90-09/ASTM E413-10 (STC) = 54 dB

SUBMITTALS:

Submit in accordance with Section 01 33 00.

Submit manufacturer's specifications and technical data for precast terrazzo tile and accessories; including manufacturer's printed installation instructions and maintenance manuals for each material specified.

Samples for Selection: Submit manufacturer's samples of actual sections of tile and accessories; include manufacturer's full range of color and patterns available.

Samples for Verification Prior to Installation: Submit full size samples of all types, colors, and patterns selected, indicating full range of patterning and color variations.

Test Reports: Submit test reports for bond and moisture tests of substrates.

Certificates: Submit certificates from manufacturer stating compliance with applicable requirements for materials specified.

QUALITY ASSURANCE:

Installer Qualifications: A firm that has at least three years of experience with the installation of precast terrazzo tile and has successfully completed installations of a similar size and scope.

Regulatory Requirements: Comply with requirements of local building codes and applicable regulations of other government authorities.

Pre-Installation Meeting: Meet with tile manufacturer's representative prior to preparation of substrate and installation of tile, to review manufacturer's instructions and requirements to ensure the tile is installed properly.

DELIVERY, STORAGE, AND HANDLING:

Deliver materials in original, unopened packages, containers or bundles bearing brand name and identification of manufacturer.

Store materials inside, under cover in a manner to keep them dry, protected from the weather, direct sunlight, surface contamination, corrosion, and damage from construction traffic and other causes.

PROJECT CONDITIONS:

Maintain minimum temperature of 70 degrees F (21 degrees C) in spaces to receive terrazzo tile, for at least 48 hours before, during and after installation. Store materials in space where they will be installed for at least 48 hours or as required ensuring that the materials have reached 70 degrees F (21 degrees C) before starting installation.

Install terrazzo tile and accessories after other finishing operations, including painting, have been completed.

Do not install terrazzo tile on concrete slabs until they have been cured and are sufficiently dry to achieve bond with adhesives, as determined by the tile manufacturer's recommended bond and moisture test. Allow sufficient time for the slab to dry out before installation is started.

Provide adequate lighting to allow for proper installation.

Do not use portable or temporary heat.

WARRANTY:

Submit 20 year wear warranty written material warranty from tile manufacturer warranting that tile is free from defects in workmanship and material.

- Products must be installed so as not to void the manufacturer's warranty for wear.
- Warranty shall be in form acceptable to Owner.

MAINTENANCE:

Extra Materials: Furnish one box of tile for each fifty boxes or fraction thereof, for each type, color, pattern and size of the tile installed, from same manufactured lot as materials installed.

- Deliver extra tile to Owner after completion of work.
- Furnish tiles in protective packaging with identifying labels.

PART 2 - PRODUCTS

MANUFACTURERS:

Acceptable Manufacturer: Fritz Tile by Expanko Inc., which is located at: 180 Gordon Dr. Suite 113 ;
Exton, PA 19341; 800-345-6202; www.fritztile.com and rgillespie@expanko.com;

Requests for substitutions will be considered in accordance with provisions of Section 01 60 00.

Obtain all materials including terrazzo tile and recommended adhesives from a single manufacturer.

MATERIALS:

Terrazzo Tile: Marble or granite chips embedded in flexible thermoset polyester resin matrix, with random distribution of chips and smooth factory applied urethane coating cured by ultra violet exposure process.

- Color/Pattern/Thickness: As selected by Architect from manufacturer's full range.
- Size: 12 by 12 inches, nominal.
- Color Match: Obtain all tile materials from same production run.

Wall Base: Fritztile straight bullnosed wall base.

Leveling Compound: Fritztile recommends only Ardex leveling compound products. Refer to Ardex for recommendations and installation methods. www.Ardex.com

Patching Compound: Fritztile recommends only Ardex patching compound products. Refer to Ardex for recommendations and installation methods. www.Ardex.com

Floor Adhesive:

- Fritz FA88 Powdered Multipurpose Adhesive
- Fritz FA1100 Pre-Mixed Wet Set Adhesive

Sealer and Finish: Two coats of Fritz FCP102 protective sealer and two coats of Fritz Duro-Gloss Finish FCP300, applied as recommended by manufacturer.

Part 3 - EXECUTION

EXAMINATION:

Concrete Subfloor:

Inspect subfloor to verify that it is clean, flat, smooth, level and free from cracks, holes, ridges, coatings preventing adhesion, and other defects impairing performance or appearance.

Notify Architect in writing of conditions that would adversely affect flooring installation; do not proceed until defective conditions have been corrected.

Perform bond and moisture tests on concrete subfloors to determine if surfaces are sufficiently cured and dry as well as to ascertain presence of curing, sealing, hardening or any other compounds.

- Perform bond test in accordance with tile manufacturer's warranty requirements.
- ASTM F 1869-11. Moisture Vapor Emission test using Anhydrous Calcium Chloride. Maximum Allowable Readings: FA88= 10 pounds per 1000 square feet in 24 hours, FA1100=7 pounds per 1000 square feet in 24 hours
- ASTM F2170-11, Relative Humidity (RH) test using situ probes. Maximum Allowable Readings: FA88=90%RH, FA1100=87%RH
- Submit test results and obtain Architect's acceptance prior to beginning installation.

Do not proceed until substrate preparation is complete and satisfactory, bond and moisture tests are completed and test reports submitted which indicate that bond and moisture values meet specified requirements.

Coordinate work with that of other installers prior to installation so that tile work fits properly with doors, frames, saddles, floor drains, and other adjacent work.

Start of work constitutes acceptance that conditions are satisfactory.

Close the space and areas where flooring is being installed to traffic and other installers until flooring has set and sealing and finish of tiles are complete.

PREPARATION:

Fill small cracks, holes and depressions in subfloors using leveling and patching compounds recommended by tile manufacturer.

Remove deleterious coatings from subfloor surfaces that would prevent a positive adhesive bond; such as curing compounds incompatible with adhesives, paints, oils, adhesives, waxes and sealers.

INSTALLATION:

Comply with manufacturer's instructions for terrazzo tile installation.

Scribe, cut and fit tile to permanent fixtures, built-in furniture, cabinets, pipes, outlets and permanent columns, wall, and partitions using tile cutting procedures recommended by tile manufacturer.

Maintain reference markers indicated on subfloor for future cutting, by repeating on finished terrazzo tile floor.

Lay tile from center marks established with principal walls discounting minor offsets, so tiles at opposite edges of room are of equal width. Adjust as necessary to avoid use of cut widths less than one half tile at perimeters. Lay tile square to room axis, unless otherwise indicated.

Adhere tile flooring to substrate using full spread of adhesive.

Lay tile using conventional procedures for laying resilient tile, placing tile carefully and firmly in position and as level as possible. Butt tile cleanly, evenly and snugly against adjacent tile.

Match tiles for color and pattern by using tile from cartons in same sequence as manufactured and packaged, if cartons are so numbered. Do not install broken, cracked or chipped tiles.

Roll and cross roll floor with 150 pound sectional roller continuously while tile is being laid. Use hand roller in areas that cannot be reached with large roller. Cease rolling when rolling has no more effect.

Do not subject floors to traffic until adhesive is dry and hard and sealers and finishes are applied.

Remove and replace tiles that are not flat, including lipped, cupped, curved, or poorly adhered tile. Remove rejected tile from site.

FIELD QUALITY CONTROL:

Manufacturer's Field Services: Provide on-site services of tile manufacturer or authorized distributor for technical assistance during preparation and installation.

CLEANING AND PROTECTION:

Upon completion of installation and curing of adhesive, apply sealant to entire perimeter and around columns, door frames, and other joints and penetrations to prevent water penetration into the adhesive layer due to accidental or maintenance (mopping) water accumulation.

Remove excess adhesives, dirt, stain and other foreign material. Clean floors in accordance with tile manufacturer's instructions.

Protect finished installation at all times. Repair or replace flooring damaged prior to final acceptance of installation by Owner.

END OF SECTION 09 65 60

SECTION 09 91 00 - PAINTING

PART 1 GENERAL

DESCRIPTION OF WORK:

Extent of painting work is indicated on drawings and schedules, and as herein specified.

Note: The Contractor is advised to review the paint schedule. In all instances as may be possible, each coat of paint color in a multiple coat application will be installed a shade different in order to observe evidence of adequate and proper paint coverage.

Work includes caulking of joints and painting and finishing of select new and previously painted interior and new exterior exposed items and surfaces throughout project, except as otherwise indicated.

Initial coats of paint may be sprayed at the Contractor's risk, final coats of paint shall be brush or roller applied.

Work includes field painting of exposed bare and covered pipes and ducts (including color coding) and of hangers, exposed steel and iron work, and primed metal surfaces of equipment installed under mechanical and electrical work, except as otherwise indicated.

"Paint" as used herein means all coating systems materials, including primers, emulsions, enamels, stains, sealers and fillers, and other applied materials whether used as prime, intermediate or finish coats.

Surfaces to be Painted: Except where natural finish of material is specifically noted as a surface not to be painted, paint exposed. Where items or surfaces are not specifically mentioned, paint the same as similar adjacent materials or areas. If color of finish is not designated in the schedule, Architect will select these from standard colors or finishes available.

Following categories of work are not included as part of field-applied finish work under this section:

- Factory Pre-Finished Items
- Factory Finished Metal Surfaces
- Operating Parts
- Sidewalks or other exterior pedestrian traffic surfaces, except as specified on the civil site plans for safety reasons.

Shop priming is included under other sections of these specifications.

Do not paint over any code-required labels, such as Underwriters' Laboratories and Factory Mutual, or any equipment identification, performance rating, name, or nomenclature plates.

Lead based paint shall not be allowed for use on this work.

QUALITY ASSURANCE:

Single Source Responsibility: Provide primers and other undercoat paint produced by same manufacturer as finish coats. Use only thinners approved by paint manufacturer, and use only within recommended limits. See "Submittals" for evidence of compatibility.

WARRANTY:

The Contractor and paint manufacturer shall jointly and fully warranty the product and installation for one year from the date of Substantial Completion as established by the Owner and Architect.

Paint products shall be warranted for a longer duration as advertised by the paint manufacturer.

SUBMITTALS:

In accordance with Division 1, Submittals, provide product data, including paint label analysis and application instructions; architectural color chip selection binders by the manufacturer proposed for the Architect's use in preparing and furnishing the finish "Color Schedule" (This binder shall have colors in minimum 3" x 8" sheets); and samples. Provide a listing of material and application for each coat of each finish sample.

Provide written evidence that sufficient testing has been completed on both new and previously painted surfaces to insure that the new product is acceptable with each surface, material and condition. In the case of previously painted surfaces, the existing paint must be tested to insure it will continue to adhere. Should the existing surface or paint prove inadequate, the contractor shall take whatever steps necessary, including removal of all old coats down to the base material. For this reason, it is recommended that the bidders undertake all inspections and testing prior to or during the bid period.

Preliminary colors will be selected when all other items requiring color selection are received by the architect. The paint contractor must be aware that the number of paint colors is multiple (i.e.: body, trim and accent) as judged solely by the architect. Refer to proposed appearance rendered pictures for a general understanding of the color scheme and depth of color tone.

- On 12" x 12" hardboard or gypsum board, provide a sample of each preliminary color, with texture to simulate actual conditions. Resubmit samples as requested by Architect until acceptable sheen, color, and texture is achieved.

- On actual wood surfaces, provide a 4" x 8" sample of natural and stained wood finish. Label and identify each as to location and application.

- On actual wall surfaces and other exterior and interior building components, duplicate painted finishes of prepared samples. Provide full-coat finish samples on at least 100 sq. ft. of surface, as directed, until required sheen, color and texture is obtained; simulate finished lighting conditions for review of in-place work.

Final acceptance of colors will be from samples applied on the job.

EXTRA STOCK:

Contractor, at close of project, shall supply to the owner one (1) gallon in unopened container for each type and color of paint selected on the project. Cans will be clearly labeled with color name and number. A list of locations and mix numbers where color was used shall also be provided.

JOB CONDITIONS:

Do not apply paint in rain, fog or mist, or when relative humidity exceeds that permitted by paint manufacturer's printed instructions.

PART 2 - PRODUCTS

ACCEPTABLE MANUFACTURERS:

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

Richard's Paint Co. (RP)
The Sherwin-Williams Co. (SW)

MATERIALS:

Material Quality: Provide best quality grade of various types of coatings required.

Color Pigments: Pure, non-fading, applicable types to suit substrates and service indicated.

ACCESSORIES:

Provide all necessary material, equipment and labor to complete the work in total.

INSPECTION:

Notify Contractor in writing of conditions detrimental to proper and timely completion of work. Do not proceed with work until unsatisfactory conditions have been corrected.

Starting of painting work will be construed as Applicator's acceptance of surfaces and conditions within any particular area. Refer to Submittals paragraphs under this section and provide written certification that all necessary inspections and testing have been performed.

Do not paint over dirt, rust, scale, grease, moisture, scuffed surfaces, or conditions otherwise detrimental to formation of a durable paint film.

SURFACE PREPARATION:

General: Perform preparation and cleaning procedures in accordance with paint manufacturer's instructions as herein specified or otherwise noted, for each particular substrate condition.

Remove hardware, hardware accessories, machined surfaces, plates, lighting fixtures, and similar items in place and not to be finish-painted, or provide surface-applied protection prior to surface preparation and painting operations. Remove, if necessary, for complete painting of items and adjacent surfaces. Following completion of painting of each space or area, reinstall removed items.

Fill small holes with appropriate filler as approved by the architect. Caulk all joints which are not specified to be filled by others.

Cementitious Materials: Determine alkalinity and moisture content of surfaces to be painted by performing appropriate tests. If surfaces are found to be sufficiently alkaline to cause blistering and burning of finish paint, correct this condition before application of paint. Do not paint over surfaces where moisture content exceeds that permitted in manufacturer's printed directions.

Clean concrete floor surfaces scheduled to be painted with a commercial solution of muriatic acid, or other etching cleaner. Flush floor with clean water to neutralize acid, and allow to dry before painting.

Wood: Scrape and clean small, dry, seasoned knots and apply a thin coat of white shellac or other recommended knot sealer, before application of priming coat. After priming, fill holes and imperfections in finish surfaces with putty or plastic wood-filler. Sandpaper smooth when dried.

Prime, stain, or seal wood required to be job-painted immediately upon delivery to job. Prime edges, ends, faces, undersides, and backsides of such wood, including cabinets, counters, cases, paneling.

When transparent finish is required, use spar varnish for backpriming.

Backprime paneling on interior partitions only where masonry, plaster, or other wet wall construction occurs on backside.

Ferrous Metals: Touch-up shop-applied prime coats wherever damaged or bare, where required by other sections of these specifications. Clean and touch-up with same type shop primer.

Galvanized Surfaces: Clean free of oil and surface contaminants with non-petroleum based solvent.

APPLICATION:

General: Apply paint in accordance with manufacturer's directions. Use applicators and techniques best suited for substrate and type of material being applied.

Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Paint surfaces behind permanently-fixed equipment or furniture with prime coat only before final installation of equipment.

Paint interior surfaces of ducts or coves, where visible through registers or grilles, with a flat, non-specular black paint.

Paint back sides of access panels, and removable or hinged covers to match exposed surfaces.

Finish exterior doors on tops, bottoms and side edges same as exterior faces, unless otherwise indicated.

Sand lightly between each succeeding enamel or varnish coat.

Omit first coat (primer) on metal surfaces which have been shop-primed and touch-up painted, unless otherwise indicated.

Minimum Coating Thickness: Apply materials at not less than manufacturer's recommended spreading rate, to establish a total dry film thickness as indicated or, if not indicated, as recommended by coating manufacturer.

Mechanical and Electrical Work: Painting of mechanical and electrical work is limited to those items exposed in mechanical equipment rooms and in occupied spaces.

Mechanical items to be painted include, but are not limited to, the following:

- Exposed piping, pipe hangers, and supports (see mechanical for color coating)
- Accessory items

Electrical items to be painted include, but are not limited to, the following:

- Conduit and fittings (in electrical rooms)
- Switchgear (in electrical rooms)

NOTE: It is understood that all new conduits outside of electrical rooms will be concealed and that switch gear is only within electrical rooms.

Prime Coats: Apply prime coat of material which is required to be painted or finished, and which has not been prime coated by others.

Stipple Enamel Finish: Roll and redistribute paint to an even and fine texture. Leave no evidence of rolling such as laps, irregularity in texture, skid marks, or other surface imperfections.

Pigmented (Opaque) Finishes: Completely cover to provide an opaque, smooth 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.

Transparent (Clear) Finishes: Use multiple coats to produce glass-smooth surface film of even luster. Provide a finish free of laps, cloudiness, color irregularity, runs, brush marks, orange peel, nail holes, or other surface imperfections.

FIELD QUALITY CONTROL:

The right is reserved by Owner to invoke the following material testing procedure at any time, and any number of times during period of field painting:

- Engage services of an independent testing laboratory to sample paint being used. Samples of materials delivered to project site will be taken, identified and sealed, and certified in presence of Contractor.
- Testing laboratory will perform appropriate tests for any or all of following characteristics: Abrasion resistance, apparent reflectivity, flexibility, washability, absorption, accelerated weathering, dry opacity, accelerated yellowness, recoating, skinning, color retention, alkali resistance and quantitative materials analysis.

If test results show that material being used does not comply with specified requirements, Contractor may be directed to stop painting work, remove non-complying paint; and, pay for testing.

CLEAN-UP AND PROTECTION:

Clean-Up: During progress of work, remove from site discarded paint materials, rubbish, cans and rags at end of each work day.

Upon completion of painting work, clean window glass and other paint-spattered surfaces. Remove spattered paint by proper methods of washing and scraping, using care not to scratch or otherwise damage finished surfaces.

Protection: Protect work of other trades, whether to be painted or not, against damage by painting and finishing work. Correct any damage by cleaning, repairing or replacing, and repainting, as acceptable to Architect.

Provide "Wet Paint" signs as required to protect newly-painted finishes. Remove temporary protective wrappings provided by others for protection of their work, after completion of painting operations.

PART 4 - EXTERIOR PAINT SCHEDULE

General: Provide the following paint systems for the various substrates, as indicated or selected by the architect.

Stucco/Concrete: (typical exterior body paint)

High Build Acrylic (semigloss) finish having two finish coats over base coat

- Base Coat:

SW: Loxon Acrylic Surfacers, A24W-200

RP: Rich Flex 100% Acrylic Latex Primer Sealer #1415, plus Block Filler

- Second Coat and Third Coat:

SW: Resilience Premium Acrylic Exterior Latex

RP: Rich Shield Premium 100% Acrylic Exterior Latex

Ferrous Metal:

Semi-Gloss Alkyd Enamel: 2 finish coats over primer.

- Prime Coat: Non-lead based primer. (Primer is not required on items delivered properly shop primed.):

SW: Kem Kromik Universal Metal Primer B50NZ

RP: Industrial Coatings Universal Metal Primer

- Second and Third Finish Coats: Semi-Gloss Alkyd Enamel (FS TT-E-529, Class A):

SW: Metalastic DTM B55

RP: Rich Shield Polyurethane Industrial Gloss Enamel #1000

Zinc-Coated Metal:

High Gloss Alkyd Enamel: 2 finish coats over primer

- Prime Coat:

SW: Pro-Cryl Universal Metal Primer, B66-310

RP: Rust Shield II 100% Acrylic Metal Primer, #1215/1220

- Second and Third Finish Coats: High Gloss Alkyd Enamel (FS TT-E-489):

SW: Industrial Enamel HS, B54WZ

RP: Rich Shield Polyurethane Industrial Gloss Enamel #1000

Aluminum:

High Gloss Alkyd Enamel: 2 finish coats over primer

Same as above for Zinc-Coated Metal.

INTERIOR PAINT SCHEDULE:

General: Provide the following paint systems for the various substrates, as indicated or as selected by the architect.

Concrete (floors):

Urethane high gloss finish: 1 coat over primer

- Primer Coat:

SW: Armorseal #33 – Epoxy Primer/Sealer

- Second Coat: Gloss Urethane paint
SW: Armorseal #650 SL/RC – Self Leveling/Recoat Epoxy

Concrete Masonry Units:

Semi-gloss Emulsion Finish: 2 finish coats over filled or primed surface.

- Primer Coat:
SW: Loxon Acrylic Masonry Surfer, A24W-200
RP: Rich Flex 100% Acrylic Alkali Resistant Primer plus Blockfiller
- Two Finish Coats: Interior Semi-Gloss Latex (FS TT-P-1511B)
SW: Pro-Mar 200 Semi-Gloss Enamel Latex
RP: Rich Shield Premium 100% Acrylic #640

Gypsum Drywall Systems:

Lusterless or Semi Gloss Emulsion Finish: 2 coats over primer

- Primer Coat: Interior Latex Base Primer Coat (FS TT-P-650)
SW: Pro-Mar Latex Wall Primer – B28W200
RP: Painter's Pride Wall Guard – SR1250
- Second and Third Coats: Interior Semi Gloss Latex Base Paint (FS TT-P-1151a)
SW: Pro-Mar 200 Latex Semi Gloss Enamel Wall Paint – B31W200
RP: Signature Series Acrylic Semi Gloss Enamel – Series 750

Ferrous Metal:

Semi-Gloss Enamel Finish: 2 coats over primer, with total dry film thickness not less than 2.5 mils.

- Prime Coat: Use applicable non-lead based primer (prime coat is not required on items delivered shop primed.)
- Second and Third Finish Coats: Interior Enamel
SW: Pro-Mar Alkyd Semi-Gloss Enamel
RP: Painter's Pride Alkyd Semi Gloss #5-777

Zinc-Coated Metal:

Semi-Gloss Finish: 2 coats over primer, with total dry film thickness not less than 2.5 mils

- Prime Coat: Zinc Dust - Zinc Chromate Primer Coating (FS TT-P-641).
- Second and Third Coats: Interior Enamel
SW: Pro-Mar Alkyd Semi-Gloss
RP: Painter's Pride Alkyd Semi-Gloss #5-777

Painted Woodwork and Hardboard Faced Doors:

Semi-Gloss Enamel Finish: 3 coats

- First Coat: Interior Enamel Undercoat (FS TT-E-543)
SW: Wall and Wood Primer
RP: Signature Series Undercoat #15
- Second and Third Coats: Odorless Interior Semi-Gloss Enamel (FS TT-E-509)
SW: Pro-Mar Alkyd Semi-Gloss Enamel
RP: Painter's Pride Alkyd Semi-Gloss Enamel, #5-777

Factory Finished Wood Doors:

Wood doors are specified in Section 08 20 00, page 4, to be factory finished; therefore, do not include cost of painting those doors in bid.

END OF SECTION 09 91 00

SECTION 23 00 10 - BASIC MECHANICAL REQUIREMENTS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

- A. Basic Requirements: Requirements of the Contract Forms, Conditions of the Contract, Specifications, Drawings, and Addenda and Contract Modifications (the Contract Documents), apply to the requirements of each Section of Division 15.
- B. Conflicts: Nothing contained in this Section shall be construed to conflict in any way with other provisions or requirements of the Contract documents. The intent is that this Section will take precedence. Where differences arise, the Architect shall decide which directions or instructions take precedence.

1.02 SUMMARY

- A. General: Unless an item is specifically mentioned as being provided by others, the requirements of Division 23 Contract Documents shall be completed. The systems, equipment, devices and accessories shall be installed, finished, tested and adjusted for continuous and proper operation. Any apparatus, material or device not shown on the Drawings but mentioned in these Specifications, or vice versa, or any incidental accessories necessary to make the project complete and operational in all respects, shall be furnished, delivered and installed without additional expense to the Owner. Include all materials, equipment, supervision, operation, methods and labor for the fabrication, installation, start-up and tests necessary for complete and properly functioning systems.

1.03 APPLICABLE STANDARDS

- A. Code Compliance: Refer to Division 1. As a minimum, unless otherwise indicated, comply with all rules, regulations, standards, codes, ordinances and laws of local, state and federal governments and the amendments and interpretation of such rules, regulations, standards, codes, ordinances and laws of local, state and federal governments by the authorities having lawful jurisdiction.
- B. ADA: Comply with the requirements of the Americans with Disabilities Act (ADA).
- C. Comply: With the National Fire Protection Association (NFPA) Standards and other Codes and Standards as adopted by the Local Authority having Jurisdiction.
- D. Comply: With the National Fire Protection Association (NFPA) Standards and other Codes and Standards indicated.
- E. Florida Building Code 2010: Conform in strict compliance to the Florida Building Code (FBC) and the amendments which are enforced by the local authority having jurisdiction.
 - 1. Florida Building Code – Mechanical 2010 Edition
 - 2. Florida Building Code – Plumbing 2010
 - 3. Florida Building Code – Fuel Gas 2010 Edition
 - 4. Florida Energy Conservation Code - 2010 Edition
- F. NATIONAL FIRE PROTECTION (NFPA) Standards:

1. NFPA-70, National Electrical Code, 2005 Revision
 2. NFPA-72, National Fire Alarm Code, 2002 Revision
 3. NFPA-90A, Standard for the Installation of Air Conditioning and Ventilation Systems, 2002 Revision
 4. NFPA-90B, Standard for the Installation of Warm Air Heating and Air Conditioning Systems, 2006 Revision
 5. NFPA-101B, Standard on Means of Egress for Buildings and Structures, 2002 Revision
- G. Notification: Comply with all of the requirements of the Federal "Right-To-Know" Regulations and the Florida "Right-To-Know" Law and provide notification to all parties concerned as to the use of toxic substances.
- H. Owner Design Guidelines: Comply with all the requirements of the latest Owner MEP Engineering Design Guidelines and the latest Owner Architectural Construction Standards.
- 1.04 DRAWINGS AND SPECIFICATIONS
- A. Intent: The intent of the drawings and specifications is to establish minimum acceptable quality standards for materials, equipment and workmanship, and to provide operable mechanical systems complete in every respect.
- B. Equipment Placement: The drawings are diagrammatic, intended to show general arrangement, capacity and location of various components, equipment and devices. Each location shall be determined by reference to the general building plans and by actual measurements in the building as built. Reasonable changes in locations ordered by the Architect prior to the performance of the affected Work shall be provided at no additional cost to the Owner.
- C. Drawing Scale: Due to the small scale of the drawings, and to unforeseen job conditions, all required offsets, transitions and fittings may not be shown but shall be provided at no additional cost.
- D. Conflict: In the event of a conflict, the Architect will render an interpretation in accordance with the General Conditions.
- 1.05 DEFINITIONS
- A. Provide/Install: The word "provide" shall mean furnish, install, connect, test, complete, and leave ready for operation. The word "install" where used in conjunction with equipment furnished by the Owner or under another contract shall mean mount, connect, complete, and leave ready for operation.
- B. Concealed: The surface of insulated or non-insulated piping, ductwork or equipment is concealed from view when standing inside a finished room, such as inside a chase or above a ceiling.
- C. Exposed: The surface of insulated or non-insulated piping, ductwork or equipment is seen from inside a finished room, such as inside an equipment or air handling unit room.

- D. Protected: The surface of insulated or non-insulated piping, ductwork or equipment on the exterior of the building but protected from direct exposure to rain by an overhang, eave, in an unconditioned parking garage or building crawl space.
- E. Unprotected: The surface of insulated or non-insulated piping, ductwork or equipment on the exterior of the building and exposed to rain.
- F. Abbreviations: Abbreviations, where not defined in the Contract Documents, shall be interpreted to mean the normal construction industry terminology, as determined by the Architect. Plural words shall be interpreted as singular and singular words shall be interpreted as plural where applicable for context of the Contract Documents.

1.06 SHOP DRAWINGS

- A. General: Refer to paragraph entitled "SUBMITTAL" in this section. Include the following data:

- 1. Shop Drawings:

- a. Submit shop drawings for the following:

- (1) Ductwork systems
 - (2) Coordination drawings

1.07 RECORD DRAWINGS

- A. Production: Maintain one set of black or blue line on white project record "as-built" drawings at the site. At all times the set shall be accurate, clear, and complete, indicating the actual installation. Record drawings shall be updated weekly to record the present stage of progress. These drawings shall be available to the Architect at all times. Equipment schedules, control diagrams, sequences of operation shall also be updated.
- B. Completion: Prior to substantial completion, transfer onto an unmarked second set of drawings all changes, marked in colored pencil, and submit them to the Architect. Upon completion of all punch lists, transfer all "As-Built" conditions to the AutoCAD drawing files, package three (3) print sets of full size drawings and two (2) CDs of the AutoCAD drawing files with associated reference files and submit them to the Architect for review and approval.

1.08 SUBMITTAL

- A. General: The provisions of this section are supplemental to the requirements in Division 1, and only apply to the material and equipment covered in Division 15.
- B. Time: Submit manufacturer's literature, performance data and installation instructions covered in each Section of Division 15 under an individual letter of transmittal within 30 days after Notice to Proceed unless otherwise indicated.
- C. Submitter's Review: All items required for each section shall be reviewed before submittal. Submittal information for each item shall bear a review stamp of approval, indicating the name of the Contractor and Subcontractor (where applicable), the material suppliers, the initials of submitter and date checked. Responsibility for errors or omissions in submittals shall not be

relieved by the Architect's review of submittals. Responsibility for submittals cannot be subrogated to material suppliers by Contractors or Subcontractors.

1. Review of the submittal data, whether indicated with "APPROVED" or with review comments, does not constitute authorization for or acceptance of a change in the contract price.
- D. Architect's Review: The submittal data shall be reviewed only for general conformance with the design concept of the project and for general compliance with the Contract Documents. Any action indicated is subject to the requirements of the Contract Documents. Reviews of submittal data review shall not include quantities; dimensions (which shall be confirmed and correlated at the job site); fabrication processes; techniques of construction; and co-ordination of the submittal data with all other trades. Copies of the submittal data will be returned marked "ACCEPTED AS SUBMITTED", "ACCEPTED AS NOTED", "REVISED AS NOTED AND RESUBMIT", "REJECTED, REVISED AS NOTED AND RESUBMIT".
- E. Submittal Items: Submittal items shall be inserted in a Technical Information Brochure. Mark the appropriate specification section or drawing reference number in the right hand corner of each item. All typewritten pages shall be on the product or equipment manufacturer's printed letterhead.
1. Manufacturer's Literature: Where indicated, include the manufacturer's printed literature. Literature shall be clearly marked to indicate the item intended for use.
 2. Performance Data: Provide performance data, wiring and control diagrams and scale drawings which show that proposed equipment will fit into allotted space (indicate areas required for service access, connections, etc.), and other data required for the Architect to determine that the equipment complies with the Contract Documents. Where noted, performance data shall be certified by the manufacturer at the design rating points.
 3. Installation Instructions: Where requested, each product submittal shall include the manufacturer's installation instructions. Generic installation instructions are not acceptable. Instructions shall be the same as those included with the product when it is shipped from the factory.
 4. Written Operating Instructions: Instructions shall be the manufacturer's written operating instructions for the specified product. If the instructions cover more than one model or type of product they shall be clearly marked to identify the instructions that cover the product delivered to the project. Operating Instructions shall be submitted immediately after the product or equipment submittal has been returned from the Architect marked "APPROVED" or "APPROVED AS NOTED".
 5. Maintenance Instructions: Information shall be the manufacturer's printed instructions and parts lists for the equipment furnished. If the instructions cover more than one model or type of equipment they shall be marked to identify the instructions for the furnished product. Submit maintenance instructions immediately after the product or equipment submittal has been returned from the Architect marked "APPROVED" or "APPROVED AS NOTED".
- F. Substitutions:
1. General: Refer to Division 1. Substitutions may be considered for any product or equipment of a manufacturer. See paragraph entitled "MANUFACTURER" in this Section. Any product or equipment may be submitted for review; however, only one substitution per item will be considered. If a substituted product or equipment item is rejected, provide the specified product or equipment.

- a. Submittal shall include the name of the material or equipment to be substituted, equipment model numbers, drawings, catalog cuts, performance and test data and any other data or information necessary for the Architect to determine that the equipment meets the specification requirements. If the Architect accepts any proposed substitutions, such acceptance will be set forth in writing.
 - b. Substituted equipment with all accessories installed or optional equipment where permitted and found acceptable, must conform to space requirements. Substituted equipment that cannot meet space requirements, whether accepted or not, shall be replaced at no additional expense to the Owner. If the substituted item affects the work of other trades, the Request for Substitution form shall include a list of the necessary modifications.
2. Deviations: The Request for Substitution form shall include a complete list of deviations from the scheduled item stating both the features and functions of the scheduled item and the comparable features and functions of the proposed substitution.
 - a. Any deviation not indicated in writing will be assumed to be identical to the specified item even if it is shown otherwise on the submittal data.
 - b. If a deviation not listed is found anytime after review and acceptance by the Architect and that deviation, in the opinion of the Architect, renders the substituted item as unacceptable, the item shall be removed and replaced by the scheduled item at no additional cost to the Owner.
 - c. The Architect shall retain the right to specify modifications to the substituted item, correcting or adjusting for the deviation, if the Architect deems it to be in the best interest of the Owner.
3. Scheduled Item: A scheduled item is a product or item of equipment indicated in the Contract Documents by manufacturer's name and model number identifying a single item. The manufacturer's trade name for a group of products that does not signify a single item including type, style, quality, performance, and sound rating shall not be classified as a scheduled item. Where more than one manufacturer and product model number are indicated, each shall be considered as a scheduled item.
4. Form: When a product or item of equipment is proposed as a substitution a "REQUEST FOR SUBSTITUTION" form shall be completed and submitted with the required data. A copy of the form is included after the end of this section.
5. Rejection: Substituted products or equipment will be rejected if, in the opinion of the Architect, the submittal does not meet any one of the following conditions or requirements:
 - a. The submittal data is insufficient or not clearly identified. The Architect may or may not request additional information.
 - b. The product or equipment will not fit the space available and still provide the manufacturers published service area requirements.
 - c. The product or equipment submitted is not equivalent to or better than the specified item. Products or equipment of lesser quality may be considered provided an equitable financial rebate, satisfactory to the Architect, is to be returned to the Owner.
 - d. The product or equipment submitted has less capacity, efficiency and safety provisions than the specified item.
 - e. The product or equipment submitted does not have warranty, service and factory representation equivalent to that specified.
 - f. The Owner prefers not to accept the submitted product.

G. Technical Information Brochure:

1. Binder: Include binders with the first submittal for the Technical Information Brochure. Each binder shall be size 3 inch, hardcover, 3-ring type for 8-1/2" X 11" sheets. Provide correct designation on outside cover and on spine of each binder, i.e., MECHANICAL SUBMITTAL DATA, MECHANICAL OPERATION INSTRUCTION and MECHANICAL MAINTENANCE INSTRUCTIONS.
2. Number: Submit not less than five sets of binders for each of the three mechanical brochures indicated above. Each set shall consist of a minimum of two binders for submittal data and 1 binder each for operating instructions and for maintenance instructions. Additional binders shall be submitted at the request of the Architect. One set of binders shall be retained by the Architect. Three sets of binders shall be maintained for the Owner and the remaining set shall become the property of the Engineer.
3. Index: First sheet in each brochure shall be a photocopy of the "Division 15 Index" of the specifications. Second sheet shall list the firm name, address, phone number, superintendent's name for the contractor and all major subcontractors and suppliers associated with the project.
4. Dividers: Provide reinforced separation sheets tabbed with the appropriate specifications Section reference number for each Section in which submittal data or operation and maintenance instructions is required.
5. Specifications: Insert a copy of the specifications for each Section and all addenda applicable to the Section between each of the Section dividers.

1.09 SHOP DRAWINGS FOR DUCT SYSTEMS

- A. Requirements: Make Shop Drawings for duct systems at a minimum scale of 1/4 inch per foot in AutoCAD Version 2010 (or later) and print on reproducible transparencies to verify clearances and equipment locations. Show required maintenance and operational clearances. Identify Shop Drawings by project name and include names of Architect, Engineer, Contractors, Subcontractors and supplier, date in Shop Drawing title block. Number drawings sequentially and indicate:
 1. Architectural and structural backgrounds with room names and numbers, etc., including but not limited to plans, sections, elevations, details, etc.
 2. Fabrication and erection dimensions.
 3. Arrangements and sectional views.
 4. Necessary details, including complete information for making connections to air distribution devices and air handling equipment.
 5. Kinds of materials and finishes.
 6. Descriptive names of equipment.
 7. Modifications and options to standard equipment required.
- B. Stamp Area: Leave 4 inch by 2-1/2 inch blank area near title block for Architect's shop drawing stamp. The acceptance of a shop drawing by indicating "APPROVED" does not relieve the contractor from full compliance with the sizes and connections shown on the contract documents unless the changes are specifically indicated on the shop drawing.
- C. Reference Key: Indicate by cross-reference the Contract Drawings, notes, or Specification paragraph numbers where item(s) occur in the Contract Documents.
- D. Ceiling Plans: Provide Shop Drawings, using sepia of architectural reflected ceiling plans, which indicate locations of exposed air distribution devices, sprinkler heads, lights and access panel.

- E. Additional Requirements: See specific Sections for additional requirements.

1.10 COORDINATION DRAWINGS

- A. General: Provide detailed (minimum 1/4 inch per foot) scaled coordination drawings showing locations and positions of all architectural, structural, (FF&E) equipment, electrical, plumbing, fire protection and mechanical elements for all installations. Provide overlay drawings, prior to beginning work, indicating work in and above ceilings and in mechanical and electrical rooms with horizontal and vertical dimensions, to avoid interference with structural framing, ceilings, partitions and other services. Accommodate phasing and temporary conditions indicated on the contract drawings as necessary to complete the work without disruption to the Owner's use of the existing occupied areas of the building(s).
- B. Coordination of Space: Coordinate use of project space and sequence of installation of mechanical and electrical work which is indicated diagrammatically on drawings. Follow routings shown for pipes, ducts and conduits as closely as practicable, with due allowance for available physical space; make runs parallel with lines of building. Utilize space efficiently to maximize accessibility for other installations, for maintenance, and for repairs.
In finished areas except as otherwise shown, conceal pipes, ducts, and wiring in construction. Coordinate locations of fixtures and outlets with finish elements. Contractor shall provide background drawings showing partitions, ceiling heights, and structural framing locations and elevations, and existing obstructions. Contractor shall resolve major interferences at initial coordination meeting prior to production of coordination drawings.
- C. Precedence of Services: In event of conflicts and interferences involving location and layout of work, use the following priority to resolve interferences:
 - 1. Structure has highest priority.
 - 2. Walls systems.
 - 3. Ceiling grid/light fixtures.
 - 4. Gravity drainage lines.
 - 5. Ductwork/diffusers, registers and grilles.
 - 5. Small piping and tubing/electrical conduit.
 - 7. Access panels.
- D. Drawings shall be developed on AutoCAD Version 2010 (or later), and utilize AIA Standard layering conventions. At the completion of the project construction, the Contractor shall provide two (2) full-sized print sets and two (2) CDs of all drawing files with related reference files representing as-built installations for Architect review. Upon approval that the submitted information is complete, a similar submittal shall be provided to the Owner.
- E. Stamp Area: Leave 4 inch by 2-1/2 inch blank area near title block for Architect's shop drawing stamp.
- F. Reference Key: Indicate by cross-reference the Contract Drawings, notes, or Specification paragraph numbers where item(s) occur in the Contract Documents.
- G. Additional Requirements: See specific Sections for additional requirements.

1.11 MANUFACTURER'S CHECKOUT

- A. Start-up and Checkout: At completion of installation and prior to performance verification, a factory-trained representative of the manufacturer shall provide start-up and checkout service. After the performance verification the manufacturer's representative shall examine performance information and check the equipment in operation, and sign "Check-Out Memo" for the record.

Submit a copy of Memo on each item of equipment where indicated in individual sections of these specifications for inclusion in each Technical Information Brochure. The "Check-Out Memo" shall be included with the performance verification data. Do not request "Instruction in Operation Conference" or request final inspection until Memos have been submitted and found acceptable.

1.12 INSTRUCTION TO OWNER

- A. Scheduling: Submit any remaining required items for checking at least one week before final inspection of building. When submittal items are found acceptable, notify Owner, in writing, that an "Instruction in Operation Conference" may proceed. Conference will be scheduled by the Owner. After the conference, copies of a memo certifying that the "Instruction in Operation Conference" and "Completed Demonstration" have been made will be signed by Owner and the instructors, and one copy will be inserted in each Technical Information Brochure.

1.13 STRUCTURAL CALCULATIONS FOR ROOF-MOUNTED EQUIPMENT

- A. All roof-mounted devices, equipment and systems shall be constructed, designed and fastened to withstand wind loads of velocities up to 155 mph, as applicable to the wind zone of the project. Structural calculations for roof-mounted equipment shall be completed in accordance with Florida Building Code requirements and Florida Administrative Code Rule 9B-72 and submitted by a structural engineer registered in the State of Florida.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

- A. Specified Products: Manufacturer's names and product model numbers indicated on the drawings and in these specifications establish the type, style, quality, performance, and sound rating of the desired product. Listing of other manufacturers indicates that their equivalent products would be acceptable if they meet the specification requirements, the specific use and installation shown on the drawings, including space and clearance requirements, and the energy consumption and efficiency of the specified product. The listing of additional manufacturers in no way indicates that the manufacturer can provide an acceptable product.
- B. Space Requirements: All manufactured products furnished on this project must have the required space and service areas indicated in the manufacturer's printed literature or shown on their shop drawing. When the manufacturer does not indicate the space required for servicing the equipment, the space shown on the drawings or as required by the Architect must be provided.

2.02 MATERIAL AND EQUIPMENT

- A. General: Material and equipment used shall be produced by manufacturers regularly engaged in the production of similar items, and with a history of satisfactory use as judged by the Architect.
- B. Specified Equipment: Equipment shall be the capacity and types indicated or shall be equivalent in the opinion of the Architect. Material and equipment furnished and installed shall be new, recently manufactured, of standard first grade quality and designed for the specific purpose. Equipment and material furnished shall be the manufacturer's standard item of production unless specified or required to be modified to suit job conditions. Sizes, material, finish, dimensions and the capacities for the specified application shall be published in catalogs for national distribution. Ratings and capacities shall be certified by a recognized rating bureau. Products shall be complete with accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

- C. Compatibility: Material and equipment of one and the same kind, type or classification and used for identical or similar purposes shall be made by the same manufacturer. Where more than one choice is available, select the options which are compatible with other products already selected. Compatibility is a basic general requirement of product selection.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. General: The installation of materials and equipment shall be done in a neat, workmanlike and timely manner by an adequate number of craftsmen knowledgeable of the requirements of the Contract Documents. They shall be skilled in the methods and craftsmanship needed to produce a first-quality installation. Personnel who install materials and equipment shall be qualified by training and experience to perform their assigned tasks. All materials and equipment shall be installed per the manufacturer's written requirements.
- B. Acceptable Workmanship: Acceptable workmanship is characterized by first-quality appearance and function which conforms to applicable standards of building system construction and exhibits a degree of quality and proficiency which is judged by the Architect as equivalent or better than that ordinarily produced by qualified industry tradesmen.
- C. Performance: Personnel shall not be used in the performance of the installation of material and equipment who, in the opinion of the Architect, are deemed to be careless or unqualified to perform the assigned tasks. Material and equipment installations not in compliance with the Contract Documents, or installed with substandard workmanship in the opinion of the Architect, shall be removed and reinstalled by qualified craftsmen at no change in the contract price.

3.02 AIR CONVEYANCE SYSTEM MECHANICAL CLEANING (NEW DUCT INSTALLATION)

- A. General: The following criteria shall be used for the installation of all new HVAC air conveyance systems (ACS).
- B. Qualifications: The enhanced air conveyance system cleaning procedures shall be performed by the Contractor. Microbiological analysis shall be performed by a firm which is acceptable to the Architect and which can demonstrate their ability to conduct the required analysis and reporting according to the NADCA and National Institute for Occupational Safety and Health (NIOSH) Methods. Submit for review and acceptance by the Architect the proposed procedure methodologies to be utilized, a listing of the proposed equipment to be used, and the proposed chemical agents to be used. A mock-up cleaning station and procedural presentation of cleaning process shall be performed at least three months prior to any ductwork installation for review by the Architect
- C. Cleaning Procedure: All ductwork transported to the project shall be protected from weather and debris. Each HVAC duct section shall, prior to installation, be cleaned and disinfected at an approved cleaning station established on-site. Exhaust ductwork shall only require surface preparation from Note 1 below. All air distribution devices (diffusers, grilles, registers) including backpans of supply devices in critical areas, as defined by AIA, shall be decontaminated pursuant to Note 3 below. Four stages of ACS cleaning shall occur:
 - 1. Surface dirt shall be removed by mechanical means, HEPA filtered vacuum and washed down with disposable cleaning cloths and 1:200 solution of trisodium phosphate (TSP) detergent.
 - 2. Wipe down surface with TSP solution again, frequently disposing contaminated cloths.

3. Decontaminate duct section with a diluted solution (4-6 tablespoons per gallon or as directed by manufacturer for use) of chlorhexidine diacetate, similar to Aveco Company Nolvasan, for an appropriate contact period then wipe down and rinse with clean cloths per the application processes defined by manufacturer guidelines.
 4. Cap ducts with a 6 mil. plastic fastened completely to duct openings.
- D. Cleaning Station: Provide a conditioned, positively pressurized, ventilated temporary enclosure to perform duct cleaning procedures. Perform all work and use protective measures as prescribed by cleaning, decontaminating solution manufacturer guidelines.
 - E. Sterilization, Occupied Facility: After the ACS has been cleaned and installed, provide surface sampling shall be performed by firm to confirm absence of *Aspergillus fumigatus*. Upon installation of a zone, the entire ACS shall then be flooded with Bioclean, or another low-odor dual quaternary ammonium compound, EPA registered for use in HVAC systems, and acceptable to the Architect, to sterilize the ACS. The ACS shall be tested in compliance with NADCA Level III sampling protocol until all air samples indicate a colony forming unit (CFU) count of 1.0 CFU per cubic meter or less; re-clean, re-sterilize and retest until all samples achieve results at or below this threshold level.
 - F. Reporting: Provide a complete report detailing the above processes. The report shall contain, as a minimum, the procedure methodologies utilized; the listing of the equipment used; a description of the portions of the ACS which were treated; the chemical agents which were used; the test results from the analysis.

3.03 CLEANING AND PROTECTION

- A. General: Refer to Division 1.
- B. Emergency Contacts: Prior to the beginning of the project, provide the Owner with a list of names, emergency telephone and beeper numbers of individuals who can be contacted during working and non-working hours, including weekends, for assistance throughout the warranty period if leaks, equipment failure or other damages occur. Update the list throughout installation and warranty to provide continuous availability of responsible parties to the Owner. If the Owner cannot contact the responsible party during an emergency situation, the Owner may effect emergency repairs through other means and may backcharge for the costs of repair material and labor incurred.
- C. Emergency Contacts: Along with the operating and maintenance manual submittal, provide the Owner with a list of the names and emergency cell phone numbers of individuals who can be contacted during working and non-working hours, including weekends, for assistance throughout the warranty period should leaks, equipment failure or other damage occur. Update the list throughout warranty to provide continuous availability of responsible parties to the Owner. If the Owner cannot contact the responsible party during an emergency situation, the Owner may effect emergency repairs through other means and may backcharge for the costs of repair material and labor incurred.
- D. Housekeeping: Keep interiors of duct and pipe systems clean and free from dirt, rubbish and foreign matter. Close open ends of piping and ductwork at all times throughout the installation. Install 30% efficient filter media over each return air grille and open return duct opening; change media regularly during construction when dirty to keep duct interiors clean. Prevent dust, debris and foreign material from entering the piping and ductwork.
- E. Equipment Protection: Protect fan motors, switches, equipment, fixtures, and other items from dirt, rubbish and foreign matter. Do not operate air-handling equipment if the building is not clean or if dust can enter the coils or the fan housings.

- F. **Equipment Cleaning:** Thoroughly clean equipment and entire piping systems internally upon completion of installation and immediately prior to final acceptance. Open dirt pockets and strainers, blow down each piping system and clean strainer screens of accumulated debris. Remove accumulated dirt, scale, oil and foreign substances. Thoroughly wipe clean internal surfaces of ductwork and air handling units prior to request for substantial completion. (See para. 3.2 above.)
- G. **Building Cleanup:** Remove debris, rubbish, leftover materials, tools and equipment from work areas and site. Clean tunnels and closed off spaces of packing boxes, wood frame members and other waste materials used in the installation. Final acceptance shall not be approved until site is cleaned.
- H. **Fixture Cleanup:** Remove temporary labels, stickers, etc., from fixtures and equipment. Do not remove permanent nameplates, equipment model numbers, ratings, etc.
- I. **Filter Replacement:** Provide filters, with the same efficiency rating as required for the final installation, for the protection of the air moving equipment and ductwork continuously throughout the construction phase. Provide a new set of clean filters for the test and balance of the air side equipment.
- J. **Protection of Finished Installation:** Where installation is required in areas previously finished by other trades, protect the area from marring, soiling or other damage.
- K. **Air Handling Unit Operation During Construction Phase:** Do not operate air handling equipment during building construction phase unless filter fabric is fastened to all duct systems' inlets and all specified and scheduled air filters are installed to minimize dirt entry into ductwork and air moving equipment. When running air handling units to dry out the building, control the building temperature to drop very slowly, and verify all HVAC insulation is completed and doors and windows are installed and closed, to prevent condensation of water from humid air on building interior surfaces, equipment, materials and ductwork.

3.04 CORRECTION OF WORK

- A. **General:** At no additional cost to the Owner, rectify discrepancies between the actual installation and contract documents when in the opinion of the T&B Agency or the Architect the discrepancies will affect system balance and performance.
- B. **Drive Changes:** Include the cost of all pulley, belt, and drive changes, as well as balancing dampers, valves and fittings, and access panels to achieve proper system balance recommended by the T&B Agency.

3.05 COORDINATION AND ASSISTANCE

- A. **General:** Provide all labor, equipment, tools and material required to operate the equipment and systems necessary for the testing and balancing of the systems and for the adjustment, calibration or repair of all electric or pneumatic automated control devices and components. These services shall be available on each working day during the period of final testing and balancing.
- B. **Drawings and Specifications:** Provide to the T&B Agency a complete set of project record drawings and specifications and an approved copy of all HVAC shop drawings and equipment submittals. The T&B Agency shall be informed of all changes made to the system during construction, including applicable change orders.
- C. **Coordination:** Coordinate the work of all trades and equipment suppliers to complete the modifications recommended by the T&B Agency and accepted by the Architect. Cut or drill holes for the insertion of air measuring devices as directed for test purposes; repair to as-new condition,

inserting plastic caps or covers to prevent air leakage. Repair or replace insulation and re-establish the integrity of the vapor retardant.

3.06 PREPARATIONS FOR PERFORMANCE VERIFICATION

- A. Verification: Prior to commencement of the balancing by the T&B Agency, the Contractor shall verify in writing:
 - 1. That air filters have been replaced and are in clean condition.
 - 2. That linkages between dampers and their actuators are secure, non-overloading and non-binding.
 - 3. That ductwork specialties are in their normal operating positions.
 - 4. That fans are operating at the correct rotation and specified RPM.
 - 5. That ductwork has been pressure tested and accepted.
 - 6. That the operating safeties (thermal overloads, firestat/freezestats, smoke detectors, relief valves, etc.), are installed and fully functional.
 - 7. That equipment has been lubricated and can be operated without damage.
 - 8. That the systems are operational and complete.
 - 9. That no latent residual work remains to be completed.

3.07 ACCEPTANCE TESTING PROCEDURE

- A. General: Each HVAC system shall be tested to confirm proper operation and function in accordance with the construction documents and control sequence of operations.
- B. The enclosed checklists shall be completed for each system and signed off by the mechanical sub-contractor project representative, then verified and signed-off by the mechanical sub-contractor project supervisor and the construction manager systems engineer. All checklists shall be incorporated into the project's close-out manuals submitted for Owner record.
- C. On-site testing by the Architect and Engineer shall be performed at the discretion of the Architect/Engineer for any or all systems to confirm test results and system function.
- D. The Contractor is responsible to provide adequate time in the completion of the construction to perform these system tests prior to final inspections in the affected areas/systems.
- E. The Contractor is responsible for ensuring all required system tests are conducted successfully and recording associated test data and results.
- F. The Contractor is responsible for contacting the Architect and Engineer at least two weeks prior to system test availability and schedule acceptable to Architect/Engineer for on-site testing.
- G. If, in the Architect's and Engineer's opinion, the test results indicate that the systems' installation is not adequately complete for testing, the testing shall be re-scheduled and the Contractor shall be responsible to prepare for such re-test.
- H. Prior to Owner occupancy, all system testing shall be completed and approved.

3.08 PROTECTION OF MATERIALS AND EQUIPMENT

- A. Requirements: Do not store fiberglass insulation or any equipment within the building until it has been "dried in". If dry space is unavailable and the insulation and equipment must be installed or stored before the building is "dried in" and completely enclosed, provide polyethylene film cover for protection.
- B. Replacement of Damaged Stored Material and Equipment: Any material and equipment that has been wet or otherwise damaged prior to installation, in the opinion of the Architect, shall be replaced with new material regardless of the condition of the material and equipment at the time of installation.
- C. Repair of Damaged Installed Material and Equipment: After installation correct or repair dents, scratches and other visible blemishes. At the direction of Architect replace or repair to "as new" condition equipment which has been damaged during construction.
- D. During construction, all piping and ductwork system openings shall be capped with at least two layers of polyethylene film, fastened tightly in place with banding material or foil tape until connection of the continuation of such piping or ductwork is occurring.

3.09 ASBESTOS AND HAZARDOUS MATERIALS

- A. General: Should asbestos or other hazardous material be encountered during execution of the work, or should the presence of asbestos or other hazardous material be suspected, immediately notify the Architect and suspend work in the affected area. The Owner will initiate a study to determine if asbestos or other hazardous materials are present and will determine what action will be taken. Removal of asbestos or other hazardous materials will be done under a separate contract.

3.10 COORDINATION OF SERVICES

- A. General: Coordinate interruption of services to Owner-occupied areas in writing in advance with the Architect. Shutdown time and duration of services interruption shall be decided by the Owner. Provide shutoff valves at points of interconnection to minimize downtime. Procedures incidental to the outage shall be prepared in advance to minimize downtime.
- B. General: Coordinate interruption of existing services in writing at least 1 week in advance with the Architect. Shutdown time and duration of services interruption shall be decided by the Owner. Provide shutoff valves at points of interconnection to minimize downtime. Procedures incidental to the outage shall be prepared in advance to minimize downtime.
- C. Fire Safety in Existing facilities: Do not decrease the fire rating of walls, partitions, ceilings, floors, doors or combinations thereof in adjacent areas or means of egress. Do not interrupt fire sprinkling or life safety systems without prior coordination with the Architect. Inform all necessary parties (Fire Department, Owner's insurance carrier, etc.) in advance, prior to and immediately after shutdown, disconnection or isolation of any portion of life safety or fire sprinkler system.
- D. Protection of Facilities: Portions of the building may be operational during construction. Maintain operation of the equipment and systems whenever the installation interfaces with existing equipment or systems. Provide protection for the building, its contents and occupants wherever installation under the contract is performed. As necessary, move, store, and protect furniture, office fixtures and carpets. Provide acoustical isolation of the work area with temporary doors, partitions, etc., to allow normal work functions. Provide exhaust fans, temporary dust barrier partitions and any containment measures required to prevent dirt, dust or fumes from reaching adjacent occupied spaces as required by the Owner or Architect. Access to the building, including

exit stairs, doors and passageways, and loading dock and other delivery areas shall be kept open and continuously accessible to the occupants. Workmen shall be confined to those areas directly involved in the project installation, and only during time periods indicated and approved by the Owner.

3.11 LAYOUT OF EXISTING EQUIPMENT

- A. General: Existing equipment, piping, ductwork, etc., as indicated on the drawings have, for the most part, been provided to the Architect through existing drawings. The layouts shown may not be from as-built drawings and may be from partial copies of original design documents not produced by the Architect. The Architect is not responsible for the accuracy nor completeness of the existing installation and all layouts are shown for reference only. It is to be understood that unforeseen conditions probably exist and that existing and new work may not be field located exactly as shown on the drawings. Verify existing conditions in the field and notify the Architect of any deviations required to install the work as shown. Coordinate new work with existing equipment, including removing, relocating, rerouting, extending with new materials, and reinstall existing piping, ductwork, conduits, wiring, tubing, supports and other equipment. The Architect shall make the final decision on all deviations or modifications required by the existing conditions.

3.12 CLEAN-UP

- A. General: Debris and rubbish shall not be disposed into the Owner's containers.

END OF SECTION

ACCEPTANCE TESTING CHECKLIST		
1. AIR HANDLING UNIT # _____	OK	N/A
FANS AND CASING SECTIONS:		
1. Spring isolators installed and not bottomed out.		
2. Motor rotation correct and free fan wheel rotation.		
3. Motor belts aligned and properly tensioned.		
4. Proper starter/VFD installed and labeled.		
5. Bearing races secured tight to fan shaft.		
6. Bearing grease cert fitting accessible and lubricated.		
7. All bolts, fasteners, and set screws checked & tightened.		
8. At full speed, fans have no unusual noise or vibration.		
9. All safety guards are properly installed.		
10. Access doors close tightly, door gaskets installed.		
11. Casing/duct sealed with proper sealant.		
12. Proper insulation installed on casing and duct, and joints sealed.		
13. No evidence of air escaping unit or insulation ballooning w/fans on.		
14. No evidence of negative machine room pressure with fans operating.		
15. Fan air volume measuring device installed.		
16. Duct static pressure control sensor installed at proper location.		
17. Duct safety static pressure sensor installed at proper location.		
18. Flex connection at fan discharge installed.		
19. Condensate drain trapped properly and run to floor drain.		
20. Manufacturer's required clearances for unit/components maintained.		
21. Dampers/actuators properly installed & close tightly.		
22. Damper linkage checked for binding, min. play & right blades.		
23. Required maintenance clearances maintained.		
24. Filters installed tightly and checked for no bypass.		
25. Metal spacers installed in filter rack.		
26. Filter manometers installed and calibrated.		
27. Air Handler control system operational.		

Air Handling Unit Comments:

Approvals:

Date _____
Mech. Contractor Signature

Date _____
GC PM/Sys. Engineer Signature

REQUEST FOR SUBSTITUTION (Must be Submitted Prior to Bid)

Project Name: _____ Location: _____

Date of Request: _____

Name of Party Requesting Substitute:

Reason for Substitution Request:

<u>Drawing</u>	<u>Spec. Sect. No.</u>	<u>Paragraph</u>	<u>Specified Item</u>	<u>Manu</u>	<u>Model</u>
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_____	_____	_____	_____	_____	_____
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Proposed Substitute: _____

Manufacturer and Model Number:

Deviations from the Specified Item: (See paragraph entitled "Deviations".)

Reason for Substitution:

Changes to Other Systems to Permit Use of Proposed Substitute:

(List changes. Submit drawings if required for clarity.)

Technical Data to Support Request for Acceptance:

(List ASTM or other standards designations, testing laboratory reports, experience records, etc.)

Other Supporting Data:

(Submit brochures, samples, drawings, etc.)

REQUEST FOR SUBSTITUTION (Continued)

Certification: In making request for substitution, the party whose authorized signature appears below, certifies that all of the following statements are correct and are accepted without exception:

The proposed substitution has been personally investigated and is equal or superior in all significant respects to the product specified for the specific applications required;

The proposed substitution will be warranted under the same terms required for the specified product;

Coordination aspects necessitated by the proposed substitution will be accomplished in a complete and proper fashion by the party signing this form without any additional cost to the Owner; and

Claims against the Owner for additional costs related to the proposed substitution which subsequently become apparent after acceptance by the Architect are hereby waived.

Credit: If this substitution is acceptable the following credit shall be given to the Owner;

\$ _____

CERTIFICATION OF EQUIVALENT PERFORMANCE AND ASSUMPTION OF LIABILITY FOR EQUIVALENT PERFORMANCE

The undersigned states that the function, appearance and quality are equivalent or superior to the specified item.

Submitted by: _____
Signature Title

Typed Name: _____

Company: _____

Signature shall be by person having authority to legally bind his firm to the above terms. Failure to provide a legally binding signature will invalidate this request.

SECTION 23 05 00 - COMMON WORK RESULTS FOR HVAC

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. Escutcheons.
 - 2. Equipment installation requirements common to equipment sections.
 - 3. Painting and finishing.
 - 4. Supports and anchorages.

1.3 DEFINITIONS

- A. Finished Spaces: Spaces other than mechanical and electrical equipment rooms, furred spaces, pipe and duct chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
- B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and mechanical equipment rooms.
- C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
- D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and chases.
- E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.
- F. The following are industry abbreviations for plastic materials:
 - 1. CPVC: Chlorinated polyvinyl chloride plastic.
 - 2. PVC: Polyvinyl chloride plastic.
- G. The following are industry abbreviations for rubber materials:
 - 1. EPDM: Ethylene-propylene-diene terpolymer rubber.
 - 2. NBR: Acrylonitrile-butadiene rubber.

1.4 SUBMITTALS

- A. Product Data: For the following:

- 1. Escutcheons.

- B. Welding certificates.

1.5 QUALITY ASSURANCE

- A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
- B. Electrical Characteristics for HVAC Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

- A. Deliver pipes and tubes with factory-applied end caps. Maintain end caps through shipping, storage, and handling to prevent pipe end damage and to prevent entrance of dirt, debris, and moisture.
- B. Store plastic pipes protected from direct sunlight. Support to prevent sagging and bending.

1.7 COORDINATION

- A. Arrange for pipe spaces, chases, slots, and openings in building structure during progress of construction, to allow for HVAC installations.
- B. Coordinate installation of required supporting devices and set sleeves in poured-in-place concrete and other structural components as they are constructed.
- C. Coordinate requirements for access panels and doors for HVAC items requiring access that are concealed behind finished surfaces. Access panels and doors are specified in Division 08 Section "Access Doors and Frames."

PART 2 - PRODUCTS

2.1 MANUFACTURERS

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

2.2 ESCUTCHEONS

- A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
- B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.
- C. One-Piece, Cast-Brass Type: With set screw.
 - 1. Finish: Polished chrome-plated.
- D. Split-Casting, Cast-Brass Type: With concealed hinge and set screw.
 - 1. Finish: Polished chrome-plated.

PART 3 - EXECUTION

3.1 HVAC DEMOLITION

- A. Refer to Division 01 Section "Cutting and Patching" and Division 02 Section "Selective Structure Demolition" for general demolition requirements and procedures.
- B. Disconnect, demolish, and remove HVAC systems, equipment, and components indicated to be removed.
 - 1. Piping to Be Removed: Remove portion of piping indicated to be removed and cap or plug remaining piping with same or compatible piping material.
 - 2. Ducts to Be Removed: Remove portion of ducts indicated to be removed and plug remaining ducts with same or compatible ductwork material.
 - 3. Equipment to Be Removed: Disconnect and cap services and remove equipment.
 - 4. Equipment to Be Removed and Reinstalled: Disconnect and cap services and remove, clean, and store equipment; when appropriate, reinstall, reconnect, and make equipment operational.
 - 5. Equipment to Be Removed and Salvaged: Disconnect and cap services and remove equipment and deliver to Owner.
- C. If pipe, insulation, or equipment to remain is damaged in appearance or is unserviceable, remove damaged or unserviceable portions and replace with new products of equal capacity and quality.

3.2 PIPING SYSTEMS - COMMON REQUIREMENTS

- A. Install piping according to the following requirements and Division 23 Sections specifying piping systems.
- B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction

loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

- C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.
- D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.
- E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.
- F. Install piping to permit valve servicing.
- G. Install piping at indicated slopes.
- H. Install piping free of sags and bends.
- I. Install fittings for changes in direction and branch connections.
- J. Install piping to allow application of insulation.
- K. Select system components with pressure rating equal to or greater than system operating pressure.
- L. Install escutcheons for penetrations of walls, ceilings, and floors according to the following:
 - 1. New Piping:
 - a. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep-pattern type.
 - b. Insulated Piping: One-piece, stamped-steel type with spring clips.
 - c. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast-brass type with polished chrome-plated finish.
 - d. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split-casting, cast-brass type with polished chrome-plated finish.
 - 2. Existing Piping: Use the following:
 - a. Bare Piping at Wall and Floor Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
 - b. Bare Piping at Ceiling Penetrations in Finished Spaces: Split-casting, cast-brass type with chrome-plated finish.
- M. Verify final equipment locations for roughing-in.
- N. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.3 PIPING JOINT CONSTRUCTION

- A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.
- B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
- C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
- D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

3.4 PIPING CONNECTIONS

- A. Make connections according to the following, unless otherwise indicated:
 - 1. Install unions, in piping NPS 2 and smaller, adjacent to each valve and at final connection to each piece of equipment.

3.5 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

- A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.
- B. Install equipment level and plumb, parallel and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
- C. Install HVAC equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
- D. Install equipment to allow right of way for piping installed at required slope.

3.6 PAINTING

- A. Painting of HVAC systems, equipment, and components is specified in Division 09 Sections "Interior Painting" and "Exterior Painting."
- B. Damage and Touchup: Repair marred and damaged factory-painted finishes with materials and procedures to match original factory finish.

3.7 ERECTION OF METAL SUPPORTS AND ANCHORAGES

- A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor HVAC materials and equipment.
- C. Field Welding: Comply with AWS D1.1.

END OF SECTION 230500

SECTION 23 07 13 - DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section includes insulating the following duct services:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, concealed return located in unconditioned space.
- B. Related Sections:
 - 1. Section 230716 "HVAC Equipment Insulation."
 - 2. Section 233113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).
- B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.
 - 1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
 - 2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
 - 3. Detail application of field-applied jackets.
 - 4. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified Installer.
- B. 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. Field quality-control reports.

1.5 QUALITY ASSURANCE

- A. 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.
- B. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing 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 agency.
 - 1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.

1.6 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.

1.7 COORDINATION

- A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."
- B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork 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.

1.8 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 "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and "Aboveground, Outdoor Duct and Plenum Insulation 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. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
- E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
- F. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type I. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. CertainTeed Corp.; SoftTouch Duct Wrap.
 - b. Johns Manville; Microlite.
 - c. Knauf Insulation; Friendly Feel Duct Wrap.
 - d. Manson Insulation Inc.; Alley Wrap.
 - e. Owens Corning; SOFTR All-Service Duct Wrap.

2.2 ADHESIVES

- A. 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.
- B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-127.Eagle Bridges - Marathon Industries; 225.
 - b. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 85-60/85-70.Mon-Eco Industries, Inc.; 22-25.
 - 2. For indoor applications, adhesive shall have a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 3. Adhesive shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."

2.3 MASTICS

- A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.
 - 1. For indoor applications, use mastics that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
- B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.
 - 1. Products: Subject to compliance with requirements, provide one of the following:

- a. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-80/30-90.
 - b. Vimasco Corporation; 749.
- 2. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
- 3. Service Temperature Range: Minus 20 to plus 180 deg F.
- 4. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
- 5. Color: White.

2.4 LAGGING ADHESIVES

- A. Description: Comply with MIL-A-3316C, Class I, Grade A and shall be compatible with insulation materials, jackets, and substrates.
 - 1. For indoor applications, use lagging adhesives that have a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 2. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-50 AHV2.Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-36.
 - b. Vimasco Corporation; 713 and 714.
 - 3. Fire-resistant, water-based lagging adhesive and coating for use indoors to adhere fire-resistant lagging cloths over duct insulation.
 - 4. Service Temperature Range: 0 to plus 180 deg F.
 - 5. Color: White.

2.5 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. FSP Jacket: Aluminum-foil, fiberglass-reinforced scrim with polyethylene backing; complying with ASTM C 1136, Type II.
 - 5. Vinyl Jacket: White vinyl with a permeance of 1.3 perms when tested according to ASTM E 96/E 96M, Procedure A, and complying with NFPA 90A and NFPA 90B.

2.6 FIELD-APPLIED JACKETS

- A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.
- B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.
- C. Metal Jacket:

1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; Metal Jacketing Systems.
 - b. ITW Insulation Systems; Aluminum and Stainless Steel Jacketing.
 - c. RPR Products, Inc.; Insul-Mate.
2. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.
 - a. Sheet and roll stock ready for shop or field sizing.
 - b. Finish and thickness are indicated in field-applied jacket schedules.
 - c. Moisture Barrier for Indoor Applications: 3-mil- thick, heat-bonded polyethylene and kraft paper.

2.7 SECUREMENTS

A. Bands:

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. ITW Insulation Systems; Gerrard Strapping and Seals.
 - b. RPR Products, Inc.; Insul-Mate Strapping, Seals, and Springs.
2. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with closed seal.
3. Springs: Twin spring set constructed of stainless steel with ends flat and slotted to accept metal bands. Spring size determined by manufacturer for application.

B. Insulation Pins and Hangers:

1. Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- diameter shank, length to suit depth of insulation indicated.
 - a. Products: Subject to compliance with requirements, available products that may be incorporated into the Work include, but are not limited to, the following:
 - 1) AGM Industries, Inc.; CWP-1.
 - 2) GEMCO; CD.
 - 3) Midwest Fasteners, Inc.; CD.
 - 4) Nelson Stud Welding; TPA, TPC, and TPS.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.
 1. Verify that systems to be insulated have been tested and are free of defects.

2. Verify that surfaces to be insulated are clean and dry.
- B. 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.

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 ducts and fittings.
- B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct 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. Keep insulation materials dry during application and finishing.
- G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.
- H. Install insulation with least number of joints practical.
- I. 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.
- J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.
- K. 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. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
 - a. For below ambient services, apply vapor-barrier mastic over staples.
 4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
 5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.
- L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.
- M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.
- N. 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.

3.4 PENETRATIONS

- A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
 4. Seal jacket to roof flashing with flashing sealant.
- B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.
1. Seal penetrations with flashing sealant.
 2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
 3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
 4. Seal jacket to wall flashing with flashing sealant.
- C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.
- D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches.

1. Comply with requirements in Section 078413 "Penetration Firestopping" firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Penetration Firestopping."

3.5 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:
 - a. On duct sides with dimensions 18 inches and smaller, place pins along longitudinal centerline of duct. Space 3 inches maximum from insulation end joints, and 16 inches o.c.
 - b. On duct sides with dimensions larger than 18 inches, place pins 16 inches o.c. each way, and 3 inches maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
 - c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
 - d. Do not overcompress insulation during installation.
 - e. Impale insulation over pins and attach speed washers.
 - f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.
4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch outward-clinching staples, 1 inch o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.
 - a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
 - b. Install vapor stops for ductwork and plenums operating below 50 deg F at 18-foot intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches.
5. Overlap unfaced blankets a minimum of 2 inches on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches o.c.

6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches o.c.

3.6 FIELD-APPLIED JACKET INSTALLATION

- A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.
 1. Draw jacket smooth and tight to surface with 2-inch overlap at seams and joints.
 2. Embed glass cloth between two 0.062-inch- thick coats of lagging adhesive.
 3. Completely encapsulate insulation with coating, leaving no exposed insulation.
- B. Where FSK jackets are indicated, install as follows:
 1. Draw jacket material smooth and tight.
 2. Install lap or joint strips with same material as jacket.
 3. Secure jacket to insulation with manufacturer's recommended adhesive.
 4. Install jacket with 1-1/2-inch laps at longitudinal seams and 3-inch- wide joint strips at end joints.
 5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.
- C. Where PVC jackets are indicated, install with 1-inch overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.
 1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.
- D. Where metal jackets are indicated, install with 2-inch overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches o.c. and at end joints.

3.7 FIRE-RATED INSULATION SYSTEM INSTALLATION

- A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.
- B. Insulate duct access panels and doors to achieve same fire rating as duct.
- C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section 078413 "Penetration Firestopping."

3.8 FINISHES

- A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."
 - 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.

3.9 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 ductwork, 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(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.
- D. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.10 DUCT INSULATION SCHEDULE, GENERAL

- A. Plenums and Ducts Requiring Insulation:
 - 1. Indoor, concealed supply and outdoor air.
 - 2. Indoor, concealed return located in unconditioned space.

3.11 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

- A. Concealed, round and flat-oval, supply-air duct insulation shall be[**one of**] the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- B. Concealed, round and flat-oval, return-air duct insulation shall be one of the following:
 - 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- C. Concealed, rectangular, supply-air duct insulation shall be one of the following:

1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.
- D. Concealed, rectangular, return-air duct insulation shall be one of the following:
 1. Mineral-Fiber Blanket: 2 inches thick and 1.5-lb/cu. ft. nominal density.

3.12 INDOOR, FIELD-APPLIED JACKET SCHEDULE

- A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
- B. If more than one material is listed, selection from materials listed is Contractor's option.
- C. Ducts and Plenums, Concealed:
 1. None.
 2. Aluminum, Stucco Embossed: 0.020 inch thick.

END OF SECTION 230713

SECTION 23 31 13 - METAL DUCTS

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. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Sealants and gaskets.
5. Hangers and supports.

B. Related Sections:

1. Division 23 Section "Testing, Adjusting, and Balancing for HVAC" for testing, adjusting, and balancing requirements for metal ducts.
2. Division 23 Section "Nonmetal Ducts" for fibrous-glass ducts, thermoset fiber-reinforced plastic ducts, thermoplastic ducts, PVC ducts, and concrete ducts.
3. Division 23 Section "HVAC Casings" for factory- and field-fabricated casings for mechanical equipment.
4. Division 23 Section "Air Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.

1.3 PERFORMANCE REQUIREMENTS

- A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.
- B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"
- C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of the following products:
 1. Sealants and gaskets.

B. Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration isolation.

C. Delegated-Design Submittal:

1. Sheet metal thicknesses.
2. Joint and seam construction and sealing.
3. Reinforcement details and spacing.
4. Materials, fabrication, assembly, and spacing of hangers and supports.
5. Design Calculations: Calculations, including analysis data signed and sealed by the qualified professional engineer responsible for their preparation for selecting hangers and supports.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:
 - a. Lighting fixtures.
 - b. Air outlets and inlets.
 - c. Speakers.
 - d. Sprinklers.
 - e. Access panels.
 - f. Perimeter moldings.

B. Welding certificates.

C. Field quality-control reports.

1.6 QUALITY ASSURANCE

- A. Welding Qualifications: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
- B. Welding Qualifications: Qualify procedures and personnel according to the following:
 - 1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
 - 2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
 - 3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.
- C. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-up."
- D. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-1, "Rectangular Duct/Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Duct/Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND DUCTS AND FITTINGS

- A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Lindab Inc.
 - b. McGill AirFlow LLC.
 - c. SEMCO Incorporated.
 - d. Sheet Metal Connectors, Inc.
 - e. Spiral Manufacturing Co., Inc.
- B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Round Duct Transverse Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- 1. Transverse Joints in Ducts Larger Than 60 Inches in Diameter: Flanged.
- C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Round Duct Longitudinal Seams," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- 1. Fabricate round ducts larger than 90 inches in diameter with butt-welded longitudinal seams.
 - 2. Fabricate flat-oval ducts larger than 72 inches in width (major dimension) with butt-welded longitudinal seams.
- D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

- A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.
- B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
- 1. Galvanized Coating Designation: G60.
 - 2. Finishes for Surfaces Exposed to View: Mill phosphatized.
- C. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- 1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.
- D. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.4 SEALANT AND GASKETS

- A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
- B. Two-Part Tape Sealing System:
 - 1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
 - 2. Tape Width: 3 inches.
 - 3. Sealant: Modified styrene acrylic.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 7. Service: Indoor and outdoor.
 - 8. Service Temperature: Minus 40 to plus 200 deg F.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
 - 10. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 11. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- C. Water-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Solids Content: Minimum 65 percent.
 - 3. Shore A Hardness: Minimum 20.
 - 4. Water resistant.
 - 5. Mold and mildew resistant.
 - 6. VOC: Maximum 75 g/L (less water).
 - 7. Maximum Static-Pressure Class: 10-inch wg, positive and negative.
 - 8. Service: Indoor or outdoor.
 - 9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
 - 10. Products: Foster 32-19 (VOC: 24 g/l), Childers CP-146 (VOC:24 g/l), or approved equal.
- D. Solvent-Based Joint and Seam Sealant:
 - 1. Application Method: Brush on.
 - 2. Base: Synthetic rubber resin.
 - 3. Solvent: Toluene and heptane.
 - 4. Solids Content: Minimum 60 percent.
 - 5. Shore A Hardness: Minimum 60.
 - 6. Water resistant.
 - 7. Mold and mildew resistant.
 - 8. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 - 9. VOC: Maximum 395 g/L.
 - 10. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
 - 11. Maximum Static-Pressure Class: 10-inch wg, positive or negative.
 - 12. Service: Indoor or outdoor.

13. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.
 14. Products: Foster 32-14, Childers CP-140, or approved equal.
- E. Flanged Joint Sealant: Comply with ASTM C 920.
1. General: Single-component, acid-curing, silicone, elastomeric.
 2. Type: S.
 3. Grade: NS.
 4. Class: 25.
 5. Use: O.
 6. For indoor applications, sealant shall have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
 7. Sealant shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small-Scale Environmental Chambers."
- F. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.
- G. Round Duct Joint O-Ring Seals:
1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg and shall be rated for 10-inch wg static-pressure class, positive or negative.
 2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
 3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.5 HANGERS AND SUPPORTS

- A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.
- B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.
- C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct."
- D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.
- E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.
- F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.
- G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.
- H. Trapeze and Riser Supports:
 1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
 2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
 3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

- A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.
- B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.
- C. Install round ducts in maximum practical lengths.
- D. Install ducts with fewest possible joints.
- E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.
- F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.
- G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.
- H. Install ducts with a clearance of 1 inch, plus allowance for insulation thickness.
- I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.
- J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches.
- K. Where ducts pass through fire-rated interior partitions and exterior walls, install fire dampers. Comply with requirements in Division 23 Section "Air Duct Accessories" for fire and smoke dampers.
- L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials.

3.2 DUCT SEALING

- A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
- B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":
 - 1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg and Lower: Seal Class B.
3. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg: Seal Class A.
4. Unconditioned Space, Return-Air Ducts: Seal Class B.

3.3 HANGER AND SUPPORT INSTALLATION

- A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 5, "Hangers and Supports."
- B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.
 1. Where practical, install concrete inserts before placing concrete.
 2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
 3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches thick.
 4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches thick.
 5. Do not use powder-actuated concrete fasteners for seismic restraints.
- C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 5-1, "Rectangular Duct Hangers Minimum Size," and Table 5-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches of each elbow and within 48 inches of each branch intersection.
- D. Hangers Exposed to View: Threaded rod and angle or channel supports.
- E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum intervals of 16 feet.
- F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.4 CONNECTIONS

- A. Make connections to equipment with flexible connectors complying with Division 23 Section "Air Duct Accessories."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.5 PAINTING

- A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 09 painting Sections.

3.6 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
- B. Leakage Tests:
 - 1. Comply with SMACNA's "HVAC Air Duct Leakage Test Manual." Submit a test report for each test.
 - 2. Test the following systems:
 - a. Supply Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
 - b. Return Ducts with a Pressure Class of 2-Inch wg or Higher: Test representative duct sections totaling no less than 25 percent of total installed duct area for each designated pressure class.
 - 3. Disassemble, reassemble, and seal segments of systems to accommodate leakage testing and for compliance with test requirements.
 - 4. Test for leaks before applying external insulation.
 - 5. Conduct tests at static pressures equal to maximum design pressure of system or section being tested. If static-pressure classes are not indicated, test system at maximum system design pressure. Do not pressurize systems above maximum design operating pressure.
 - 6. Give seven days' advance notice for testing.
- C. Duct System Cleanliness Tests:
 - 1. Visually inspect duct system to ensure that no visible contaminants are present.
 - 2. Test sections of metal duct system, chosen randomly by Owner, for cleanliness according to "Vacuum Test" in NADCA ACR, "Assessment, Cleaning and Restoration of HVAC Systems."
 - a. Acceptable Cleanliness Level: Net weight of debris collected on the filter media shall not exceed 0.75 mg/100 sq. cm.
- D. Duct system will be considered defective if it does not pass tests and inspections.
- E. Prepare test and inspection reports.

3.7 DUCT CLEANING

- A. Clean new duct system(s) before testing, adjusting, and balancing.
- B. Use service openings for entry and inspection.
 - 1. Create new openings and install access panels appropriate for duct static-pressure class if required for cleaning access. Provide insulated panels for insulated or lined duct. Patch insulation and liner as recommended by duct liner manufacturer. Comply with Division 23 Section "Air Duct Accessories" for access panels and doors.
 - 2. Disconnect and reconnect flexible ducts as needed for cleaning and inspection.
 - 3. Remove and reinstall ceiling to gain access during the cleaning process.
- C. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

D. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

E. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coil drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

- A. Air Balance: Comply with requirements in Division 23 Section "Testing, Adjusting, and Balancing for HVAC."

3.9 DUCT SCHEDULE

A. Supply Ducts:

1. Ducts Connected to Constant-Volume Air-Handling Units:
 - a. Pressure Class: Positive 2-inch wg.

- b. Minimum SMACNA Seal Class: A.
- c. SMACNA Leakage Class for Rectangular: 6.
- d. SMACNA Leakage Class for Round and Flat Oval: 6.

B. Return Ducts:

1. Ducts Connected to Air-Handling Units:

- a. Pressure Class: Positive or negative 2-inch wg.
- b. Minimum SMACNA Seal Class: A.
- c. SMACNA Leakage Class for Rectangular: 6.
- d. SMACNA Leakage Class for Round and Flat Oval: 6.

C. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

- a. Velocity 1000 fpm or Lower:
 - 1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
- b. Velocity 1000 to 1500 fpm:
 - 1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
- c. Velocity 1500 fpm or Higher:
 - 1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
 - 2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.

2. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-2, "Rectangular Elbows."

- a. Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
- b. Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
- c. Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-3, "Vanes and Vane Runners," and Figure 4-4, "Vane Support in Elbows."

3. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "Round Duct Elbows."

- a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.
 - 1) Velocity 1000 fpm or Lower: 0.5 radius-to-diameter ratio and three segments for 90-degree elbow.
 - 2) Velocity 1000 to 1500 fpm: 1.0 radius-to-diameter ratio and four segments for 90-degree elbow.
 - 3) Velocity 1500 fpm or Higher: 1.5 radius-to-diameter ratio and five segments for 90-degree elbow.

4) Radius-to Diameter Ratio: 1.5.

- b. Round Elbows, 12 Inches and Smaller in Diameter: Stamped or pleated.
- c. Round Elbows, 14 Inches and Larger in Diameter: Standing seam.

D. Branch Configuration:

- 1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 4-6, "Branch Connection."
 - a. Rectangular Main to Rectangular Branch: 45-degree entry.
 - b. Rectangular Main to Round Branch: Spin in.
- 2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-5, "90 Degree Tees and Laterals," and Figure 3-6, "Conical Tees." Saddle taps are permitted in existing duct.
 - a. Velocity 1000 fpm or Lower: 90-degree tap.
 - b. Velocity 1000 to 1500 fpm: Conical tap.
 - c. Velocity 1500 fpm or Higher: 45-degree lateral.

END OF SECTION 233113

SECTION 23 33 00 - AIR DUCT ACCESSORIES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Manual volume dampers.
 - 2. Turning vanes.
 - 3. Duct-mounted access doors.
 - 4. Flexible connectors.
 - 5. Flexible ducts.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
 - 1. For duct silencers, include pressure drop and dynamic insertion loss data. Include breakout noise calculations for high transmission loss casings.
- B. Shop Drawings: For duct accessories. Include plans, elevations, sections, details and attachments to other work.
 - 1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances; and method of field assembly into duct systems and other construction. Include the following:
 - a. Special fittings.
 - b. Manual volume damper installations.
 - c. Control-damper installations.
 - d. Fire-damper, smoke-damper, combination fire- and smoke-damper, ceiling, and corridor damper installations, including sleeves; and duct-mounted access doors and remote damper operators.
 - e. Duct security bars.
 - f. Wiring Diagrams: For power, signal, and control wiring.

1.4 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Reflected ceiling plans, drawn to scale, on which ceiling-mounted access panels and access doors required for access to duct accessories are shown and coordinated with each other, using input from Installers of the items involved.
- B. Source quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For air duct accessories to include in operation and maintenance manuals.

1.6 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fusible Links: Furnish quantity equal to 10 percent of amount installed.

PART 2 - PRODUCTS

2.1 ASSEMBLY DESCRIPTION

- A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."
- B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

2.2 MATERIALS

- A. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.
 - 1. Galvanized Coating Designation: G60.
 - 2. Exposed-Surface Finish: Mill phosphatized.
- B. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.
- C. Tie Rods: Galvanized steel, 1/4-inch minimum diameter for lengths 36 inches or less; 3/8-inch minimum diameter for lengths longer than 36 inches.

2.3 MANUAL VOLUME DAMPERS

- A. Standard, Steel, Manual Volume Dampers:
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. Flexmaster U.S.A., Inc.
 - d. McGill AirFlow LLC.
 - e. Nailor Industries Inc.
 - f. Pottorff.

- g. Ruskin Company.
 - h. Trox USA Inc.
 - i. Vent Products Company, Inc.
2. Standard leakage rating, with linkage outside airstream.
 3. Suitable for horizontal or vertical applications.
 4. Frames:
 - a. Frame: Hat-shaped, 0.094-inch- thick, galvanized sheet steel.
 - b. Mitered and welded corners.
 - c. Flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized-steel, 0.064 inch thick.
 6. Blade Axles: Galvanized steel.
 7. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
 8. Tie Bars and Brackets: Galvanized steel.
- B. Standard, Aluminum, Manual Volume Dampers:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. McGill AirFlow LLC.
 - d. Nailor Industries Inc.
 - e. Pottorff.
 - f. Ruskin Company.
 - g. Trox USA Inc.
 - h. Vent Products Company, Inc.
 2. Standard leakage rating, with linkage outside airstream.
 3. Suitable for horizontal or vertical applications.
 4. Frames: Hat-shaped, 0.10-inch- thick, aluminum sheet channels; frames with flanges for attaching to walls and flangeless frames for installing in ducts.
 5. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Roll-Formed Aluminum Blades: 0.10-inch- thick aluminum sheet.
 - e. Extruded-Aluminum Blades: 0.050-inch- thick extruded aluminum.
 6. Blade Axles: Galvanized steel.

7. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Aluminum.

C. Low-Leakage, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Air Balance Inc.; a division of Mestek, Inc.
 - b. American Warming and Ventilating; a division of Mestek, Inc.
 - c. McGill AirFlow LLC.
 - d. Nailor Industries Inc.
 - e. Pottorff.
 - f. Ruskin Company.
 - g. Trox USA Inc.
 - h. Vent Products Company, Inc.
2. Comply with AMCA 500-D testing for damper rating.
3. Low-leakage rating, with linkage outside airstream, and bearing AMCA's Certified Ratings Seal for both air performance and air leakage.
4. Suitable for horizontal or vertical applications.
5. Frames:
 - a. Hat shaped.
 - b. 0.094-inch- thick, galvanized sheet steel.
 - c. Mitered and welded corners.
 - d. Flanges for attaching to walls and flangeless frames for installing in ducts.
6. Blades:
 - a. Multiple or single blade.
 - b. Parallel- or opposed-blade design.
 - c. Stiffen damper blades for stability.
 - d. Galvanized, roll-formed steel, 0.064 inch thick.
7. Blade Axles: Galvanized steel.
8. Bearings:
 - a. Oil-impregnated bronze.
 - b. Dampers in ducts with pressure classes of 3-inch wg or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
9. Blade Seals: Neoprene.
10. Jamb Seals: Cambered aluminum.
11. Tie Bars and Brackets: Galvanized steel.
12. Accessories:
 - a. Include locking device to hold single-blade dampers in a fixed position without vibration.

2.4 TURNING VANES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Elgen Manufacturing.
 4. METALAIRE, Inc.
 5. SEMCO Incorporated.
 6. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
1. Acoustic Turning Vanes: Fabricate airfoil-shaped aluminum extrusions with perforated faces and fibrous-glass fill.
- C. Manufactured Turning Vanes for Nonmetal Ducts: Fabricate curved blades of resin-bonded fiberglass with acrylic polymer coating; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.
- D. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 4-3, "Vanes and Vane Runners," and 4-4, "Vane Support in Elbows."
- E. Vane Construction: Single wall.
- F. Vane Construction: Single wall for ducts up to 48 inches wide and double wall for larger dimensions.

2.5 DUCT-MOUNTED ACCESS DOORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. American Warming and Ventilating; a division of Mestek, Inc.
 2. Cesco Products; a division of Mestek, Inc.
 3. Ductmate Industries, Inc.
 4. Elgen Manufacturing.
 5. Flexmaster U.S.A., Inc.
 6. Greenheck Fan Corporation.
 7. McGill AirFlow LLC.
 8. Nailor Industries Inc.
 9. Pottorff.
 10. Ventfabrics, Inc.
 11. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 7-2, "Duct Access Doors and Panels," and 7-3, "Access Doors - Round Duct."
1. Door:
 - a. Double wall, rectangular.

- b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
 - c. Vision panel.
 - d. Hinges and Latches: 1-by-1-inch butt or piano hinge and cam latches.
 - e. Fabricate doors airtight and suitable for duct pressure class.
 - 2. Frame: Galvanized sheet steel, with bend-over tabs and foam gaskets.
 - 3. Number of Hinges and Locks:
 - a. Access Doors Less Than 12 Inches Square: No hinges and two sash locks.
 - b. Access Doors up to 18 Inches Square: Continuous and two sash locks.
 - c. Access Doors up to 24 by 48 Inches: Continuous and two compression latches with outside handles.
 - d. Access Doors Larger Than 24 by 48 Inches: Continuous hinge and two compression latches with outside and inside handles.
- C. Pressure Relief Access Door:
- 1. Door and Frame Material: Galvanized sheet steel.
 - 2. Door: Double wall with insulation fill with metal thickness applicable for duct pressure class.
 - 3. Operation: Open outward for positive-pressure ducts and inward for negative-pressure ducts.
 - 4. Factory set at 3.0- to 8.0-inch wg.
 - 5. Doors close when pressures are within set-point range.
 - 6. Hinge: Continuous piano.
 - 7. Latches: Cam.
 - 8. Seal: Neoprene or foam rubber.
 - 9. Insulation Fill: 1-inch- thick, fibrous-glass or polystyrene-foam board.

2.6 DUCT ACCESS PANEL ASSEMBLIES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Ductmate Industries, Inc.
 - 2. Flame Gard, Inc.
 - 3. 3M.
- B. Labeled according to UL 1978 by an NRTL.
- C. Panel and Frame: Minimum thickness 0.0528-inch carbon steel.
- D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.
- E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F.
- F. Minimum Pressure Rating: 10-inch wg, positive or negative.

2.7 FLEXIBLE CONNECTORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
 2. Duro Dyne Inc.
 3. Elgen Manufacturing.
 4. Ventfabrics, Inc.
 5. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Materials: Flame-retardant or noncombustible fabrics.
- C. Coatings and Adhesives: Comply with UL 181, Class 1.
- D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches wide attached to two strips of 2-3/4-inch- wide, 0.028-inch- thick, galvanized sheet steel or 0.032-inch- thick aluminum sheets. Provide metal compatible with connected ducts.
- E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.
1. Minimum Weight: 26 oz./sq. yd..
 2. Tensile Strength: 480 lbf/inch in the warp and 360 lbf/inch in the filling.
 3. Service Temperature: Minus 40 to plus 200 deg F.
- F. Thrust Limits: Combination coil spring and elastomeric insert with spring and insert in compression, and with a load stop. Include rod and angle-iron brackets for attaching to fan discharge and duct.
1. Frame: Steel, fabricated for connection to threaded rods and to allow for a maximum of 30 degrees of angular rod misalignment without binding or reducing isolation efficiency.
 2. Outdoor Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
 3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
 4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
 5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
 6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
 7. Coil Spring: Factory set and field adjustable for a maximum of 1/4-inch movement at start and stop.

2.8 FLEXIBLE DUCTS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Flexmaster U.S.A., Inc.
 2. McGill AirFlow LLC.
 3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.
- B. Insulated, Flexible Duct: UL 181, Class 1, 2-ply vinyl film supported by helically wound, spring-steel wire; fibrous-glass insulation; [polyethylene] [aluminized] vapor-barrier film.

1. Pressure Rating: 10-inch wg positive and 1.0-inch wg negative.
2. Maximum Air Velocity: 4000 fpm.
3. Temperature Range: Minus 10 to plus 160 deg F.
4. Insulation R-value: [Comply with ASHRAE/IESNA 90.1] <Insert value>.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.
- B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.
- C. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.
 1. Install steel volume dampers in steel ducts.
 2. Install aluminum volume dampers in aluminum ducts.
- D. Set dampers to fully open position before testing, adjusting, and balancing.
- E. Install test holes at fan inlets and outlets and elsewhere as indicated.
- F. Install fire dampers according to UL listing.
- G. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:
 1. On both sides of duct coils.
 2. Upstream from duct filters.
 3. At outdoor-air intakes and mixed-air plenums.
 4. At drain pans and seals.
 5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
 6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.
 7. At each change in direction and at maximum 50-foot spacing.
 8. Upstream from turning vanes.
 9. Upstream or downstream from duct silencers.
 10. Control devices requiring inspection.
 11. Elsewhere as indicated.
- H. Install access doors with swing against duct static pressure.

- I. Access Door Sizes:
 - 1. One-Hand or Inspection Access: 8 by 5 inches.
 - 2. Two-Hand Access: 12 by 6 inches.
 - 3. Head and Hand Access: 18 by 10 inches.
 - 4. Head and Shoulders Access: 21 by 14 inches.
 - 5. Body Access: 25 by 14 inches.
 - 6. Body plus Ladder Access: 25 by 17 inches.
- J. Label access doors according to Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.
- K. Install flexible connectors to connect ducts to equipment.
- L. For fans developing static pressures of 5-inch wg and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.
- M. Connect diffusers or light troffer boots to ducts with maximum 72-inch <Insert value> lengths of flexible duct clamped or strapped in place.
- N. Connect flexible ducts to metal ducts with draw bands.
- O. Install duct test holes where required for testing and balancing purposes.
- P. Install thrust limits at centerline of thrust, symmetrical on both sides of equipment. Attach thrust limits at centerline of thrust and adjust to a maximum of 1/4-inch movement during start and stop of fans.

3.2 FIELD QUALITY CONTROL

- A. Tests and Inspections:
 - 1. Operate dampers to verify full range of movement.
 - 2. Inspect locations of access doors and verify that purpose of access door can be performed.
 - 3. Operate fire, smoke, and combination fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
 - 4. Inspect turning vanes for proper and secure installation.
 - 5. Operate remote damper operators to verify full range of movement of operator and damper.

END OF SECTION 233300

SECTION 23 37 13 - DIFFUSERS, REGISTERS, AND GRILLES

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. Rectangular and square ceiling diffusers.
 - 2. Louver face diffusers.
- B. Related Sections:
 - 1. Section 233300 "Air Duct Accessories" for fire and smoke dampers and volume-control dampers not integral to diffusers, registers, and grilles.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated, include the following:
 - 1. Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static-pressure drop, and noise ratings.
 - 2. Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

PART 2 - PRODUCTS

2.1 CEILING DIFFUSERS

- A. Rectangular and Square Ceiling Diffusers:
 - 1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Anemostat Products; a Mestek company.
 - b. METALAIRE, Inc.
 - c. Price Industries.
 - 2. Devices shall be specifically designed for variable-air-volume flows.
 - 3. Material: Aluminum.
 - 4. Finish: Baked enamel, white.
 - 5. Face Size: **24 by 24 inches**.
 - 6. Face Style: Three cone.

7. Mounting: T-bar.
8. Pattern: Fixed.
9. Accessories:
 - a. Plaster ring.
 - b. Operating rod extension.

B. Louver Face Diffuser:

1. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
 - a. Anemostat Products; a Mestek company.
 - b. METALAIRE, Inc.
 - c. Price Industries.
2. Devices shall be specifically designed for variable-air-volume flows.
3. Material: Aluminum.
4. Finish: Baked enamel, white.
5. Mounting: Surface.
6. Accessories:
 - a. Square to round neck adaptor.
 - b. Adjustable pattern vanes.
 - c. Throw reducing vanes.
 - d. Operating rod extension.

2.2 SOURCE QUALITY CONTROL

- A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine areas where diffusers, registers, and grilles are to be installed for compliance with requirements for installation tolerances and other conditions affecting performance of equipment.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install diffusers, registers, and grilles level and plumb.
- B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

- C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.3 ADJUSTING

- A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION 233713

SECTION 23 74 13 - PACKAGED, OUTDOOR, CENTRAL-STATION AIR-HANDLING UNITS

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 packaged, outdoor, central-station air-handling units (rooftop units) with the following components and accessories:
 - 1. Direct-expansion cooling.
 - 2. Hot-gas reheat.
 - 3. Electric-heating coils.
 - 4. Integral, space temperature controls.
 - 5. Roof curbs.

1.3 DEFINITIONS

- A. DDC: Direct-digital controls.
- B. ECM: Electrically commutated motor.
- C. Outdoor-Air Refrigerant Coil: Refrigerant coil in the outdoor-air stream to reject heat during cooling operations and to absorb heat during heating operations. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.
- D. Outdoor-Air Refrigerant-Coil Fan: The outdoor-air refrigerant-coil fan in RTUs. "Outdoor air" is defined as the air outside the building or taken from outdoors and not previously circulated through the system.
- E. RTU: Rooftop unit. As used in this Section, this abbreviation means packaged, outdoor, central-station air-handling units. This abbreviation is used regardless of whether the unit is mounted on the roof or on a concrete base on ground.
- F. Supply-Air Fan: The fan providing supply air to conditioned space. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.
- G. Supply-Air Refrigerant Coil: Refrigerant coil in the supply-air stream to absorb heat (provide cooling) during cooling operations and to reject heat (provide heating) during heating operations. "Supply air" is defined as the air entering a space from air-conditioning, heating, or ventilating apparatus.
- H. VVT: Variable-air volume and temperature.

1.4 ACTION SUBMITTALS

- A. Product Data: Include manufacturer's technical data for each RTU, including rated capacities, dimensions, required clearances, characteristics, furnished specialties, and accessories.
- 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. Wiring Diagrams: Power, signal, and control wiring.
- C. Delegated-Design Submittal: For RTU supports 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. Design Calculations: Calculate requirements for selecting vibration isolators and for designing vibration isolation bases.
 - 2. Detail mounting, securing, and flashing of roof curb to roof structure. Indicate coordinating requirements with roof membrane system.
 - 3. Wind-Restraint Details: Detail fabrication and attachment of wind and seismic restraints and snubbers. Show anchorage details and indicate quantity, diameter, and depth of penetration of anchors.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Plans and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:
 - 1. Structural members to which RTUs will be attached.
 - 2. Roof openings
 - 3. Roof curbs and flashing.
- B. Manufacturer Wind Loading Qualification Certification: Submit certification that specified equipment will withstand wind forces identified in "Performance Requirements" Article and in Section 230548 "Vibration and Seismic Controls for HVAC."
 - 1. Basis for Certification: Indicate whether withstand certification is based on actual test of assembled components or on calculations.
 - 2. Dimensioned Outline Drawings of Equipment Unit: Identify center of wind force and locate and describe mounting and anchorage provisions.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.
- C. Manufacturer Seismic Qualification Certification: Submit certification that RTUs, accessories, and components will withstand seismic forces defined in "Performance Requirements" Article and in Section 230548 "Vibration and Seismic Controls for HVAC."
 - 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.
 - 3. Detailed description of equipment anchorage devices on which the certification is based and their installation requirements.

- D. Field quality-control test reports.
- E. Warranty: Special warranty specified in this Section.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For RTUs to include in emergency, operation, and maintenance manuals.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fan Belts: One set for each belt-driven fan.
 - 2. Filters: One set of filters for each unit.

1.8 QUALITY ASSURANCE

- A. ARI Compliance:
 - 1. Comply with ARI 203/110 and ARI 303/110 for testing and rating energy efficiencies for RTUs.
 - 2. Comply with ARI 270 for testing and rating sound performance for RTUs.
- B. ASHRAE Compliance:
 - 1. Comply with ASHRAE 15 for refrigeration system safety.
 - 2. Comply with ASHRAE 33 for methods of testing cooling and heating coils.
 - 3. Comply with applicable requirements in ASHRAE 62.1, Section 5 - "Systems and Equipment" and Section 7 - "Construction and Startup."
- C. ASHRAE/IESNA 90.1 Compliance: Applicable requirements in ASHRAE/IESNA 90.1, Section 6 - "Heating, Ventilating, and Air-Conditioning."
- D. NFPA Compliance: Comply with NFPA 90A and NFPA 90B.
- E. UL Compliance: Comply with UL 1995.
- F. 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.

1.9 WARRANTY

- A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to replace components of RTUs that fail in materials or workmanship within specified warranty period.
 - 1. Warranty Period for Compressors: Manufacturer's standard, but not less than five years from date of Substantial Completion.

2. Warranty Period for Control Boards: Manufacturer's standard, but not less than three years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
- B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- C. Basis-of-Design Product: Subject to compliance with requirements, provide **[the product indicated on Drawings]** **<Insert manufacturer's name; product name or designation>** or a comparable product by one of the following:
 1. AAON, Inc.
 2. Addison Products Company.
 3. Carrier Corporation.
 4. Trane; American Standard Companies, Inc.

2.2 CASING

- A. General Fabrication Requirements for Casings: Formed and reinforced double-wall insulated panels, fabricated to allow removal for access to internal parts and components, with joints between sections sealed.
- B. Exterior Casing Material: Galvanized steel with factory-painted finish, with pitched roof panels and knockouts with grommet seals for electrical and piping connections and lifting lugs.
 1. Exterior Casing Thickness: 0.079 inch thick.
- C. Inner Casing Fabrication Requirements:
 1. Inside Casing: Galvanized steel, 0.034 inch thick, perforated 40 percent free area.
- D. Casing Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
 1. Materials: ASTM C 1071, Type I.
 2. Thickness: 1 inch.
 3. Liner materials shall have air-stream surface coated with an erosion- and temperature-resistant coating or faced with a plain or coated fibrous mat or fabric.
 4. Liner Adhesive: Comply with ASTM C 916, Type I.
- E. Condensate Drain Pans: Formed sections of galvanized-steel sheet, a minimum of 2 inches deep, and complying with ASHRAE 62.1.
 1. Double-Wall Construction: Fill space between walls with foam insulation and seal moisture tight.
 2. Drain Connections: Threaded nipple.
 3. Pan-Top Surface Coating: Corrosion-resistant compound.

- F. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1.

2.3 FANS

- A. Belt-Driven Supply-Air Fans: Double width, forward curved, centrifugal; with permanently lubricated, single-speed motor installed on an adjustable fan base resiliently mounted in the casing. Aluminum or painted-steel wheels, and galvanized- or painted-steel fan scrolls.
- B. Condenser-Coil Fan: Propeller, mounted on shaft of permanently lubricated motor.
- C. Fan Motor: Comply with requirements in Section 230513 "Common Motor Requirements for HVAC Equipment."

2.4 COILS

- A. Supply-Air Refrigerant Coil:
 - 1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
 - 3. Coil Split: Interlaced.
 - 4. Condensate Drain Pan: Galvanized steel with corrosion-resistant coating formed with pitch and drain connections complying with ASHRAE 62.1.
- B. Hot-Gas Reheat Refrigerant Coil:
 - 1. Aluminum-plate fin and seamless internally grooved copper tube in steel casing with equalizing-type vertical distributor.
 - 2. Polymer strip shall prevent all copper coil from contacting steel coil frame or condensate pan.
 - 3. Baked phenolic coating.
- C. Electric-Resistance Heating:
 - 1. Open Heating Elements: Resistance wire of 80 percent nickel and 20 percent chromium, supported and insulated by floating ceramic bushings recessed into casing openings, fastened to supporting brackets, and mounted in galvanized-steel frame. Terminate elements in stainless-steel machine-staked terminals secured with stainless-steel hardware.
 - 2. Overtemperature Protection: Disk-type, automatically reset, thermal-cutout, safety device; serviceable through terminal box.
 - 3. Overcurrent Protection: Manual-reset thermal cutouts, factory wired in each heater stage.
 - 4. Control Panel: Unit mounted with disconnecting means and overcurrent protection. Include the following controls:
 - a. Magnetic contactors.
 - b. Step Controller: Pilot lights and override toggle switch for each step.
 - c. SCR Controller: Pilot lights operate on load ratio, a minimum of five steps.
 - d. Time-delay relay.
 - e. Airflow proving switch.

2.5 REFRIGERANT CIRCUIT COMPONENTS

- A. Number of Refrigerant Circuits: Two.
- B. Compressor: Hermetic, scroll, mounted on vibration isolators; with internal overcurrent and high-temperature protection, internal pressure relief, and crankcase heater.
- C. Refrigeration Specialties:
 - 1. Refrigerant: R-410A.
 - 2. Expansion valve with replaceable thermostatic element.
 - 3. Refrigerant filter/dryer.
 - 4. Manual-reset high-pressure safety switch.
 - 5. Automatic-reset low-pressure safety switch.
 - 6. Minimum off-time relay.
 - 7. Automatic-reset compressor motor thermal overload.
 - 8. Brass service valves installed in compressor suction and liquid lines.
 - 9. Low-ambient kit high-pressure sensor.
 - 10. Hot-gas reheat solenoid valve with a replaceable magnetic coil.
 - 11. Hot-gas bypass solenoid valve with a replaceable magnetic coil.
 - 12. Four-way reversing valve with a replaceable magnetic coil, thermostatic expansion valves with bypass check valves, and a suction line accumulator.

2.6 AIR FILTRATION

- A. Minimum arrestance according to ASHRAE 52.1, and a minimum efficiency reporting value (MERV) according to ASHRAE 52.2.
 - 1. Pleated: Minimum 90 percent arrestance, and MERV 7.

2.7 DAMPERS

- A. Outdoor-Air Damper: Linked damper blades, for 0 to 25 percent outdoor air, with manual damper filter.
- B. Outdoor- and Return-Air Mixing Dampers: Parallel- or opposed-blade galvanized-steel dampers mechanically fastened to cadmium plated for galvanized-steel operating rod in reinforced cabinet. Connect operating rods with common linkage and interconnect linkages so dampers operate simultaneously.
 - 1. Damper Motor: Modulating with adjustable minimum position.
 - 2. Relief-Air Damper: Gravity actuated or motorized, as required by ASHRAE/IESNA 90.1, with bird screen and hood.

2.8 ELECTRICAL POWER CONNECTION

- A. Provide for single connection of power to unit with unit-mounted disconnect switch accessible from outside unit and control-circuit transformer with built-in overcurrent protection.

2.9 CONTROLS

- A. Control equipment and sequence of operation are specified in Section 230900 "Instrumentation and Control for HVAC."
- B. Basic Unit Controls:
 - 1. Control-voltage transformer.
 - 2. Wall-mounted thermostat or sensor with the following features:
 - a. Heat-cool-off switch.
 - b. Fan on-auto switch.
 - c. Fan-speed switch.
 - d. Automatic changeover.
 - e. Adjustable deadband.
 - f. Exposed set point.
 - g. Exposed indication.
 - h. Degree F indication.
 - i. Unoccupied-period-override push button.
 - j. Data entry and access port to input temperature and humidity set points, occupied and unoccupied periods, and output room temperature and humidity, supply-air temperature, operating mode, and status.
 - 3. Wall-mounted humidistat or sensor with the following features:
 - a. Concealed set point.
 - b. Concealed indication.
 - 4. Unit-Mounted Annunciator Panel for Each Unit:
 - a. Lights to indicate power on, cooling, heating, fan running, filter dirty, and unit alarm or failure.
 - b. DDC controller or programmable timer and interface with HVAC instrumentation and control system.
 - c. Digital display of outdoor-air temperature, supply-air temperature, return-air temperature, economizer damper position, indoor-air quality, and control parameters.
- C. DDC Controller:
 - 1. Controller shall have volatile-memory backup.
 - 2. Safety Control Operation:
 - a. Smoke Detectors: Stop fan and close outdoor-air damper if smoke is detected. Provide additional contacts for alarm interface to fire alarm control panel.
 - b. Firestats: Stop fan and close outdoor-air damper if air greater than 130 deg F enters unit. Provide additional contacts for alarm interface to fire alarm control panel.
 - c. Fire Alarm Control Panel Interface: Provide control interface to coordinate with operating sequence described in Section 283111 "Digital, Addressable Fire-Alarm System" and Section 283112 "Zoned (DC Loop) Fire-Alarm System."
 - d. Low-Discharge Temperature: Stop fan and close outdoor-air damper if supply air temperature is less than 44 deg F.
 - e. Defrost Control for Condenser Coil: Pressure differential switch to initiate defrost sequence.

3. Scheduled Operation: Occupied and unoccupied periods on **[seven]** **[365]**-day clock with a minimum of **[two]** **[four]** programmable periods per day.
 4. Unoccupied Period:
 - a. Heating Setback: 10 deg F.
 - b. Cooling Setback: System off.
 - c. Override Operation: Two hours.
 5. Supply Fan Operation:
 - a. Occupied Periods: Run fan continuously.
 - b. Unoccupied Periods: Cycle fan to maintain setback temperature.
 6. Refrigerant Circuit Operation:
 - a. Occupied Periods: Cycle or stage compressors, and operate hot-gas bypass to match compressor output to cooling load to maintain room temperature and humidity. Cycle condenser fans to maintain maximum hot-gas pressure. Operate low-ambient control kit to maintain minimum hot-gas pressure.
 - b. Unoccupied Periods: Compressors off.
 - c. Switch reversing valve for heating or cooling mode on air-to-air heat pump.
 7. Hot-Gas Reheat-Coil Operation:
 - a. Occupied Periods: Humidistat opens hot-gas valve to provide hot-gas reheat, and cycles compressor.
 - b. Unoccupied Periods: Reheat not required.
 8. Electric-Heating-Coil Operation:
 - a. Occupied Periods: Stage coil to maintain room temperature.
 - b. Unoccupied Periods: Energize coil to maintain setback temperature.
 - c. Operate supplemental electric heating coil with compressor for heating with outdoor temperature below 25 deg F.
 9. Fixed Minimum Outdoor-Air Damper Operation:
 - a. Occupied Periods: Open to 25 percent.
 - b. Unoccupied Periods: Close the outdoor-air damper.
- D. Interface Requirements for HVAC Instrumentation and Control System:
1. Interface relay for scheduled operation.
 2. Interface relay to provide indication of fault at the central workstation and diagnostic code storage.
 3. Provide BACnet compatible interface for central HVAC control workstation for the following:
 - a. Adjusting set points.
 - b. Monitoring supply fan start, stop, and operation.
 - c. Inquiring data to include outdoor-air damper position, supply- and room-air temperature and humidity.
 - d. Monitoring occupied and unoccupied operations.
 - e. Monitoring constant and variable motor loads.
 - f. Monitoring variable-frequency drive operation.

- g. Monitoring cooling load.
- h. Monitoring economizer cycles.
- i. Monitoring air-distribution static pressure and ventilation air volume.

2.10 ACCESSORIES

- A. Duplex, 115-V, ground-fault-interrupter outlet with 15-A overcurrent protection. Include transformer if required. Outlet shall be energized even if the unit main disconnect is open.
- B. Filter differential pressure switch with sensor tubing on either side of filter. Set for final filter pressure loss.
- C. Coil guards of painted, galvanized-steel wire.
- D. Hail guards of galvanized steel, painted to match casing.
- E. Concentric diffuser with white louvers and polished aluminum return grilles, insulated diffuser box with mounting flanges, and interior transition.

2.11 ROOF CURBS

- A. Roof curbs with vibration isolators and wind or seismic restraints are specified in Section 230548 "Vibration and Seismic Controls for HVAC."
- B. Materials: Galvanized steel with corrosion-protection coating, watertight gaskets, and factory-installed wood nailer; complying with NRCA standards.
 - 1. Curb Insulation and Adhesive: Comply with NFPA 90A or NFPA 90B.
 - a. Materials: ASTM C 1071, Type I or II.
 - b. Thickness: 2 inches.
 - 2. Application: Factory applied with adhesive and mechanical fasteners to the internal surface of curb.
 - a. Liner Adhesive: Comply with ASTM C 916, Type I.
 - b. Mechanical Fasteners: Galvanized steel, suitable for adhesive attachment, mechanical attachment, or welding attachment to duct without damaging liner when applied as recommended by manufacturer and without causing leakage in cabinet.
 - c. Liner materials applied in this location shall have air-stream surface coated with a temperature-resistant coating or faced with a plain or coated fibrous mat or fabric depending on service air velocity.
 - d. Liner Adhesive: Comply with ASTM C 916, Type I.
- C. Curb Height: 14 inches.
- D. Wind and Seismic Restraints: Metal brackets compatible with the curb and casing, painted to match RTU, used to anchor unit to the curb, and designed for loads at Project site. Comply with requirements in Section 230548 "Vibration and Seismic Controls for HVAC" for wind-load requirements.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine substrates, areas, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of RTUs.
- B. Examine roughing-in for RTUs to verify actual locations of piping and duct connections before equipment installation.
- C. Examine roofs for suitable conditions where RTUs will be installed.
- D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Equipment Mounting:
 - 1. Comply with requirements for vibration isolation and seismic control devices specified in Section 230548 "Vibration and Seismic Controls for HVAC."
 - 2. Comply with requirements for vibration isolation devices specified in Section 230548.13 "Vibration Controls for HVAC."
- B. Roof Curb: Install on roof structure or concrete base, level and secure, according to NRCA's "Low-Slope Membrane Roofing Construction Details Manual," Illustration "Raised Curb Detail for Rooftop Air Handling Units and Ducts." Install RTUs on curbs and coordinate roof penetrations and flashing with roof construction specified in Section 077200 "Roof Accessories." Secure RTUs to upper curb rail, and secure curb base to roof framing or concrete base with anchor bolts.
- C. Unit Support: Install unit level on structural curbs. Coordinate wall penetrations and flashing with wall construction. Secure RTUs to structural support with anchor bolts.

3.3 CONNECTIONS

- A. Install condensate drain, minimum connection size, with trap and indirect connection to nearest roof drain or area drain.
- B. Duct installation requirements are specified in other HVAC Sections. Drawings indicate the general arrangement of ducts. The following are specific connection requirements:
 - 1. Install ducts to termination at top of roof curb.
 - 2. Remove roof decking only as required for passage of ducts. Do not cut out decking under entire roof curb.
 - 3. Connect supply ducts to RTUs with flexible duct connectors specified in Section 233300 "Air Duct Accessories."
 - 4. Install return-air duct continuously through roof structure.
 - 5. Install normal-weight, 3000-psi, compressive strength (28-day) concrete mix inside roof curb, 4 inches thick. Concrete, formwork, and reinforcement are specified with concrete.

3.4 FIELD QUALITY CONTROL

- A. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect, test, and adjust components, assemblies, and equipment installations, including connections. Report results in writing.
- B. Perform tests and inspections and prepare test reports.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing. Report results in writing.
- C. Tests and Inspections:
 - 1. After installing RTUs and after electrical circuitry has been energized, test units for compliance with requirements.
 - 2. Inspect for and remove shipping bolts, blocks, and tie-down straps.
 - 3. Operational Test: After electrical circuitry has been energized, start units to confirm proper motor rotation and unit operation.
 - 4. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- D. Remove and replace malfunctioning units and retest as specified above.

3.5 STARTUP SERVICE

- A. Engage a factory-authorized service representative to perform startup service.
- B. Complete installation and startup checks according to manufacturer's written instructions and do the following:
 - 1. Inspect for visible damage to unit casing.
 - 2. Inspect for visible damage to furnace combustion chamber.
 - 3. Inspect for visible damage to compressor, coils, and fans.
 - 4. Inspect internal insulation.
 - 5. Verify that labels are clearly visible.
 - 6. Verify that clearances have been provided for servicing.
 - 7. Verify that controls are connected and operable.
 - 8. Verify that filters are installed.
 - 9. Clean condenser coil and inspect for construction debris.
 - 10. Clean furnace flue and inspect for construction debris.
 - 11. Connect and purge gas line.
 - 12. Remove packing from vibration isolators.
 - 13. Inspect operation of barometric relief dampers.
 - 14. Verify lubrication on fan and motor bearings.
 - 15. Inspect fan-wheel rotation for movement in correct direction without vibration and binding.
 - 16. Adjust fan belts to proper alignment and tension.
 - 17. Start unit according to manufacturer's written instructions.
 - a. Start refrigeration system.
 - b. Do not operate below recommended low-ambient temperature.
 - c. Complete startup sheets and attach copy with Contractor's startup report.
 - 18. Inspect and record performance of interlocks and protective devices; verify sequences.

19. Operate unit for an initial period as recommended or required by manufacturer.
20. Perform the following operations for both minimum and maximum firing. Adjust burner for peak efficiency.
 - a. Measure gas pressure on manifold.
 - b. Inspect operation of power vents.
 - c. Measure combustion-air temperature at inlet to combustion chamber.
 - d. Measure flue-gas temperature at furnace discharge.
 - e. Perform flue-gas analysis. Measure and record flue-gas carbon dioxide and oxygen concentration.
 - f. Measure supply-air temperature and volume when burner is at maximum firing rate and when burner is off. Calculate useful heat to supply air.
21. Calibrate thermostats.
22. Adjust and inspect high-temperature limits.
23. Inspect outdoor-air dampers for proper stroke and interlock with return-air dampers.
24. Start refrigeration system and measure and record the following when ambient is a minimum of 15 deg F above return-air temperature:
 - a. Coil leaving-air, dry- and wet-bulb temperatures.
 - b. Coil entering-air, dry- and wet-bulb temperatures.
 - c. Outdoor-air, dry-bulb temperature.
 - d. Outdoor-air-coil, discharge-air, dry-bulb temperature.
25. Inspect controls for correct sequencing of heating, mixing dampers, refrigeration, and normal and emergency shutdown.
26. Measure and record the following minimum and maximum airflows. Plot fan volumes on fan curve.
 - a. Supply-air volume.
 - b. Return-air volume.
 - c. Relief-air volume.
 - d. Outdoor-air intake volume.
27. Simulate maximum cooling demand and inspect the following:
 - a. Compressor refrigerant suction and hot-gas pressures.
 - b. Short circuiting of air through condenser coil or from condenser fans to outdoor-air intake.
28. Verify operation of remote panel including pilot-light operation and failure modes. Inspect the following:
 - a. High-temperature limit on gas-fired heat exchanger.
 - b. Low-temperature safety operation.
 - c. Filter high-pressure differential alarm.
 - d. Economizer to minimum outdoor-air changeover.
 - e. Relief-air fan operation.
 - f. Smoke and firestat alarms.
29. After startup and performance testing and prior to Substantial Completion, replace existing filters with new filters.

3.6 CLEANING AND ADJUSTING

- A. Occupancy Adjustments: When requested within 12 months of date of Substantial Completion, provide on-site assistance in adjusting system to suit actual occupied conditions. Provide up to two visits to site during other-than-normal occupancy hours for this purpose.
- B. After completing system installation and testing, adjusting, and balancing RTU and air-distribution systems, clean filter housings and install new filters.

3.7 DEMONSTRATION

- A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain RTUs. Refer to Section 017900 "Demonstration and Training."

END OF SECTION 237413

SECTION 260010 - BASIC ELECTRICAL REQUIREMENTS

PART 1 - GENERAL

1.01 GENERAL

- A. Basic Requirements: The Drawings and general provisions of the Contract, including General and Supplementary Conditions and Division 1 Specification sections, apply to work of this section.
- B. General Provisions: Provide all labor, materials, equipment, and incidentals required to make ready for use complete electrical systems as specified herein and shown on the drawings.
- C. Provide and Install: The word "provide" where used on the Drawings or in the Specifications shall mean "furnish, install, mount, connect, test, complete, and make ready for operation". The word "install" where used on the Drawings or in the Specifications shall mean "mount, connect, test, complete, and make ready for operation". Perform work required by, and in accordance with, the Contract Documents.
- D. Installation: Provide and place in satisfactory condition, ready for proper operation, raceways, wires, cables, and other material needed for all complete electrical systems required by the Contract Documents. Additional raceways and wiring shall be provided to complete the installation of the specific equipment provided. Include auxiliaries and accessories for complete and properly operating systems. Provide electrical systems and accessories to comply with the NEC, state and local codes and ordinances. It is the intent of these Specifications that the electrical systems be suitable in every way for the use intended. Material and work which is incidental to the work of this Contract shall be provided at no additional cost to the Contract.
- E. Field Connections: Provide field connections to remote equipment and control panels provided under other Divisions of these Specifications. Provide raceway, wire, and interconnections between equipment, transmitters, local indicators, and receivers. Install field connections to "packaged" equipment provided under other Divisions of these Specifications.

1.02 SCOPE OF WORK

- A. General: Provide labor, materials, permits, inspections and re-inspection fees, tools, equipment, transportation, insurance, temporary protection, temporary power and lighting, supervision and incidental items essential for proper installation and operation of the Electrical systems indicated in the Contract Documents. Provide materials not specifically mentioned or indicated but which are usually provided or are essential for proper installation and operation of the Electrical systems indicated in the contract documents.
- B. Notices: Give notices, file Plans, pay fees, and obtain permits and approvals from authorities having jurisdiction. Include all fees in the Bid Price.

1.03 INTERPRETATION OF DRAWINGS

- A. General: The Drawings are diagrammatic and are not intended to show exact locations of Raceway runs, outlet boxes, junction boxes, pull boxes, etc. The locations of equipment, appliances, fixtures, Raceways, outlets, boxes and similar devices shown on the Drawings are approximate only. Exact locations shall be determined and coordinated in the field. The right is reserved to change, without additional cost, the location of any outlet within the same room or general area before it is permanently installed. Obtain all information relevant to the placing of electrical work and in case of interference with other work, proceed as directed by the Architect.
- B. Discrepancies: Notify the Architect of any discrepancies found during construction of the project. The Architect will provide written instructions as to how to proceed with that portion of work. If a conflict exists between the Contract Documents and an applicable code or standard, the most stringent requirement shall apply.
- C. Wiring: Each three-phase circuit shall be run in a separate Raceway unless otherwise shown on the Drawings. Unless otherwise accepted by the Architect, Raceway shall not be installed exposed. Where circuits are shown as "home-runs" all necessary fittings, supports, and boxes shall be provided for a complete raceway installation.
- D. Layout: Circuit layouts are not intended to show the number of fittings, or other installation details. Connections to equipment shall be made as required, and in accordance with the accepted shop and manufacturer's setting drawings.
- E. Coordination: Coordinate final equipment locations with drawings or other disciplines. Layout before installation so that all trades may install equipment in available space. Provide coordination as required for installation in a neat and workmanlike manner.

1.04 EQUIPMENT SIZE AND HANDLING

- A. Coordination: Investigate each space in the structure through which equipment must pass to reach its final location. If necessary, ship the equipment in sections of specific sizes to permit the passing through the necessary areas within the structure.
- B. Handling: Equipment shall be kept upright at all times. When equipment has to be tilted for ease of passage through restricted areas during transportation, the manufacturer shall be required to brace the equipment suitably, to insure that the tilting does not impair the functional integrity of the equipment.

1.05 RECORD DRAWINGS

- A. Production: The Contractor shall provide two (2) sets of black or blue line on white drawings to maintain and submit record "As-Built Documents". Label each sheet of the Record Document set with "Project Record Documents" with company name of the installing contractor in stamped or printed letters. One set shall be maintained at the site and at all times be accurate, clear, and complete. These drawings shall be available at all times to the Architect's field representatives.
- B. Recording: Record information concurrent with construction progress. Make entries within 24 hours upon receipt of information. The "As-Built" drawings shall accurately reflect installed electrical work specified or shown on the Contract Documents.
- C. Completion: At the completion of the Work, transfer changes with a colored pencil onto the second set and submit to the Architect. The "As-Built" drawings shall be made available to the Architect to make the substantial completion punch list.

- D. Final: Upon Contractor's completion of the Engineer's final punch list, transfer all "As-Built" conditions and all requirements by the Engineer to a reproducible set of drawings and CAD files. Submit drawings and CAD disks for review and acceptance. The Contractor shall provide updated disks which include final As-Built conditions.

1.06 ABBREVIATIONS

- A. Abbreviations: The following abbreviations or initials may be used:

A/C	Air Conditioning
AC	Alternating Current
ABV CLG	Above Ceiling
ADA	Americans with Disabilities Act
AF	Ampere Frame
AFF	Above Finished Floor
AFG	Above Finished Grade
AHU	Air Handler Unit
AIC	Amps Interrupting Capacity
AL	Aluminum
AMP	Ampere
ANSI	American National Standards Institute
ASA	American Standards Association
AT	Ampere Trip
ATS	Automatic Transfer Switch
AUX	Auxiliary
AWG	American Wire Gauge
BC	Bare Copper
BIL	Basic Impulse Level
BMS	Building Management System
BRKR or BKR	Breaker
CAB	Cabinet
C	Conduit or Raceway
CB	Circuit Breaker
CBM	Certified Ballast Manufacturers
CCTV	Closed Circuit Television
CKT	Circuit
CLEC	Clock Equipment Cabinet
CLG	Ceiling
CO	Conduit or Raceway Only
COAX	Coaxial Cable
COND	Conductor
CONN	Connection
CPU	Central Processing Unit
CT	Current Transformer
CU	Copper
CW	Cold Water
DC	Direct Current
DDC	Direct Digital Control
DEG	Degree
DISC	Disconnect
DO	Draw Out
DN	Down
DPST	Double Pole Single Throw
EMT	Electrical Metallic Tubing
EO	Electrically Operated
EOL	End of Line Resistor

EWC	Electric Water Cooler
FAAP	Fire Alarm Annunciator Panel
FACP	Fire Alarm Control Panel
FCU	Fan Coil Unit
FLA	Full Load Amperes
FM	Factory Mutual
GF	Ground Fault
GFCI	Ground Fault Circuits Interrupter
GND	Ground
HOA	Hand-Off-Automatic
HORIZ	Horizontal
HP	Horsepower
IC	Intercom
ICU	Intensive Care Unit
IEEE	Institute of Electrical and Electronic Engineers
IES	Illuminating Engineering Society
IMC	Intermediate Metallic Raceway
IN	Inches
IT	Instantaneous Trip
IPCEA	Insulated Power Cable Engineers Association
JB	Junction Box
KCMIL	Thousand Circular Mills
KV	Kilovolt
KVA	Kilo-Volt-Amps
KW	Kilowatts
LBS	Pounds
LED	Light Emitting Diode
LT	Light
LTD	Long Time Delay
LTT	Long Time Trip
LTG	Lighting
MAX	Maximum
MCB	Main Circuit Breaker
MCC	Motor Control Center
MCP	Motor Circuit Protector
MIC	Microphone
MIN	Minimum
MLO	Main Lugs Only
MTD	Mounted
MTG	Mounting
MUX	Multiplex (Transponder) Panel
MVA	Mega Volt Amps
N	Neutral
NC	Normally Closed
NEC	National Electrical Code
NECA	National Electrical Contractors Association
NEMA	National Electrical Manufacturers Association
NFPA	National Fire Protection Association
NIC	Not in Contract
NF	Non Fused
NL	Non Linear
NO	Number or Normally Open
#	Number
Ø	Phase
OL	Overload
OSHA	Occupational Safety and Health Administration

P	Pole
PB	Pullbox
PIV	Post Indicator Valve
PNL	Panel
PR	Pair
PWR	Power
PF	Power Factor
PRI	Primary
PT	Potential Transformer
PVC	Polyvinylchloride
REF	Refrigerator
RGC or GRC	Rigid Galvanized Raceway
RMS	Root-Mean-Square
RPM	Revolutions Per Minute
RECPT	Receptacle
SCA	Short Circuit Amps
SD	Smoke Detector
SEC	Secondary
S/N	Solid Neutral
SPKR	Speaker
SPST	Single Pole Single Throw
SST	Solid State Trip
ST	Short Time Trip
STD	Short Time Delay
SW	Switch
SWGR	Switchgear
SWBD	Switchboard
TEL	Telephone
TTB	Telephone Terminal Board
TTC	Telephone Terminal Cabinet
TVEC	Television Equipment Cabinet
TYP	Typical
UL	Underwriters Laboratories
UON	Unless Otherwise Noted
V	Volt
VFD	Variable Frequency Drive
VSD	Variable Speed Drive
W	Wire
WP	Weatherproof
XFMR	Transformer

1.07 CODES, FEES, AND STANDARDS

- A. Application: The codes, standards and practices listed herein generally apply to the entire project and specification sections. Other codes, standards or practices that are more specific will be referenced within a particular specification.
- B. Requirements: All materials and types of construction covered in the specifications will be required to meet or exceed applicable standards of manufacturer, testing, performance, and installation according to the requirements of UL, ANSI, NEMA, IEEE, and NEC referenced documents where indicated and the manufacturer's recommended practices. Requirements indicated on the contract documents that exceed but are not contrary to governing codes shall be followed.
- C. Compliance and Certification: The installation shall comply with the governing state and local codes or ordinances. The completed electrical installation shall be inspected and certified by applicable agencies that it is in compliance with codes.

D. Applicability: The codes and standards and practices listed herein, and their respective dates are furnished as the minimum latest requirements.

1. State of Florida.
2. Suwannee County.
3. City of Live Oak.

E. Utility Company: Comply with latest utility company regulations.

F. Building Code: Florida Building Code (2010 w/addendums).

G. Standards: American Society of Mechanical Engineers

1. ASME-A17.1 (2004) Elevator Code, plus Interpretations to Date.

H. Labels: Materials and equipment shall be new and free of defects, and shall be U.L. listed, bear the U.L. label or be labeled or listed with an approved, nationally recognized Electrical Testing Agency. Where no labeling or listing service is available or desired for certain types of equipment, test data shall be submitted to validate that equipment meets or exceeds available standards.

I. NFPA: National Fire Protection Association (NFPA) Standards

- | | |
|-----------|----------------------------------------------------------------------------------|
| NFPA-1 | (2006) Uniform Fire Code™ |
| NFPA-13 | (2002) Standard for the Installation of Sprinkler Systems |
| NFPA-70 | (2005) National Electrical Code |
| NFPA-72 | (2002) National Fire Alarm Code |
| NFPA-75 | (2003) Standard for the Protection of Information Technology Equipment |
| NFPA-90A | (2002) Standard for the Installation of Air Conditioning And Ventilating Systems |
| NFPA-101A | (2004) Guide on Alternative Approaches to Life Safety |
| NFPA-101B | (2002) Standard on Means of Egress for Buildings and Structures |
| NFPA-780 | (2004) Installation of Lightning Protection Systems |

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1.08 INVESTIGATION OF SITE

- A. General: Before commencing work, verify existing conditions at the premises including, but not limited to, existing structural frame, existing openings; existing wall and partition locations, existing mechanical and electrical work, equipment type, and examine adjoining work on which work is in anyway dependent.
- B. Responsibility: No waiver of responsibility for defective and inadequate work or additional cost as a result of existing conditions which should have been verified shall be considered unless notice of same has been filed by the Contractor and agreed to in writing by the Architect before the bid date.
- C. Site Renovation: Verify and coordinate existing site raceways and pipes at any excavation on site. Provide hand-digging and required rerouting in areas of existing Raceways and pipes within bid price.
- D. Renovation: Investigate site thoroughly and reroute raceway and wiring in area of new construction in order to maintain continuity of existing circuitry. Existing Raceways shown on plans show approximate locations only.
- E. Special Considerations: Special attention is called to the fact that there will be piping, fixtures or other items in the existing building which must be removed or relocated in order to perform the alteration work. Include removal and relocation required for completion of the alterations and the

new construction. All existing wiring that is to remain in renovated areas shall be made code compliant.

- F. Power Outage: Special attention is called to the fact that work involved is in connection with existing buildings which shall remain in operation while work is being performed. Work must be done in accordance with the priority schedule. Schedule work for a minimum outage to Owner. Request written permission and receive written acceptance from the Owner no later than 72 hours in advance of power and communication shut-downs. Perform work required at other than standard working hours where outages cannot be accepted by Owner during regular working hours. Protect existing buildings and equipment during construction.

1.09 SUPERVISION OF THE WORK

- A. Supervision: Provide one field superintendent who has had a minimum of four (4) years previous successful experience on projects of comparable sizes, type and complexity. The Superintendent shall be present at all times when work is being performed. At least one member of the Electrical Contracting Firm shall hold a State Master Certificate of Competency.

1.10 COORDINATION

- A. General: Compare drawings and specifications with those of other trades and report any discrepancies between them to the Architect. Obtain from the Architect written instructions to make the necessary changes in any of the affected work. Work shall be installed in cooperation with other Trades installing interrelated work. Before installation, Trades shall make proper provisions to avoid interferences in a manner approved by the Architect.
- B. Provide all required coordination and supervision where work connects to or is affected by work of others, and comply with all requirements affecting this Division. Work required under other divisions, specifications or drawings to be performed by this Division shall be coordinated with the Contractor and such work performed at no additional cost to Owner including but not limited to electrical work required for:
 - 1. Door hardware
 - 2. Roll-up doors
 - 3. Roll-up grilles
 - 4. Signage
 - 5. Fire shutters
 - 6. Elevators
 - 7. Sliding or automatic doors
 - 8. Mechanical Division of the Specifications
 - 9. Interior design drawings
 - 10. Millwork design drawings and shop drawings
- C. Obtain set of Contract Documents from Owner's Authorized Representative or Contractor for all areas of work noted above and include all electrical work in bid whether included in Division 26 Contract Documents or not.
- D. Secure approved shop drawings from all required disciplines and verify final electrical characteristics before roughing power feeds to any equipment. When electrical data on approved shop drawings differs from that shown or called for in Construction Documents, make adjustments to the wiring, disconnects, and branch circuit protection to match that required for the equipment installed.
- E. Damage from interference caused by inadequate coordination shall be corrected at no additional cost to the Owner.
- F. Adjustments: Locations of raceway and equipment shall be adjusted to accommodate the work with interferences anticipated and encountered. Determine the exact routing and location of systems prior to fabrication or installation.
- G. Priorities: Lines which pitch shall have the right of way over those which do not pitch. For example, plumbing drains shall normally have the right of way. Lines whose elevations cannot be changed shall have the right of way over lines whose elevations can be changed.
- H. Modifications: Offsets and changes of direction in raceway systems shall be made to maintain proper headroom and pitch of sloping lines whether or not indicated on the drawings. Provide elbows, boxes, etc., as required to allow offsets and changes to suit job conditions.
- I. Replacement: Work shall be installed in a way to permit removal (without damage to other parts) of other system components provided under this Contract requiring periodic replacement or maintenance. Raceway shall be arranged in a manner to clear the openings of swinging overhead access doors as well as ceiling tiles.
- J. Layout: The Contract Drawings are diagrammatic only intending to show general runs and locations of raceway and equipment, and not necessarily showing required offsets, details and accessories and

equipment to be connected. Work shall be accurately laid out with other Trades to avoid conflicts and to obtain a neat and workmanlike installation, which will afford maximum accessibility for operation, maintenance and headroom.

- K. **Contract Conflicts:** Where discrepancies exist in the Scope of Work as to what Trade provides items such as starters, disconnects, flow switches, etc. such conflicts shall be coordinated between the divisions involved. It is the intent of the Contract Documents that all work shall be provided complete as one bid price.
- L. **Drawing Conflicts:** Where drawing details, plans or specification requirements are in conflict and where sizes of the same item run are shown to be different within the contract documents, the most stringent requirement shall be included in the Contract. Systems and equipment called for in the specification or as shown on the drawings shall be provided as if it was required by both the drawings and specifications. Prior to ordering or installation of any portion of work, which appears to be in conflict, such work shall be brought to Architect's attention for direction as to what is to be provided.
- M. It is the responsibility of this Contractor to coordinate the exact required location of floor outlets, floor ducts, floor stub-ups, etc. with Owner's Authorized Representative and Designer (and receive their approval) prior to rough-in. Locations indicated in Contract Documents are only approximate locations.
- N. The Contract Documents describe specific sizes of switches, breakers, fuses, Raceways, conductors, motor starters and other items of wiring equipment. These sizes are based on specific items of power consuming equipment (heaters, lights, motors for fans, compressors, pumps, etc.). Coordinate the requirements of each load with each load's respective circuitry shown and with each load's requirements as noted on its nameplate data and manufacturer's published electrical criteria. Adjust circuit breaker, fuse, Raceway, and conductor sizes to meet the actual requirements of the equipment being provided and installed and change from single point to multiple points of connection (or vice versa) to meet equipment requirements. Changes shall be made at no additional cost to the Owner.
- O. **Working Clearances:** Minimum working clearances about electrical equipment shall be as referenced in the applicable edition NEC Article 110, and shall include equipment installed in ceiling spaces.

1.11 DEMOLITION

- A. **General:** Relocate existing equipment and reroute existing raceways in areas being renovated as required to facilitate the installation of the new systems. The Owner shall require continuous operation of the existing systems, while demolition, relocation work or new tie-ins are performed.
- B. **Coordination:** Prior to any deactivation, relocation or demolition work, arrange a conference with the Architect and the Owner's representative in the field to inspect each of the items to be deactivated, removed or relocated. Care shall be taken to protect equipment designated as being relocated and reused or equipment remaining in operation and integrated with the new systems.
- C. **Provisions:** Deactivation, relocation, and temporary tie-ins shall be provided by the Contractor. Demolition, removal and the legal disposal of demolished materials shall be provided by the Contractor.
- D. **Owner's Salvage:** The Owner reserves the right to inspect the material scheduled for removal and salvage any items he deems usable as spare parts.
- E. **Phasing:** The Contractor shall perform work in phases as directed by the Architect to suit the project progress schedule, as well as the completion date of the project.

PART 2 - PRODUCTS

2.01 MATERIALS

- A. Specified Method: Where several brand names, make or manufacturers are listed as acceptable each shall be regarded as equally acceptable, based on the design selection but each must meet all specification requirements. Where a manufacturer's model number is listed, this model shall set the standard of quality and performance required. Where no brand name is specified, the source and quality shall be subject to Engineer's review and acceptance. Where manufacturers are listed, one of the listed manufacturers shall be submitted for acceptance. No substitutions are permitted.
- B. Certification: When a product is specified to be in accordance with a trade association or government standard requested by the Engineer, Contractor shall provide a certificate that the product complies with the referenced standard. Upon request of Engineer, Contractor shall submit supporting test data to substantiate compliance.
- C. Basis of Bid: Each bidder represents that his bid is based upon the manufacturer's, materials, and equipment described in the Contract Documents.
- D. Space Requirements: Equipment or optional equipment shall conform to established space requirements within the project. Equipment which does not meet space requirements, shall be replaced at no additional expense to the Contract. Modifications of related systems shall be made at no additional expense to the Contract. Submit modifications to the Architect/Engineer for acceptance.

2.02 SHOP DRAWINGS

- A. General: Shop drawings shall be submitted for every item listed within the Submittals section each individual specification section. One copy shall be submitted to the engineer prior to ordering equipment. Refer to Basis of approval paragraph.
- B. Responsibility: It is the Contractors responsibility to provide material in accordance with the plans and specifications. Material not provided in accordance with the plans and specifications shall be removed and replaced at the Contractors expense.
- C. Official Record: The shop drawing submittal shall become the official record of the materials to be installed. If materials are installed which do not correspond to the record submittal they shall be removed from the project without any additional cost or delays in construction completion.
- D. Information: The shop drawing record submittal shall include the following information to the extent applicable to the particular item;
 - 1. Manufacturer's name and product designation or catalog number.
 - 2. Standards or specifications of ANSI, ASTM, ICEA, IEEE, ISA, NEMA, NFPA, OSHA, UL, or other organizations, including the type, size, or other designation.
 - 3. Dimensioned plan, sections, and elevations showing means for mounting, raceway connections, and grounding, and showing layout of components.
 - 4. Materials and finish specifications, including paints.
 - 5. List of components including manufacturer's names and catalog numbers.
 - 6. Internal wiring diagram indicating connections to components and the terminals for external connections.
 - 7. Manufacturer's instructions and recommendations for installation, operation, and maintenance.
 - 8. Manufacturer's recommended list of spare parts.
 - 9. Provide 1/2" = 1'-0" enlarged electrical room layout drawings for all electrical rooms. All equipment shall be indicated at actual size of equipment being provided. All dimensions and required working clearances shall be shown.
- E. Preparation: Prior to submittal, shop drawings shall be checked for accuracy and contract requirements. Shop drawings shall bear the date checked and shall be accompanied by a statement

that the shop drawings have been examined for conformity to Specifications and Drawings. This statement shall also list discrepancies with the Specifications and Drawings. Shop drawings not so checked and noted shall be returned to Contractor unreviewed.

- F. Basis of Review: Approval is only for general conformance with the design concept of the project and general compliance with the information given in the contract documents. Contractor is responsible for quantities, dimensions, fabrication processes, and construction techniques.
- G. Responsibility: The responsibility that dimensions are confirmed and correlated with proper coordination of other trades shall be included as part of the Contract Documents. The responsibility and the necessity of providing materials and workmanship required by the Specifications and Drawings which may not be indicated on the shop drawings shall be included as part of the Contract Documents. The Contractor is responsible for any delays in job progress occurring directly or indirectly from late submissions or re-submissions of shop drawings, product data, or samples.
- H. Ordering Equipment: No material shall be ordered or shop work started until the Engineer has officially received the shop drawings record submittal and has formally released the Contractor for submittal requirements.
- I. Brochure Requirements: Submit Technical Information Brochures at the start of construction or no later than 30 days after Award of the Contract. Each brochure shall consist of an adequately sized, hardcover, 3-ring binder for 8-1/2" X 11" sheets. Provide correct designation on outside cover and on end of brochure. When one binder is not enough to adequately catalog all data, an additional binder shall be submitted.
- J. Brochure Contents: First sheet in the brochure shall be a photocopy of the Electrical Index pages in these specifications. Second sheet shall be a list of Project Addresses for this project. Third sheet shall list Project Information. Provide reinforced separation sheets tabbed with the appropriate specification reference number and typed index for each section in the Electrical Schedule.
- K. Technical Information consisting of marked catalog sheets or shop drawings shall be inserted in the brochure in proper order on all items specified and shown on drawings. At the end of the brochure, provide and insert a copy of the specifications for this Division and all addenda applicable to this Division.
- L. Contractor's Review: Review the brochures before submitting to the Engineer. No request for payment shall be considered until the brochure has been reviewed, stamped and submitted for review.
- M. Cost: Submit cost breakdown on work in the Technical Information Brochures. The cost of material and labor for each item shall be indicated. The cost of fittings and incidentals are not required.
- N. Title Drawings: Title drawings to include identification of project and names of Architect-Engineer, Engineer, Contractors, and/or supplier, data, number sequentially and indicate in general;
 - 1. Fabrication and Erection dimensions.
 - 2. Arrangements and sectional views.
 - 3. Necessary details, including complete information for making connections with other work.
 - 4. Kinds of materials and finishes.
 - 5. Descriptive names of equipment.
 - 6. Modifications and options to standard equipment required by the contract.
 - 7. Leave blank area, size approximately 4 by 2-1/2 inches, near title block (for Engineer's stamp imprint).
 - 8. In order to facilitate review of shop drawings, they shall be noted, indicating by cross-reference the contract drawings, notes, and specification paragraph numbers where items occur in the contract documents.

9. See specific sections of specifications for further requirements.
- O. Technical Data: Submit technical data verifying that the item submitted complies with the requirements of the specifications. Technical data shall include manufacturer's name and model number, dimensions, weights, electrical characteristics, and clearances required. Indicate optional equipment and changes from the standard item as called for in the specifications. Provide drawings, or diagrams, dimensioned and in correct scale, covering equipment, showing arrangement of components and overall coordination.
- P. Same Manufacturer: In general, relays, contactors, starters, motor control centers, switchboards, panelboards, dry type transformers, disconnect switches, circuit breakers, manual motor starter switches, etc., shall be supplied and manufactured by the same manufacturer. This requirement shall apply to same type of electrical components specified in other Divisions.

2.03 EQUIPMENT, MATERIALS, AND SUPPORTS

- A. General: Each item of equipment or material shall be manufactured by a company regularly engaged in the manufacture of the type and size of equipment, shall be suitable for the environment in which it is to be installed, shall be approved for its purpose, environment, and application, and shall bear the UL label.
- B. Installation Requirements: Each item of equipment or material shall be installed in accordance with instructions and recommendations of the manufacturer, however, the methods shall not be less stringent than specified herein.
- C. Required Accessories: Provide all devices and materials, such as expansion bolts, foundation bolts, screws, channels, angles, and other attaching means, required to fasten enclosures, raceways, and other electrical equipment and materials to be mounted on structures which are existing or new.
- D. Protection: Electrical equipment shall at all times during construction be adequately protected against mechanical injury or damage by the elements. Equipment shall be stored in dry permanent shelters. If apparatus has been damaged, such damage shall be repaired at no additional cost or time extension to the Contract. If apparatus has been subject to possible injury, it shall be thoroughly cleaned, dried out and put through tests as directed by the Manufacturer and Engineer, or shall be replaced, if directed by the Engineer, at no additional cost to the Contract.

2.04 IDENTIFICATION OF EQUIPMENT

- A. General: Electrical items shall be identified as specified in the Contract Documents. Such identification shall be in addition to the manufacturer's nameplates and shall serve to identify the item's function and the equipment or system, which it serves or controls. Refer to Identification Section of the specifications for additional information.

2.05 CONCRETE PADS

- A. General: Provide reinforced concrete pads for floor mounted electrical equipment. Unless otherwise noted, pads shall be nominal four (4) inches high and shall exceed dimensions of equipment being set on them, including future sections, by six (6) inches on all sides, except when equipment is flush against a wall, then the side or sides against the wall shall be flush with the equipment. Chamfer top edges 1/2". Trowel surfaces smooth. Reinforce pads with #5 reinforcing bars at 24" centers each way, unless specifically detailed on drawings.

2.06 SURFACE MOUNTED EQUIPMENT

- A. General: Surface mounted fixtures, outlets, cabinets, panels, etc. shall have a factory-applied finish or shall be painted as accepted by Engineer. Raceways and fittings, where allowed to be installed

surface mounted, shall be painted to match the finish on which it was installed. Paint shall be in accordance with other applicable sections of these specifications.

2.07 CUTTING AND PATCHING

- A. Core Drilling: The Contractor shall be responsible for core drilling as required for work under this section, but in no case shall the Contractor cut into or weld onto any structural element of the project without the written approval of the Architect.
- B. Cutting and Patching: Cutting, rough patching and finish patching shall be provided as specified in the contract documents. Cutting and patching shall be performed in a neat and workmanlike manner. Upon completion, the patched area shall match adjacent surfaces.
- C. Openings and Sleeves: Locate openings required for work performed under this section. Provide sleeves, guards or other accepted methods to allow passage of items installed under this section.
- D. Roof Penetration: Provide roofer with pitch pans, fittings, etc., required for electrical items which penetrate the roof. Roof penetrations are to be waterproofed in such a manner that roofing guarantees are fully in force. Roof penetrations shall be coordinated with other Trades to ensure that roof warranty is not invalidated.

2.08 SLEEVES AND FORMS FOR OPENINGS

- A. Sleeves: Provide sleeves for Raceways penetrating floors, walls, partitions, etc. Locate necessary slots for electrical work and form before concrete is poured. Watertight sleeves shall be line seal type WS. Fire rated partition sleeves shall be mild steel. Sleeves shall be Schedule 40 PVC or galvanized rigid steel unless specifically noted otherwise. Size shall be one standard diameter larger than pipe being installed or of a larger diameter to below 1/4" minimum clearance.
- B. Forms: Provide boxed out forms for Raceway penetrations only where allowed by the Architect. Fill opening after Raceway installation, with equivalent material.

2.09 OPERATING AND MAINTENANCE INSTRUCTIONS

- A. General: Thoroughly instruct the Owner's Representative, to the complete satisfaction of the Architect and Engineer, in the proper operation of all systems and equipment provided. The Contractor shall make all arrangements, via the Architect, as to whom the instructions are to be given in the operation of the systems and the period of time in which they are to be given. The Architect shall be completely satisfied that the Owner's Representative has been thoroughly and completely instructed in the proper operation of all systems and equipment before final payment is made. If the Architect determines that complete and thorough instructions have not been given by the Contractor to the Owner's Representative, then the Contractor shall be directed by the Architect to provide whatever instructions are necessary until the intent of this paragraph of the Specification has been complied with.
- B. Submittals: Submit to the Architect for approval five (5) typed sets, bound neatly in loose-leaf binders, of instructions for the installation, operation, care and maintenance of equipment and systems, including instructions for the ordering and stocking of spare parts for equipment installed under this contract. The lists shall include part number and suggested suppliers. Each set shall also include an itemized list of component parts that should be kept on hand and where such parts can be purchased.
- C. Information Requirements: Information shall indicate possible problems with equipment and suggested corrective action. The manuals shall be indexed for each type of equipment. Each section shall be clearly divided from the other sections. A sub index for each section shall also be provided.

- D. Instructions: The instructions shall contain information deemed necessary by the Architect and include but not limited to the following:
1. Introduction:
 - a. Explanation of Manual and its use.
 - b. Summary description of the Electrical Systems.
 - c. Purpose of systems.
 2. System:
 - a. Detailed description of all systems.
 - b. Illustrations, schematics, block diagrams, catalog cuts and other exhibits.

3. Operations:
 - a. Complete detailed, step by step, sequential description of all phases of operation for all portions of the systems, including start up, shutdown and balancing. Include posted instruction charts.
4. Maintenance:
 - a. Parts list and part numbers.
 - b. Maintenance and replacement charts and the Manufacturer's recommendations for preventive maintenance.
 - c. Trouble shooting charts for systems and components.
 - d. Instructions for testing each type of part.
 - e. Recommended list of on-hand spare parts.
 - f. Complete calibration instructions for all parts and entire systems.
 - g. General and miscellaneous maintenance notes.
5. Manufacturer's Literature:
 - a. Complete listing for all parts.
 - b. Names, addresses and telephone numbers.
 - c. Care and operation.
 - d. All pertinent brochures, illustrations, drawings, cuts, bulletins, technical data, certified performance charts and other literature with the model actually furnished to be clearly and conspicuously identified.
 - e. Internal wiring diagrams and Engineering data sheets for all items and/or equipment furnished under each Contract.
 - f. Guarantee and warranty data.

2.10 SERVICE AND METERING

- A. Company: The utility company serving this project is Lakeland Electric which will be referred to as the Utility Company herein.
- B. Service: Make arrangements with the power company for obtaining a complete service. Pay charges and provide labor and material for the service. Service shall be obtained at 120/208 volts from the Utility Company. Provide Utility Company approved meter socket and empty 1-1/2" Raceway from transformer secondary bushings to meter location.
- C. Fees: Contact the Utility Company to determine if any fees, charges or costs will be due the Company, as required for temporary power, permanent power, installations, hook-ups, etc. This fee, charge or cost shall be included in the bid price.
- D. Payment: Pay for required licenses, fees and inspections. Include costs in the proposed construction cost submission. These costs shall include but not be limited to applicable taxes, permits, necessary notices, certificates and costs required to obtain same.
- E. Codes: Install a complete system in accordance with the latest edition of the National Electrical Code and the latest regulations of governing local, State, County and other applicable codes, including the Utility Company requirements.
- F. Provide transformer pad per Utility Company requirements.

2.11 TEMPORARY LIGHT AND POWER

- A. Capacity: Provide capacity for new temporary service. Make arrangements with the Owner for temporary service and pay all related expenses. Temporary light and power shall be provided constantly during the project dependent upon Owner's safety requirements.
- B. Lighting: Temporary light shall be based on one 200 watt lamp covering each 1,000 square foot of floor area in the building. Each room 100 square foot and over shall have a minimum of one 100-watt lamp with guards. Provide power for motors up to 3/4 horsepower only. Provisions are to be made for electric welders, if required.
- C. Outlets: Provide outlets located at convenient points so that extension cords of not over fifty (50) feet will reach work requiring artificial light or power.
- D. Other Connections: Contractors of other trades shall furnish their own cords and sockets, as may be required for their work and shall also pay for cost of temporary wiring of construction offices and shanties used by them.
- E. New Fixtures: Permanently installed lighting fixtures may be used for temporary lighting at the Contractor's option with the provision that cool white lamps for fluorescent, clear lamps for incandescent and marked temporary for other types shall be installed. At job completion, lamps shall be replaced with permanent lamps specified.
- F. Wiring: Temporary electrical work shall be furnished and installed in conformity with the National Electrical Code and in accordance with the requirements of the local ordinances and shall be maintained in a workmanlike manner throughout their entire construction period and shall be removed after installation of the permanent electrical systems. Extension cords shall be GFCI protected or shall be fed from GFCI circuit breakers.
- H. Payment: The Contractor will pay for the cost of energy consumed by all trades. Any temporary wiring of a special nature for light and power required other than mentioned above shall be paid for by the Contractor using same.

2.12 EXISTING CONDITIONS

- A. Support: Existing Raceway and cables within the area of renovation shall be provided with proper supports as specified for new work in other sections of this specification.
- B. Installation: Existing electrical which is designated for reworking or requires relocation, repair or adjustment shall conform to applicable codes and shall be treated as new work complying to all sections of this specification.
- C. Violations: Where existing conditions are discovered which are not in compliance with the codes and standards, the Contractor shall submit proper documentation to the Architect for clarification and corrective work direction. Existing conditions shall not remain which will create a disapproval of the renovated area.
- D. Patching: Existing Raceway and cable penetrations shall be properly fire treated per code and specification requirements. The Contractor shall thoroughly inspect existing locations and include the cost of patching and repair in his proposed construction cost.

PART 3 - EXECUTION

3.01 WORKMANSHIP

- A. General: The installation of materials and equipment shall be performed in a neat, workmanlike and timely manner by an adequate number of craftsmen knowledgeable of the requirements of the Contract Documents. They shall be skilled in the methods and craftsmanship needed to produce a quality level of workmanship. Personnel who install materials and equipment shall be qualified by training and experience to perform their assigned tasks.
- B. Acceptable Workmanship: Acceptable workmanship is characterized by first-quality appearance and function, conforming to applicable standards of building system construction, and exhibiting a high degree of quality and proficiency which is judged by the Architect as equivalent or better than that ordinarily produced by qualified industry tradesmen.
- C. Performance: Personnel shall not be used in the performance of the installation of material and equipment who, in the opinion of the Architect, are deemed to be careless or unqualified to perform the assigned tasks. Material and equipment installations not in compliance with the Contract Documents, or installed with substandard workmanship and not acceptable to the Architect, shall be removed and reinstalled by qualified craftsmen, at no change in the contract price.

3.02 PROTECTION AND CLEAN UP

- A. Protection and Restoration: Suitably protect equipment provided under this Division during construction. Restore damaged surfaces and items to "like new" condition before a request for substantial completion inspection.
- B. Handling: Materials shall be properly protected and Raceway openings shall be temporarily closed by the Contractor to prevent obstruction and damage. Post notice prohibiting the use of systems provided under this Contract, prior to completion of work and acceptance of systems by the Owner's representative. The Contractor shall take precautions to protect his materials from damage and theft.
- C. Safeguards: The Contractor shall furnish, place and maintain proper safety guards for the prevention of accidents that might be caused by the workmanship, materials, equipment or systems provided under this contract.
- D. Cleanup: Keep the job site free from debris and rubbish. Remove debris and rubbish from the site and leave premises in clean condition on a daily basis.

3.03 SYSTEMS GUARANTEE

- A. General: Provide a one-year guarantee. This guarantee shall be by the Contractor to the Owner for any defective workmanship or material, which has been provided under this Contract at no cost to the Owner for a period of one year from the date of substantial completion of the System. The guarantee shall include lamps, for ninety days after date of Substantial Completion of the System. Explain the provisions of guarantee to the Owner at the "Demonstration of Completed System".

3.04 FINAL OBSERVATION

- A. General: Work shall be completed, and forms and other information shall be submitted for acceptance one week prior to the request for final observation of the installation.

3.05 SPECIAL CONSIDERATIONS

- A. Comply with special requirements imposed at site by Owner. This may include badging of employees, prohibition of smoking, special working hours, or special working conditions.

END OF SECTION 260010

CERTIFICATE OF COMPLETED DEMONSTRATION MEMO

Note to Contractor: Do not submit this form at the time Technical Information Brochure is submitted. Submit five copies of information listed below for checking at least one week before scheduled completion of the building. After information has been accepted and inserted in each brochure, give the Owner a Demonstration of the Completed Electrical Systems and have the Owner sign five copies of this form. Provide one signed copy for each brochure. After this has been done, a written request for a final inspection of the System shall be made.

Re: _____
(Name of Project)

(Division Number and Name)

This memo is for the information of all concerned that the Owner has been given a Demonstration of the Completed Electrical Systems on the work covered under this Division. This conference consisted of the system operation, a tour on which all major items of equipment were pointed out, and the following items were given to the Owner;

- (a) Owner's copy of Technical Information Brochure containing approved submittal sheets on all items, including the following; (To be inserted in the Technical Information Brochure after the correct tab).
 - (1) Maintenance Information published by manufacturer on equipment items.
 - (2) Printed Warranties by manufacturers on equipment items.
 - (3) Performance verification information as recorded by the Contractor.
 - (4) Check-out Memo on equipment by manufacturer's representative.
 - (5) Written operating instructions on any specialized items.
 - (6) Explanation of the one-year guarantee on the system.
- (b) "As-Built" conditions as described in the record drawing specifications.
- (c) A demonstration of the System in Operation and of the maintenance procedures which shall be required.

(Name of General Contractor)

By: _____
(Authorized Signature, Title & Date)

(Name of SubContractor)

By: _____
(Authorized Signature, Title & Date)

Brochure, Instruction, Prints, Demonstration & Instruction in Operation Received:

(Name of Owner)

By: _____
(Authorized Signature, Title, Date)

cc: Owner, Architect, Engineer, Contractor, Sub Contractor and General Contractor
(List names as stated in cc: above)

SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

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 DEFINITIONS

- A. EPDM: Ethylene-propylene-diene terpolymer rubber.
- B. NBR: Acrylonitrile-butadiene rubber.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For testing agency.
- B. Field quality-control test reports.

1.6 QUALITY ASSURANCE

- A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a member company of the InterNational Electrical Testing Association or is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.
 - 1. Testing Agency's Field Supervisor: Person currently certified by the InterNational Electrical Testing Association or the National Institute for Certification in Engineering Technologies to supervise on-site testing specified in Part 3.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

- C. Comply with NFPA 70.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:
 - 1. American Insulated Wire Corp.; a Leviton Company.
 - 2. Southwire Company.
- B. Copper Conductors: Comply with NEMA WC 70.
- C. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- D. Multiconductor Cable: Not permitted.

2.2 CONNECTORS AND SPLICES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Hubbell Power Systems, Inc.
 - 2. O-Z/Gedney; EGS Electrical Group LLC.
 - 3. 3M; Electrical Products Division.
 - 4. 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. Cord Drops and Portable Appliance Connections: Type SO, hard service cord with stainless-steel, wire-mesh, strain relief device at terminations to suit application.
- H. Class 1 Control Circuits: Type THHN-THWN, in raceway.
- I. Class 2 Control Circuits: Type THHN-THWN, in raceway.
- J. Metal-clad and armored cable, Types MC and AC, are not permitted.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.
- E. Support cables according to Division 26 Section "Hangers and Supports for Electrical Systems."
- F. Identify and color-code conductors and cables according to Division 26 Section "Identification for Electrical Systems."

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least 6 inches of slack.

3.5 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.6 FIRESTOPPING

- A. Apply firestopping to electrical penetrations of fire-rated floor and wall assemblies to restore original fire-resistance rating of assembly according to Division 07 Section "Penetration Firestopping."

3.7 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, and conductors feeding the following critical equipment and services for compliance with requirements.
 - a. One (1) branch receptacle circuit in each exam room.
 - 2. Perform each visual and mechanical inspection and electrical test stated in NETA Acceptance Testing Specification. Certify compliance with test parameters.
 - 3. Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each splice in cables and conductors No. 3 AWG and larger. Remove box and equipment covers so splices are accessible to portable scanner.
 - a. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each splice 11 months after date of Substantial Completion.
 - b. Instrument: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
 - c. Record of Infrared Scanning: Prepare a certified report that identifies splices checked and that describes scanning results. Include notation of deficiencies detected, remedial action taken, and observations after remedial action.
- C. Test Reports: Prepare a written report to record the following:
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Test results that do not comply with requirements and corrective action taken to achieve compliance with requirements. Should the sampled receptacle branch circuit fail, test all receptacle branch circuits in affected exam room.
- D. Remove and replace malfunctioning units and retest as specified above.

END OF SECTION 260519

SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

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: Grounding systems and equipment.
- B. Section includes grounding systems and equipment, plus the following special applications:
 - 1. Ground bonding common with lightning protection system.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.

1.4 INFORMATIONAL SUBMITTALS

- A. Informational Submittals: Plans showing dimensioned as-built locations of grounding features specified in "Field Quality Control" Article, including the following:
 - 1. Ground rods.
 - 2. Grounding for sensitive electronic equipment.
- B. Field quality-control reports.

1.5 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For grounding 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. Instructions for periodic testing and inspection of grounding features at test wells ground rings grounding connections for separately derived systems based on NETA MTS.
 - a. Tests shall determine if ground-resistance or impedance values remain within specified maximums, and instructions shall recommend corrective action if values do not.
 - b. Include recommended testing intervals.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper or tinned-copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.
 - 3. Tinned Conductors: ASTM B 33.
 - 4. Bonding Cable: 28 kcmil, 14 strands of No. 17 AWG conductor, 1/4 inch (6 mm) in diameter.
 - 5. Bonding Conductor: No. 4 or No. 6 AWG, stranded conductor.
 - 6. Bonding Jumper: Copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
 - 7. Tinned Bonding Jumper: Tinned-copper tape, braided conductors terminated with copper ferrules; 1-5/8 inches (41 mm) wide and 1/16 inch (1.6 mm) thick.
- C. Grounding Bus: Predrilled rectangular bars of annealed copper, 1/4 by 4 inches (6.3 by 100 mm) in cross section, with 9/32-inch (7.14-mm) holes spaced 1-1/8 inches (28 mm) apart. Stand-off insulators for mounting shall comply with UL 891 for use in switchboards, 600 V. Lexan or PVC, impulse tested at 5000 V.

2.2 CONNECTORS

- A. Listed and labeled by an NRTL acceptable to authorities having jurisdiction for applications in which used and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, pressure type with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.
- C. Welded Connectors: Exothermic-welding kits of types recommended by kit manufacturer for materials being joined and installation conditions.
- D. Bus-bar Connectors: Mechanical type, cast silicon bronze, solderless compression-type wire terminals, and long-barrel, two-bolt connection to ground bus bar.

2.3 BONDING AND EQUIPMENT GROUNDING

- A. Description of System: In general, all electrical equipment (metallic conduit, motor frames, panelboards, etc.) shall be bonded together with a green insulated copper system grounding conductor in accordance with specific rules of Article 250 of the NEC equipment grounding conductors through the raceway system shall be continuous from main switch ground bus to panel ground bar of each panelboard, and from panel grounding bar of each panelboard to branch circuit equipment and devices.

- B. Equipment Grounding Conductors: All raceways shall have an insulated copper system ground conductor run throughout the entire length of circuit installed within conduit in strict accordance with NEC. Grounding conductor shall be included in total conduit fill when determining conduit sizes, even though not included or shown on drawings.
- C. Redundant Grounding: In general, all branch circuits shall be provided with a redundant grounding system through the use of grounding conductors and metallic conduit.
- D. Bonding: In addition to connections to grounding electrodes, the main service ground shall be bonded to the lightning protection system and other underground metal piping.
- E. Light Poles: All exterior light poles shall have their enclosures grounded directly to a separate driven ground at the light pole in addition to the building ground connection, via the circuit equipment ground conductor.
- F. Bushings: Provide insulated grounding bushings on all metallic feeder conduits terminated within panelboards, switchboards or enclosed overcurrent devices. Provide insulated grounding bushings on all branch circuit conduits where concentric knockouts are used.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger unless otherwise indicated.
- B. Isolated Grounding Conductors: Green-colored insulation with continuous yellow stripe. On feeders with isolated ground, identify grounding conductor where visible to normal inspection, with alternating bands of green and yellow tape, with at least three bands of green and two bands of yellow.
- C. Grounding Bus: Install in electrical and telephone equipment rooms, in rooms housing service equipment, and elsewhere as indicated.
 - 1. Install bus on insulated spacers 2 inches (50 mm) minimum from wall, 6 inches (150 mm) above finished floor unless otherwise indicated.
 - 2. Where indicated on both sides of doorways, route bus up to top of door frame, across top of doorway, and down to specified height above floor; connect to horizontal bus.
- D. Conductor Terminations and Connections:
 - 1. Pipe and Equipment Grounding Conductor Terminations: Bolted connectors.
 - 2. Underground Connections: Welded connectors except at test wells and as otherwise indicated.
 - 3. Connections to Ground Rods at Test Wells: Bolted connectors.
 - 4. Connections to Structural Steel: Welded connectors.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits.

- B. Install insulated equipment grounding conductors with the following items, in addition to those required by NFPA 70:
1. Feeders and branch circuits.
 2. Lighting circuits.
 3. Receptacle circuits.
 4. Single-phase motor and appliance branch circuits.
 5. Three-phase motor and appliance branch circuits.
 6. Flexible raceway runs.
 7. Busway Supply Circuits: Install insulated equipment grounding conductor from grounding bus in the switchgear, switchboard, or distribution panel to equipment grounding bar terminal on busway.
 8. Computer and Rack-Mounted Electronic Equipment Circuits: Install insulated equipment grounding conductor in branch-circuit runs from equipment-area power panels and power-distribution units.
- C. Air-Duct Equipment Circuits: Install insulated equipment grounding conductor to duct-mounted electrical devices operating at 120 V and more, including air cleaners, heaters, dampers, humidifiers, and other duct electrical equipment. Bond conductor to each unit and to air duct and connected metallic piping.
- D. Water Heater, Heat-Tracing, and Antifrost Heating Cables: Install a separate insulated equipment grounding conductor to each electric water heater and heat-tracing cable. Bond conductor to heater units, piping, connected equipment, and components.
- E. Isolated Grounding Receptacle Circuits: Install an insulated equipment grounding conductor connected to the receptacle grounding terminal. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- F. Isolated Equipment Enclosure Circuits: For designated equipment supplied by a branch circuit or feeder, isolate equipment enclosure from supply circuit raceway with a nonmetallic raceway fitting listed for the purpose. Install fitting where raceway enters enclosure, and install a separate insulated equipment grounding conductor. Isolate conductor from raceway and from panelboard grounding terminals. Terminate at equipment grounding conductor terminal of the applicable derived system or service unless otherwise indicated.
- G. Signal and Communication Equipment: In addition to grounding and bonding required by NFPA 70, provide a separate grounding system complying with requirements in TIA/ATIS J-STD-607-A.
1. For telephone, alarm, voice and data, and other communication equipment, provide No. 4 AWG minimum insulated grounding conductor in raceway from grounding electrode system to each service location, terminal cabinet, wiring closet, and central equipment location.
 2. Service and Central Equipment Locations and Wiring Closets: Terminate grounding conductor on a 1/4-by-4-by-12-inch (6.3-by-100-by-300-mm) grounding bus.
 3. Terminal Cabinets: Terminate grounding conductor on cabinet grounding terminal.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.

- B. Ground Bonding Common with Lightning Protection System: Comply with NFPA 780 and UL 96 when interconnecting with lightning protection system. Bond electrical power system ground directly to lightning protection system grounding conductor at closest point to electrical service grounding electrode. Use bonding conductor sized same as system grounding electrode conductor, and install in conduit.
- C. Ground Rods: Drive rods until tops are 2 inches (50 mm) below finished floor or final grade unless otherwise indicated.
1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating if any.
 2. For grounding electrode system, install at least three rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- D. Test Wells: Ground rod driven through drilled hole in bottom of handhole. Handholes are specified in Division 26 Section "Raceways and Boxes," and shall be at least 12 inches (300 mm) deep, with cover.
1. Test Wells: Install at least one test well for each service unless otherwise indicated. Install at the ground rod electrically closest to service entrance. Set top of test well flush with finished grade or floor.
- E. Bonding Straps and Jumpers: Install in locations accessible for inspection and maintenance except where routed through short lengths of conduit.
1. Bonding to Structure: Bond straps directly to basic structure, taking care not to penetrate any adjacent parts.
 2. Bonding to Equipment Mounted on Vibration Isolation Hangers and Supports: Install bonding so vibration is not transmitted to rigidly mounted equipment.
 3. Use exothermic-welded connectors for outdoor locations; if a disconnect-type connection is required, use a bolted clamp.
- F. Grounding and Bonding for Piping:
1. Metal Water Service Pipe: Install insulated copper grounding conductors, in conduit, from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes; use a bolted clamp connector or bolt a lug-type connector to a pipe flange by using one of the lug bolts of the flange. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting. Bond metal grounding conductor conduit or sleeve to conductor at each end.
 2. Water Meter Piping: Use braided-type bonding jumpers to electrically bypass water meters. Connect to pipe with a bolted connector.
 3. Bond each aboveground portion of gas piping system downstream from equipment shutoff valve.
- G. Bonding Interior Metal Ducts: Bond metal air ducts to equipment grounding conductors of associated fans, blowers, electric heaters, and air cleaners. Install tinned bonding jumper to bond across flexible duct connections to achieve continuity.
- H. Grounding for Steel Building Structure: Install a driven ground rod at base of each corner column and at intermediate exterior columns at distances not more than 60 feet (18 m) apart.

3.4 LABELING

- A. Comply with requirements in Division 26 Section "Identification for Electrical Systems" Article for instruction signs. The label or its text shall be green.
- B. Install labels at the telecommunications bonding conductor and grounding equalizer and at the grounding electrode conductor where exposed.
 - 1. Label Text: "If this connector or cable is loose or if it must be removed for any reason, notify the facility manager."

3.5 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- B. Tests and Inspections:
 - 1. After installing grounding system but before permanent electrical circuits have been energized, test for compliance with requirements.
 - 2. Inspect physical and mechanical condition. Verify tightness of accessible, bolted, electrical connections with a calibrated torque wrench according to manufacturer's written instructions.
 - 3. Test completed grounding system at each location where a maximum ground-resistance level is specified, at service disconnect enclosure grounding terminal, at ground test wells, and at individual ground rods. Make tests at ground rods before any conductors are connected.
 - a. Measure ground resistance no fewer than two full days after last trace of precipitation and without soil being moistened by any means other than natural drainage or seepage and without chemical treatment or other artificial means of reducing natural ground resistance.
 - b. Perform tests by fall-of-potential method according to IEEE 81.
 - 4. Prepare dimensioned Drawings locating each test well, ground rod and ground-rod assembly, and other grounding electrodes. Identify each by letter in alphabetical order, and key to the record of tests and observations. Include the number of rods driven and their depth at each location, and include observations of weather and other phenomena that may affect test results. Describe measures taken to improve test results.
- C. Grounding system will be considered defective if it does not pass tests and inspections.
- D. Prepare test and inspection reports.
- E. Report measured ground resistances that exceed the following values:
 - 1. Power and Lighting Equipment or System with Capacity of 500 kVA and Less: 10 ohms.
 - 2. Power and Lighting Equipment or System with Capacity of 500 to 1000 kVA: 5 ohms.
 - 3. Power and Lighting Equipment or System with Capacity More Than 1000 kVA: 3 ohms.
 - 4. Power Distribution Units or Panelboards Serving Electronic Equipment: 1 ohm(s).
 - 5. Substations and Pad-Mounted Equipment: 5 ohms.

- 6. Manhole Grounds: 10 ohms.
- F. Excessive Ground Resistance: If resistance to ground exceeds specified values, notify Architect promptly and include recommendations to reduce ground resistance.

EQUIPOTENTIAL GROUND TEST REPORT

FACILITY NAME: _____ PROJECT NAME: _____

DATE: _____ TESTED BY: _____

MAXIMUM TEST INTERVALS:

GENERAL CARE - 12 MOS.

CRITICAL CARE - 6 MOS.

WET LOCATIONS - 12 MOS.

NAME: _____

COMPANY: _____

TYPE METER USED AND EXTERNAL NETWORK IF USED:

NOTE: MAXIMUM READINGS PERMITTED - 20 MV NEW - CONSTRUCTION / RENOVATION
0.1 OHM NEW - CONSTRUCTION / RENOVATION

Room No.	AREA TYPE Description (C) = CRITICAL CARE (G) = GENERAL CARE	VOLTAGE MEASUREMENT			IMPEDANCE MEASUREMENT		REMARKS - IF VOLTAGE READINGS MORE THAN 20MV IN EXISTING CONST. NOTE TESTS & INVESTIGATION REQUIRED.
		NO. OF RECEPTS.	NO. OF OTHER	MAX. READING IN MILIVOLTS	NO. OF RECEPTS .	MAX READING IN OHMS	

END OF SECTION 260526

SECTION 260529 - HANGERS AND SUPPORTS FOR ELECTRICAL SYSTEMS

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. Hangers and supports for electrical equipment and systems.
 - 2. Construction requirements for concrete bases.

1.3 DEFINITIONS

- A. EMT: Electrical metallic tubing.
- B. IMC: Intermediate metal conduit.
- C. RMC: Rigid metal conduit.

1.4 PERFORMANCE REQUIREMENTS

- A. Design supports for multiple raceways capable of supporting combined weight of supported systems and its contents.
- B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.5 ACTION SUBMITTALS

- A. Product Data: For the following:
 - 1. Steel slotted support systems.
 - 2. Nonmetallic slotted support systems.
- B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
 - 1. Trapeze hangers. Include Product Data for components.
 - 2. Steel slotted channel systems. Include Product Data for components.
 - 3. Nonmetallic slotted channel systems. Include Product Data for components.
 - 4. Equipment supports.

1.6 INFORMATIONAL SUBMITTALS

- A. Welding certificates.

1.7 QUALITY ASSURANCE

- A. Welding: Qualify procedures and personnel according to AWS D1.1/D1.1M, "Structural Welding Code - Steel."
- B. Comply with NFPA 70.

1.8 COORDINATION

- A. Coordinate size and location of concrete bases. Cast anchor-bolt inserts into bases. Concrete, reinforcement, and formwork requirements are specified in Division 03.
- B. Coordinate installation of roof curbs, equipment supports, and roof penetrations. These items are specified in Division 07 Section "Roof Accessories."

PART 2 - PRODUCTS

2.1 SUPPORT, ANCHORAGE, AND ATTACHMENT COMPONENTS

- A. Steel Slotted Support Systems: Comply with MFMA-4, factory-fabricated components for field assembly.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. ERICO International Corporation.
 - d. GS Metals Corp.
 - e. Thomas & Betts Corporation.
 - f. Unistrut; Tyco International, Ltd.
 - g. Wesanco, Inc.
 - 2. Metallic Coatings: Hot-dip galvanized after fabrication and applied according to MFMA-4.
 - 3. Nonmetallic Coatings: Manufacturer's standard PVC, polyurethane, or polyester coating applied according to MFMA-4.
 - 4. Painted Coatings: Manufacturer's standard painted coating applied according to MFMA-4.
 - 5. Channel Dimensions: Selected for applicable load criteria.
- B. Nonmetallic Slotted Support Systems: Structural-grade, factory-formed, glass-fiber-resin channels and angles with 9/16-inch- diameter holes at a maximum of 8 inches o.c., in at least 1 surface.
 - 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

- a. Allied Tube & Conduit.
 - b. Cooper B-Line, Inc.; a division of Cooper Industries.
 - c. Fabco Plastics Wholesale Limited.
 - d. Seasafe, Inc.
- 2. Fittings and Accessories: Products of channel and angle manufacturer and designed for use with those items.
- 3. Fitting and Accessory Materials: Same as channels and angles, except metal items may be stainless steel.
- 4. Rated Strength: Selected to suit applicable load criteria.
- C. Raceway and Cable Supports: As described in NECA 1 and NECA 101.
- D. Conduit and Cable Support Devices: Steel hangers, clamps, and associated fittings, designed for types and sizes of raceway or cable to be supported.
- E. Support for Conductors in Vertical Conduit: Factory-fabricated assembly consisting of threaded body and insulating wedging plug or plugs for non-armored electrical conductors or cables in riser conduits. Plugs shall have number, size, and shape of conductor gripping pieces as required to suit individual conductors or cables supported. Body shall be malleable iron.
- F. Structural Steel for Fabricated Supports and Restraints: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
- G. Mounting, Anchoring, and Attachment Components: Items for fastening electrical items or their supports to building surfaces include the following:
 - 1. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete, steel, or wood, with tension, shear, and pullout capacities appropriate for supported loads and building materials where used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Hilti Inc.
 - 2) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 3) MKT Fastening, LLC.
 - 4) Simpson Strong-Tie Co., Inc.; Masterset Fastening Systems Unit.
 - 2. Mechanical-Expansion Anchors: Insert-wedge-type, zinc-coated steel, for use in hardened portland cement concrete with tension, shear, and pullout capacities appropriate for supported loads and building materials in which used.
 - a. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1) Cooper B-Line, Inc.; a division of Cooper Industries.
 - 2) Empire Tool and Manufacturing Co., Inc.
 - 3) Hilti Inc.
 - 4) ITW Ramset/Red Head; a division of Illinois Tool Works, Inc.
 - 5) MKT Fastening, LLC.
 - 3. Concrete Inserts: Steel or malleable-iron, slotted support system units similar to MSS Type 18; complying with MFMA-4 or MSS SP-58.

4. Clamps for Attachment to Steel Structural Elements: MSS SP-58, type suitable for attached structural element.
5. Through Bolts: Structural type, hex head, and high strength. Comply with ASTM A 325.
6. Toggle Bolts: All-steel springhead type.
7. Hanger Rods: Threaded steel.

2.2 FABRICATED METAL EQUIPMENT SUPPORT ASSEMBLIES

- A. Description: Welded or bolted, structural-steel shapes, shop or field fabricated to fit dimensions of supported equipment.
- B. Materials: Comply with requirements in Division 05 Section "Metal Fabrications" for steel shapes and plates.

PART 3 - EXECUTION

3.1 APPLICATION

- A. Comply with NECA 1 and NECA 101 for application of hangers and supports for electrical equipment and systems except if requirements in this Section are stricter.
- B. Maximum Support Spacing and Minimum Hanger Rod Size for Raceway: Space supports for EMT, IMC, and RMC as required by NFPA 70. Minimum rod size shall be 1/4 inch in diameter.
- C. Multiple Raceways or Cables: Install trapeze-type supports fabricated with steel slotted or other support system, sized so capacity can be increased by at least 25 percent in future without exceeding specified design load limits.
 1. Secure raceways and cables to these supports with two-bolt conduit clamps.
- D. Spring-steel clamps designed for supporting single conduits without bolts may be used for 1-1/2-inch and smaller raceways serving branch circuits and communication systems above suspended ceilings and for fastening raceways to trapeze supports.

3.2 SUPPORT INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except as specified in this Article.
- B. Strength of Support Assemblies: Where not indicated, select sizes of components so strength will be adequate to carry present and future static loads within specified loading limits. Minimum static design load used for strength determination shall be weight of supported components plus 200 lb.
- C. Mounting and Anchorage of Surface-Mounted Equipment and Components: Anchor and fasten electrical items and their supports to building structural elements by the following methods unless otherwise indicated by code:
 1. To Wood: Fasten with lag screws or through bolts.
 2. To New Concrete: Bolt to concrete inserts.

3. To Masonry: Approved toggle-type bolts on hollow masonry units and expansion anchor fasteners on solid masonry units.
 4. To Existing Concrete: Expansion anchor fasteners.
 5. Instead of expansion anchors, powder-actuated driven threaded studs provided with lock washers and nuts may be used in existing standard-weight concrete 4 inches thick or greater. Do not use for anchorage to lightweight-aggregate concrete or for slabs less than 4 inches thick.
 6. To Steel: Welded threaded studs complying with AWS D1.1/D1.1M, with lock washers and nuts and beam clamps (MSS Type 19, 21, 23, 25, or 27) complying with MSS SP-69.
 7. To Light Steel: Sheet metal screws.
 8. Items Mounted on Hollow Walls and Nonstructural Building Surfaces: Mount cabinets, panelboards, disconnect switches, control enclosures, pull and junction boxes, transformers, and other devices on slotted-channel racks attached to substrate per manufacturer's installation instructions.
- D. Drill holes for expansion anchors in concrete at locations and to depths that avoid reinforcing bars.

3.3 INSTALLATION OF FABRICATED METAL SUPPORTS

- A. Comply with installation requirements in Division 05 Section "Metal Fabrications" for site-fabricated metal supports.
- B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor electrical materials and equipment.
- C. Field Welding: Comply with AWS D1.1/D1.1M.

3.4 CONCRETE BASES

- A. Construct concrete bases of dimensions indicated but not less than 4 inches larger in both directions than supported unit, and so anchors will be a minimum of 10 bolt diameters from edge of the base.
- B. Use 3000-psi, 28-day compressive-strength concrete. Concrete materials, reinforcement, and placement requirements are specified in Division 03 Section "Cast-in-Place Concrete."
- C. Anchor equipment to concrete base.
 1. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
 2. Install anchor bolts to elevations required for proper attachment to supported equipment.
 3. Install anchor bolts according to anchor-bolt manufacturer's written instructions.

3.5 PAINTING

- A. Touchup: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.
 1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils.

- B. Touchup: Comply with requirements in Division 09 painting Sections for cleaning and touchup painting of field welds, bolted connections, and abraded areas of shop paint on miscellaneous metal.
- C. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION 260529

SECTION 260533 - RACEWAYS AND BOXES FOR ELECTRICAL SYSTEMS

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. Metal conduits, tubing, and fittings.
 - 2. Nonmetal conduits, tubing, and fittings.
 - 3. Metal wireways and auxiliary gutters.
 - 4. Nonmetal wireways and auxiliary gutters.
 - 5. Surface raceways.
 - 6. Boxes, enclosures, and cabinets.

1.3 DEFINITIONS

- A. ARC: Aluminum rigid conduit.
- B. GRC: Galvanized rigid steel conduit.
- C. IMC: Intermediate metal conduit.

1.4 ACTION SUBMITTALS

- A. Product Data: For surface raceways, wireways and fittings, floor boxes, hinged-cover enclosures, and cabinets.
- B. Shop Drawings: For custom enclosures and cabinets. Include plans, elevations, sections, and attachment details.

1.5 INFORMATIONAL SUBMITTALS

- A. Coordination Drawings: Conduit routing plans, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of items involved:
 - 1. Structural members in paths of conduit groups with common supports.
 - 2. HVAC and plumbing items and architectural features in paths of conduit groups with common supports.

PART 2 - PRODUCTS

2.1 METAL CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. AFC Cable Systems, Inc.
 - 2. Allied Tube & Conduit; a Tyco International Ltd. Co.
 - 3. O-Z/Gedney; a brand of EGS Electrical Group.
 - 4. Picoma Industries, a subsidiary of Mueller Water Products, Inc.
 - 5. Republic Conduit.
 - 6. Southwire Company.
 - 7. Thomas & Betts Corporation.
 - 8. Western Tube and Conduit Corporation.
 - 9. Wheatland Tube Company; a division of John Maneely Company.
- B. Listing and Labeling: Metal conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. GRC: Comply with ANSI C80.1 and UL 6.
- D. ARC: Comply with ANSI C80.5 and UL 6A.
- E. IMC: Comply with ANSI C80.6 and UL 1242.
- F. PVC-Coated Steel Conduit: PVC-coated rigid steel conduit.
 - 1. Comply with NEMA RN 1.
 - 2. Coating Thickness: 0.040 inch, minimum.
- G. EMT: Comply with ANSI C80.3 and UL 797.
- H. FMC: Comply with UL 1; zinc-coated steel or aluminum.
- I. LFMC: Flexible steel conduit with PVC jacket and complying with UL 360.
- J. Fittings for Metal Conduit: Comply with NEMA FB 1 and UL 514B.
 - 1. Conduit Fittings for Hazardous (Classified) Locations: Comply with UL 886 and NFPA 70.
 - 2. Fittings for EMT:
 - a. Material: Steel or die cast.
 - b. Type: Setscrew or compression.
 - 3. Expansion Fittings: PVC or steel to match conduit type, complying with UL 651, rated for environmental conditions where installed, and including flexible external bonding jumper.
 - 4. Coating for Fittings for PVC-Coated Conduit: Minimum thickness of 0.040 inch, with overlapping sleeves protecting threaded joints.
- K. Joint Compound for IMC, GRC, or ARC: Approved, as defined in NFPA 70, by authorities having jurisdiction for use in conduit assemblies, and compounded for use to lubricate and protect threaded conduit joints from corrosion and to enhance their conductivity.

2.2 NONMETALLIC CONDUITS, TUBING, AND FITTINGS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. CANTEX Inc.
 - 2. CertainTeed Corp.
 - 3. Kraloy.
 - 4. Lamson & Sessions; Carlon Electrical Products.
 - 5. Niedax-Kleinhuis USA, Inc.
 - 6. RACO; a Hubbell company.
 - 7. Thomas & Betts Corporation.
- B. Listing and Labeling: Nonmetallic conduits, tubing, and fittings shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. RNC: Type EPC-40-PVC, complying with NEMA TC 2 and UL 651 unless otherwise indicated.
- D. LFNC: Comply with UL 1660.
- E. Rigid HDPE: Comply with UL 651A.
- F. RTRC: Comply with UL 1684A and NEMA TC 14.
- G. Fittings for ENT and RNC: Comply with NEMA TC 3; match to conduit or tubing type and material.
- H. Fittings for LFNC: Comply with UL 514B.

2.3 METAL WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Cooper B-Line, Inc.
 - 2. Hoffman; a Pentair company.
 - 3. Mono-Systems, Inc.
 - 4. Square D; a brand of Schneider Electric.
- B. Description: Sheet metal, complying with UL 870 and NEMA 250, Type 1 or Type 3R as shown, unless otherwise indicated, and sized according to NFPA 70.
 - 1. Metal wireways installed outdoors shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Fittings and Accessories: Include covers, couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings to match and mate with wireways as required for complete system.
- D. Wireway Covers: Screw-cover type unless otherwise indicated.
- E. Finish: Manufacturer's standard enamel finish.

2.4 NONMETALLIC WIREWAYS AND AUXILIARY GUTTERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Allied Moulded Products, Inc.
 - 2. Hoffman; a Pentair company.
 - 3. Lamson & Sessions; Carlon Electrical Products.
 - 4. Niedax-Kleinhuis USA, Inc.
- B. Listing and Labeling: Nonmetallic wireways and auxiliary gutters shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- C. Description: Fiberglass polyester, extruded and fabricated to required size and shape, without holes or knockouts. Cover shall be gasketed with oil-resistant gasket material and fastened with captive screws treated for corrosion resistance. Connections shall be flanged and have stainless-steel screws and oil-resistant gaskets.
- D. Fittings and Accessories: Couplings, offsets, elbows, expansion joints, adapters, hold-down straps, end caps, and other fittings shall match and mate with wireways as required for complete system.

2.5 BOXES, ENCLOSURES, AND CABINETS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Adalet.
 - 2. Cooper Technologies Company; Cooper Crouse-Hinds.
 - 3. EGS/Appleton Electric.
 - 4. Erickson Electrical Equipment Company.
 - 5. FSR Inc.
 - 6. Hoffman; a Pentair company.
 - 7. Hubbell Incorporated; Killark Division.
 - 8. Kraloy.
 - 9. Milbank Manufacturing Co.
 - 10. Mono-Systems, Inc.
 - 11. O-Z/Gedney; a brand of EGS Electrical Group.
 - 12. RACO; a Hubbell Company.
 - 13. Stahlin Non-Metallic Enclosures; a division of Robroy Industries.
 - 14. Thomas & Betts Corporation.
 - 15. Wiremold / Legrand.
- B. General Requirements for Boxes, Enclosures, and Cabinets: Boxes, enclosures, and cabinets installed in wet locations shall be listed for use in wet locations.
- C. Sheet Metal Outlet and Device Boxes: Comply with NEMA OS 1 and UL 514A.
- D. Cast-Metal Outlet and Device Boxes: Comply with NEMA FB 1, aluminum, Type FD, with gasketed cover.
- E. Nonmetallic Outlet and Device Boxes: Comply with NEMA OS 2 and UL 514C.

- F. Luminaire Outlet Boxes: Nonadjustable, designed for attachment of luminaire weighing 50 lb. Outlet boxes designed for attachment of luminaires weighing more than 50 lb shall be listed and marked for the maximum allowable weight.
- G. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.
- H. Cast-Metal Access, Pull, and Junction Boxes: Comply with NEMA FB 1 and UL 1773, cast aluminum with gasketed cover.
- I. Box extensions used to accommodate new building finishes shall be of same material as recessed box.
- J. Device Box Dimensions: 4 inches square by 2-1/8 inches deep.
- K. Gangable boxes are allowed.
- L. Hinged-Cover Enclosures: Comply with UL 50 and NEMA 250, Type 1 with continuous-hinge cover with flush latch unless otherwise indicated.
 - 1. Metal Enclosures: Steel, finished inside and out with manufacturer's standard enamel.
 - 2. Nonmetallic Enclosures: Fiberglass.
 - 3. Interior Panels: Steel; all sides finished with manufacturer's standard enamel.
- M. Cabinets:
 - 1. NEMA 250, Type 1 galvanized-steel box with removable interior panel and removable front, finished inside and out with manufacturer's standard enamel.
 - 2. Hinged door in front cover with flush latch and concealed hinge.
 - 3. Key latch to match panelboards.
 - 4. Metal barriers to separate wiring of different systems and voltage.
 - 5. Accessory feet where required for freestanding equipment.
 - 6. Nonmetallic cabinets shall be listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed Conduit: IMC.
 - 2. Concealed Conduit, Aboveground: IMC.
 - 3. Underground Conduit: RNC, Type EPC-40-PVC.
 - 4. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): LFNC.
 - 5. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Indoors: Apply raceway products as specified below unless otherwise indicated:
 - 1. Exposed, Not Subject to Physical Damage: EMT.
 - 2. Exposed, Not Subject to Severe Physical Damage: EMT.
 - 3. Exposed and Subject to Severe Physical Damage: GRC. Raceway locations include the following:

- a. Loading dock.
 - b. Corridors used for traffic of mechanized carts, forklifts, and pallet-handling units.
 - c. Mechanical rooms.
- 4. Concealed in Ceilings and Interior Walls and Partitions: EMT.
- 5. Connection to Vibrating Equipment (Including Transformers and Hydraulic, Pneumatic, Electric Solenoid, or Motor-Driven Equipment): FMC, except use LFMC in damp or wet locations.
- 6. Damp or Wet Locations: GRC.
- 7. Boxes and Enclosures: NEMA 250, Type 1, except use NEMA 250, Type 4 stainless steel in institutional and commercial kitchens and damp or wet locations.
- C. Minimum Raceway Size: 1/2-inch trade size.
- D. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings unless otherwise indicated. Comply with NEMA FB 2.10.
 - 2. PVC Externally Coated, Rigid Steel Conduits: Use only fittings listed for use with this type of conduit. Patch and seal all joints, nicks, and scrapes in PVC coating after installing conduits and fittings. Use sealant recommended by fitting manufacturer and apply in thickness and number of coats recommended by manufacturer.
 - 3. EMT: Use setscrew or compression, steel or cast-metal fittings. Comply with NEMA FB 2.10.
 - 4. Flexible Conduit: Use only fittings listed for use with flexible conduit. Comply with NEMA FB 2.20.
- E. Do not install aluminum conduits, boxes, or fittings in contact with concrete or earth.
- F. Install surface raceways only where indicated on Drawings.
- G. Do not install nonmetallic conduit where ambient temperature exceeds 120 deg F.

3.2 INSTALLATION

- A. Comply with NECA 1 and NECA 101 for installation requirements except where requirements on Drawings or in this article are stricter. Comply with NECA 102 for aluminum conduits. Comply with NFPA 70 limitations for types of raceways allowed in specific occupancies and number of floors.
- B. Keep raceways at least 6 inches away from parallel runs of flues and steam or hot-water pipes. Install horizontal raceway runs above water and steam piping.
- C. Complete raceway installation before starting conductor installation.
- D. Comply with requirements in Division 26 Section "Hangers and Supports for Electrical Systems" for hangers and supports.
- E. Arrange stub-ups so curved portions of bends are not visible above finished slab.
- F. Install no more than the equivalent of three 90-degree bends in any conduit run except for control wiring conduits, for which fewer bends are allowed. Support within 12 inches of changes in direction.

- G. Conceal conduit and EMT within finished walls, ceilings, and floors unless otherwise indicated. Install conduits parallel or perpendicular to building lines.
- H. Support conduit within 12 inches of enclosures to which attached.
- I. Stub-ups to Above Recessed Ceilings:
 - 1. Use EMT for raceways.
 - 2. Use a conduit bushing or insulated fitting to terminate stub-ups not terminated in hubs or in an enclosure.
- J. Threaded Conduit Joints, Exposed to Wet, Damp, Corrosive, or Outdoor Conditions: Apply listed compound to threads of raceway and fittings before making up joints. Follow compound manufacturer's written instructions.
- K. Coat field-cut threads on PVC-coated raceway with a corrosion-preventing conductive compound prior to assembly.
- L. Raceway Terminations at Locations Subject to Moisture or Vibration: Use insulating bushings to protect conductors including conductors smaller than No. 4 AWG.
- M. Install raceways square to the enclosure and terminate at enclosures with locknuts. Install locknuts hand tight plus 1/4 turn more.
- N. Do not rely on locknuts to penetrate nonconductive coatings on enclosures. Remove coatings in the locknut area prior to assembling conduit to enclosure to assure a continuous ground path.
- O. Cut conduit perpendicular to the length. For conduits 2-inch trade size and larger, use roll cutter or a guide to make cut straight and perpendicular to the length.
- P. Install pull wires in empty raceways. Use polypropylene or monofilament plastic line with not less than 200-lb tensile strength. Leave at least 12 inches of slack at each end of pull wire. Cap underground raceways designated as spare above grade alongside raceways in use.
- Q. Surface Raceways:
 - 1. Install surface raceway with a minimum 2-inch radius control at bend points.
 - 2. Secure surface raceway with screws or other anchor-type devices at intervals not exceeding 48 inches and with no less than two supports per straight raceway section. Support surface raceway according to manufacturer's written instructions. Tape and glue are not acceptable support methods.
- R. Install raceway sealing fittings at accessible locations according to NFPA 70 and fill them with listed sealing compound. For concealed raceways, install each fitting in a flush steel box with a blank cover plate having a finish similar to that of adjacent plates or surfaces. Install raceway sealing fittings according to NFPA 70.
- S. Install devices to seal raceway interiors at accessible locations. Locate seals so no fittings or boxes are between the seal and the following changes of environments. Seal the interior of all raceways at the following points:
 - 1. Where conduits pass from warm to cold locations, such as boundaries of refrigerated spaces.
 - 2. Where an underground service raceway enters a building or structure.
 - 3. Where otherwise required by NFPA 70.

- T. Comply with manufacturer's written instructions for solvent welding RNC and fittings.
- U. Expansion-Joint Fittings:
 - 1. Install in each run of aboveground RNC that is located where environmental temperature change may exceed 30 deg F and that has straight-run length that exceeds 25 feet. Install in each run of aboveground RMC and EMT conduit that is located where environmental temperature change may exceed 100 deg F and that has straight-run length that exceeds 100 feet.
 - 2. Install type and quantity of fittings that accommodate temperature change listed for each of the following locations:
 - a. Outdoor Locations Not Exposed to Direct Sunlight: 125 deg F temperature change.
 - b. Outdoor Locations Exposed to Direct Sunlight: 155 deg F temperature change.
 - c. Indoor Spaces Connected with Outdoors without Physical Separation: 125 deg F temperature change.
 - 3. Install fitting(s) that provide expansion and contraction for at least 0.00041 inch per foot of length of straight run per deg F of temperature change for PVC conduits. Install fitting(s) that provide expansion and contraction for at least 0.000078 inch per foot of length of straight run per deg F of temperature change for metal conduits.
 - 4. Install expansion fittings at all locations where conduits cross building or structure expansion joints.
 - 5. Install each expansion-joint fitting with position, mounting, and piston setting selected according to manufacturer's written instructions for conditions at specific location at time of installation. Install conduit supports to allow for expansion movement.
- V. Flexible Conduit Connections: Comply with NEMA RV 3. Use a maximum of 72 inches of flexible conduit for recessed and semirecessed luminaires, equipment subject to vibration, noise transmission, or movement; and for transformers and motors.
 - 1. Use LFMC in damp or wet locations subject to severe physical damage.
 - 2. Use LFMC or LFNC in damp or wet locations not subject to severe physical damage.
- W. Mount boxes at heights indicated on Drawings. If mounting heights of boxes are not individually indicated, give priority to ADA requirements. Install boxes with height measured to center of box unless otherwise indicated.
- X. Recessed Boxes in Masonry Walls: Saw-cut opening for box in center of cell of masonry block, and install box flush with surface of wall. Prepare block surfaces to provide a flat surface for a raintight connection between box and cover plate or supported equipment and box.
- Y. Horizontally separate boxes mounted on opposite sides of walls so they are not in the same vertical channel.
- Z. Locate boxes so that cover or plate will not span different building finishes.
- AA. Support boxes of three gangs or more from more than one side by spanning two framing members or mounting on brackets specifically designed for the purpose.
- BB. Fasten junction and pull boxes to or support from building structure. Do not support boxes by conduits.
- CC. Set metal floor boxes level and flush with finished floor surface.

DD. Set nonmetallic floor boxes level. Trim after installation to fit flush with finished floor surface.

3.3 SLEEVE AND SLEEVE-SEAL INSTALLATION FOR ELECTRICAL PENETRATIONS

- A. Install sleeves and sleeve seals at penetrations of exterior floor and wall assemblies. Comply with requirements in Division 26 Section "Sleeves and Sleeve Seals for Electrical Raceways and Cabling."

3.4 FIRESTOPPING

- A. Install firestopping at penetrations of fire-rated floor and wall assemblies. Comply with requirements in Division 07 Section "Penetration Firestopping."

3.5 PROTECTION

- A. Protect coatings, finishes, and cabinets from damage and deterioration.
 - 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.
 - 2. Repair damage to PVC coatings or paint finishes with matching touchup coating recommended by manufacturer.

END OF SECTION 260533

SECTION 260544 - SLEEVES AND SLEEVE SEALS FOR ELECTRICAL RACEWAYS AND CABLING

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. Sleeves for raceway and cable penetration of non-fire-rated construction walls and floors.
 - 2. Sleeve-seal systems.
 - 3. Sleeve-seal fittings.
 - 4. Grout.
 - 5. Silicone sealants.
- B. Related Requirements:
 - 1. Division 07 Section "Penetration Firestopping" for penetration firestopping installed in fire-resistance-rated walls, horizontal assemblies, and smoke barriers, with and without penetrating items.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.

PART 2 - PRODUCTS

2.1 SLEEVES

- A. Wall Sleeves:
 - 1. Steel Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc coated, plain ends.
- B. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies: Galvanized-steel sheet; 0.0239-inch minimum thickness; round tube closed with welded longitudinal joint, with tabs for screw-fastening the sleeve to the board.
- C. Molded-PE or -PP Sleeves: Removable, tapered-cup shaped, and smooth outer surface with nailing flange for attaching to wooden forms.
- D. Sleeves for Rectangular Openings:
 - 1. Material: Galvanized sheet steel.

2. Minimum Metal Thickness:

- a. For sleeve cross-section rectangle perimeter less than 50 inches and with no side larger than 16 inches, thickness shall be 0.052 inch.
- b. For sleeve cross-section rectangle perimeter 50 inches or more and one or more sides larger than 16 inches, thickness shall be 0.138 inch.

2.2 SLEEVE-SEAL SYSTEMS

- A. Description: Modular sealing device, designed for field assembly, to fill annular space between sleeve and raceway or cable.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Advance Products & Systems, Inc.
 - b. CALPICO, Inc.
 - c. Metraflex Company (The).
 - d. Pipeline Seal and Insulator, Inc.
 - e. Proco Products, Inc.
- 2. Sealing Elements: EPDM rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
- 3. Pressure Plates: Carbon steel.
- 4. Connecting Bolts and Nuts: Carbon steel, with corrosion-resistant coating, of length required to secure pressure plates to sealing elements.

2.3 SLEEVE-SEAL FITTINGS

- A. Description: Manufactured plastic, sleeve-type, waterstop assembly made for embedding in concrete slab or wall. Unit shall have plastic or rubber waterstop collar with center opening to match piping OD.

- 1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - a. Presealed Systems.

2.4 GROUT

- A. Description: Nonshrink; recommended for interior and exterior sealing openings in non-fire-rated walls or floors.
- B. Standard: ASTM C 1107/C 1107M, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.
- C. Design Mix: 5000-psi, 28-day compressive strength.
- D. Packaging: Premixed and factory packaged.

2.5 SILICONE SEALANTS

- A. Silicone Sealants: Single-component, silicone-based, neutral-curing elastomeric sealants of grade indicated below.
 - 1. Grade: Pourable (self-leveling) formulation for openings in floors and other horizontal surfaces that are not fire rated.
- B. Silicone Foams: Multicomponent, silicone-based liquid elastomers that, when mixed, expand and cure in place to produce a flexible, nonshrinking foam.

PART 3 - EXECUTION

3.1 SLEEVE INSTALLATION FOR NON-FIRE-RATED ELECTRICAL PENETRATIONS

- A. Comply with NECA 1.
- B. Comply with NEMA VE 2 for cable tray and cable penetrations.
- C. Sleeves for Conduits Penetrating Above-Grade Non-Fire-Rated Concrete and Masonry-Unit Floors and Walls:
 - 1. Interior Penetrations of Non-Fire-Rated Walls and Floors:
 - a. Seal annular space between sleeve and raceway or cable, using joint sealant appropriate for size, depth, and location of joint. Comply with requirements in Division 07 Section "Joint Sealants."
 - b. Seal space outside of sleeves with mortar or grout. Pack sealing material solidly between sleeve and wall so no voids remain. Tool exposed surfaces smooth; protect material while curing.
 - 2. Use pipe sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 3. Size pipe sleeves to provide 1/4-inch annular clear space between sleeve and raceway or cable unless sleeve seal is to be installed.
 - 4. Install sleeves for wall penetrations unless core-drilled holes or formed openings are used. Install sleeves during erection of walls. Cut sleeves to length for mounting flush with both surfaces of walls. Deburr after cutting.
 - 5. Install sleeves for floor penetrations. Extend sleeves installed in floors 2 inches above finished floor level. Install sleeves during erection of floors.
- D. Sleeves for Conduits Penetrating Non-Fire-Rated Gypsum Board Assemblies:
 - 1. Use circular metal sleeves unless penetration arrangement requires rectangular sleeved opening.
 - 2. Seal space outside of sleeves with approved joint compound for gypsum board assemblies.
- E. Roof-Penetration Sleeves: Seal penetration of individual raceways and cables with flexible boot-type flashing units applied in coordination with roofing work.
- F. Aboveground, Exterior-Wall Penetrations: Seal penetrations using steel pipe sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch annular clear space between pipe and sleeve for installing mechanical sleeve seals.

- G. Underground, Exterior-Wall and Floor Penetrations: Install cast-iron pipe sleeves. Size sleeves to allow for 1-inch annular clear space between raceway or cable and sleeve for installing sleeve-seal system.

3.2 SLEEVE-SEAL-SYSTEM INSTALLATION

- A. Install sleeve-seal systems in sleeves in exterior concrete walls and slabs-on-grade at raceway entries into building.
- B. Install type and number of sealing elements recommended by manufacturer for raceway or cable material and size. Position raceway or cable in center of sleeve. Assemble mechanical sleeve seals and install in annular space between raceway or cable and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.3 SLEEVE-SEAL-FITTING INSTALLATION

- A. Install sleeve-seal fittings in new walls and slabs as they are constructed.
- B. Assemble fitting components of length to be flush with both surfaces of concrete slabs and walls. Position waterstop flange to be centered in concrete slab or wall.
- C. Secure nailing flanges to concrete forms.
- D. Using grout, seal the space around outside of sleeve-seal fittings.

END OF SECTION 260544

SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Identification for raceways.
 - 2. Identification of control cables.
 - 3. Identification for conductors.
 - 4. Underground-line warning tape.
 - 5. Warning labels and signs.
 - 6. Instruction signs.
 - 7. Equipment identification labels.
 - 8. Miscellaneous identification products.

1.3 ACTION SUBMITTALS

- A. Product Data: For each electrical identification product indicated.
- B. Identification Schedule: An index of nomenclature of electrical equipment and system components used in identification signs and labels.

1.4 QUALITY ASSURANCE

- A. Comply with ANSI A13.1.
- B. Comply with NFPA 70.
- C. Comply with 29 CFR 1910.144 and 29 CFR 1910.145.
- D. Comply with ANSI Z535.4 for safety signs and labels.
- E. Adhesive-attached labeling materials, including label stocks, laminating adhesives, and inks used by label printers, shall comply with UL 969.

1.5 COORDINATION

- A. Coordinate identification names, abbreviations, colors, and other features with requirements in other Sections requiring identification applications, Drawings, Shop Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual; and with those required by codes, standards, and 29 CFR 1910.145. Use consistent designations throughout Project.

- B. Coordinate installation of identifying devices with completion of covering and painting of surfaces where devices are to be applied.
- C. Coordinate installation of identifying devices with location of access panels and doors.
- D. Install identifying devices before installing acoustical ceilings and similar concealment.

PART 2 - PRODUCTS

2.1 POWER RACEWAY IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway size.
- B. Colors for Raceways Carrying Circuits at 600 V or Less:
 - 1. Black letters on an orange field.
 - 2. Legend: Indicate voltage and system or service type.
- C. Self-Adhesive Vinyl Labels for Raceways Carrying Circuits at 600 V or Less: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.2 CONTROL CABLE IDENTIFICATION MATERIALS

- A. Comply with ANSI A13.1 for minimum size of letters for legend and for minimum length of color field for each raceway and cable size.
- B. Self-Adhesive Vinyl Labels: Preprinted, flexible label laminated with a clear, weather- and chemical-resistant coating and matching wraparound adhesive tape for securing ends of legend label.

2.3 CONDUCTOR IDENTIFICATION MATERIALS

- A. Color-Coding Conductor Tape: Colored, self-adhesive vinyl tape not less than 3 mils thick by 1 to 2 inches wide.

2.4 FLOOR MARKING TAPE

- A. 2-inch-wide, 5-mil pressure-sensitive vinyl tape, with black and white stripes and clear vinyl overlay.

2.5 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
- B. Self-Adhesive Warning Labels: Factory-printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment unless otherwise indicated.

- C. Warning label and sign shall include, but are not limited to, the following legends:
1. Workspace Clearance Warning: "WARNING - OSHA REGULATION - AREA IN FRONT OF ELECTRICAL EQUIPMENT MUST BE KEPT CLEAR FOR 36 INCHES."
 2. Arc Flash: Provide permanent warning labels on all electrical panels to warn personnel of potential electric arc flash hazards per NEC 110.16. The Owner shall determine the potential for arc flash hazard level in accordance with NFPA 70E and OSHA.

2.6 INSTRUCTION SIGNS

- A. Engraved, laminated acrylic or melamine plastic, minimum 1/16 inch thick for signs up to 20 sq. inches and 1/8 inch thick for larger sizes.
1. Engraved legend with black letters on white face.
 2. Punched or drilled for mechanical fasteners.
 3. Framed with mitered acrylic molding and arranged for attachment at applicable equipment.
- B. Adhesive Film Label: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch.
- C. Adhesive Film Label with Clear Protective Overlay: Machine printed, in black, by thermal transfer or equivalent process. Minimum letter height shall be 3/8 inch. Overlay shall provide a weatherproof and UV-resistant seal for label.

2.7 EQUIPMENT IDENTIFICATION LABELS

- A. Engraved Plastic Laminate Nameplates:
1. Provide engraving phenolic plastic laminate, in sizes and thicknesses indicated, engraved with 1/16 inch thick lines with square standard pica lettering and wording as specified herein.
 - a. black face with white core plies (letter color) for normal systems
 - b. red with white letters for fire alarm
 2. Punch for mechanical fastening, except where adhesive mounting is necessary because of substrate.
 3. Material thickness shall be 1/16 inch. Titles shall be 1/2 inch high and all other lettering shall be 1/4 inch high.
 4. Provide beveled edge in order to eliminate sharp corners.
 5. Provide self-tapping stainless steel round head screws. Provide contact type permanent adhesive where screws cannot or shall not penetrate the substrate. Adhesive nameplate shall be permanently installed.

2.8 CABLE TIES

- A. General-Purpose Cable Ties: Fungus inert, self extinguishing, one piece, self locking, Type 6/6 nylon.
1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.

4. Color: Black except where used for color-coding.
- B. UV-Stabilized Cable Ties: Fungus inert, designed for continuous exposure to exterior sunlight, self extinguishing, one piece, self locking, Type 6/6 nylon.
1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F, According to ASTM D 638: 12,000 psi.
 3. Temperature Range: Minus 40 to plus 185 deg F.
 4. Color: Black.
- C. Plenum-Rated Cable Ties: Self extinguishing, UV stabilized, one piece, self locking.
1. Minimum Width: 3/16 inch.
 2. Tensile Strength at 73 deg F, According to ASTM D 638: 7000 psi.
 3. UL 94 Flame Rating: 94V-0.
 4. Temperature Range: Minus 50 to plus 284 deg F.
 5. Color: Black.

2.9 MISCELLANEOUS IDENTIFICATION PRODUCTS

- A. Paint: Comply with requirements in Division 09 painting Sections for paint materials and application requirements. Select paint system applicable for surface material and location (exterior or interior).
- B. Fasteners for Labels and Signs: Self-tapping, stainless-steel screws or stainless-steel machine screws with nuts and flat and lock washers.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Verify identity of each item before installing identification products.
- B. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- C. Apply identification devices to surfaces that require finish after completing finish work.
- D. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- E. Attach signs and plastic labels that are not self-adhesive type with mechanical fasteners appropriate to the location and substrate.
- F. System Identification Color-Coding Bands for Raceways and Cables: Each color-coding band shall completely encircle cable or conduit. Place adjacent bands of two-color markings in contact, side by side. Locate bands at changes in direction, at penetrations of walls and floors, at 50-foot maximum intervals in straight runs, and at 25-foot maximum intervals in congested areas.
- G. Cable Ties: For attaching tags. Use general-purpose type, except as listed below:

1. Outdoors: UV-stabilized nylon.
 2. In Spaces Handling Environmental Air: Plenum rated.
- H. Painted Identification: Comply with requirements in Division 09 painting Sections for surface preparation and paint application.

3.2 IDENTIFICATION SCHEDULE

- A. Accessible Raceways, 600 V or Less, for Service, Feeder, and Branch Circuits More Than 30 A, and 120 V to ground: Identify with self-adhesive vinyl tape applied in bands. Install labels at 10-foot maximum intervals.
- B. Accessible Raceways and Cables within Buildings: Identify the covers of each junction and pull box with colors indicated in the wiring system legend and system voltage.
- C. Power-Circuit Conductor Identification, 600 V or Less: For conductors in vaults, pull and junction boxes, manholes, and handholes, use color-coding conductor tape to identify the phase.
1. Color-Coding for Phase and Voltage Level Identification, 600 V or Less: Use colors listed below for ungrounded service feeder and branch-circuit conductors.
 - a. Color shall be factory applied or field applied for sizes larger than No. 8 AWG, if authorities having jurisdiction permit.
 - b. Colors for 208/120-V Circuits:
 - 1) Phase A: Black.
 - 2) Phase B: Red.
 - 3) Phase C: Blue.
 - c. Field-Applied, Color-Coding Conductor Tape: Apply in half-lapped turns for a minimum distance of 6 inches from terminal points and in boxes where splices or taps are made. Apply last two turns of tape with no tension to prevent possible unwinding. Locate bands to avoid obscuring factory cable markings.
- D. Install instructional sign including the color-code for grounded and ungrounded conductors using adhesive-film-type labels.
- E. Conductors to Be Extended in the Future: Attach write-on tags to conductors and list source.
- F. Auxiliary Electrical Systems Conductor Identification: Identify field-installed alarm, control, and signal connections.
1. Identify conductors, cables, and terminals in enclosures and at junctions, terminals, and pull points. Identify by system and circuit designation.
 2. Use system of marker tape designations that is uniform and consistent with system used by manufacturer for factory-installed connections.
 3. Coordinate identification with Project Drawings, manufacturer's wiring diagrams, and the Operation and Maintenance Manual.
- G. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Self-adhesive warning labels.
1. Comply with 29 CFR 1910.145.

2. Identify system voltage with black letters on an orange background.
 3. Apply to exterior of door, cover, or other access.
- H. Operating Instruction Signs: Install instruction signs to facilitate proper operation and maintenance of electrical systems and items to which they connect. Install instruction signs with approved legend where instructions are needed for system or equipment operation.
- I. Emergency Operating Instruction Signs: Install instruction signs with white legend on a red background with minimum 3/8-inch-high letters for emergency instructions at equipment used for emergency operations.
- J. Equipment Identification Labels: On each unit of equipment, install unique designation label that is consistent with wiring diagrams, schedules, and the Operation and Maintenance Manual. Apply labels to disconnect switches and protection equipment, central or master units, control panels, control stations, terminal cabinets, and racks of each system. Systems include power, lighting, control, communication, signal, monitoring, and alarm systems unless equipment is provided with its own identification.
1. Labeling Instructions:
 - a. Indoor Equipment: Engraved, laminated acrylic or melamine label. Unless otherwise indicated, provide a single line of text with 1/2-inch-high letters on 1-1/2-inch-high label; where two lines of text are required, use labels 2 inches high.
 - b. Outdoor Equipment: Engraved, laminated acrylic or melamine label.
 - c. Elevated Components: Increase sizes of labels and letters to those appropriate for viewing from the floor.
 - d. Unless provided with self-adhesive means of attachment, fasten labels with appropriate mechanical fasteners that do not change the NEMA or NRTL rating of the enclosure.
 2. Equipment to Be Labeled:
 - a. Panelboards: Typewritten directory of circuits in the location provided by panelboard manufacturer. Panelboard identification shall be engraved, laminated acrylic or melamine label.
 - b. Enclosures and electrical cabinets.
 - c. Access doors and panels for concealed electrical items.
 - d. Enclosed switches.
 - e. Enclosed circuit breakers.
 - f. Enclosed controllers.
 - g. Variable-speed controllers.
 - h. Push-button stations.
 - i. Contactors.
 - j. Remote-controlled switches, dimmer modules, and control devices.
 - k. Battery-inverter units.
 - l. Battery racks.
 - m. Power-generating units.
 - n. Monitoring and control equipment.

END OF SECTION 260553

SECTION 260923 - LIGHTING CONTROL DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Indoor occupancy sensors.
 - 2. Lighting contactors.
- B. Related Requirements:
 - 1. Division 26 Section "Wiring Devices" for wall-box dimmers, wall-switch occupancy sensors, and manual light switches.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product.
- B. Shop Drawings: Show installation details for occupancy and light-level sensors.
 - 1. Interconnection diagrams showing field-installed wiring.
 - 2. Include diagrams for power, signal, and control wiring.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For each type of lighting control device to include in emergency, operation, and maintenance manuals.

PART 2 - PRODUCTS

2.1 INDOOR OCCUPANCY SENSORS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 - 1. Intelligent Lighting Controls (ILC)
 - 2. Watt Stopper.
 - 3. Crestron Control
 - 4. Douglas Lighting Controls
 - 5. Cooper Industries, Inc.

6. Hubbell Building Automation, Inc.
7. Leviton Mfg. Company Inc.
8. Lithonia Lighting; Acuity Lighting Group, Inc.
9. Lutron Electronics Co., Inc.
10. Sensor Switch, Inc.

B. General Requirements for Sensors: Wall- or ceiling-mounted, solid-state indoor occupancy sensors with a separate power pack.

1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
2. Operation: Unless otherwise indicated, turn lights on when coverage area is occupied, and turn them off when unoccupied; with a time delay for turning lights off, adjustable over a minimum range of 1 to 30 minutes.
3. Sensor Output: Contacts rated to operate the connected relay, complying with UL 773A. Sensor is powered from the power pack.
4. Power Pack: 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. Sensor has 24-V dc, 150-mA, Class 2 power source, as defined by NFPA 70.
5. 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.
6. Indicator: Digital display, to show when motion is detected during testing and normal operation of sensor.
7. Bypass Switch: Override the "on" function in case of sensor failure.

C. Dual-Technology Type: Ceiling mounted; detect occupants in coverage area using PIR and ultrasonic detection methods. The particular technology or combination of technologies that control on-off functions is selectable in the field by operating controls on unit.

1. Sensitivity Adjustment: Separate for each sensing technology.
2. 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., and detect a person of average size and weight moving not less than 12 inches in either a horizontal or a vertical manner at an approximate speed of 12 inches/s.
3. Detection Coverage (Standard Room): Detect occupancy anywhere within a circular area of 1000 sq. ft. when mounted on a 96-inch-high ceiling.

2.2 PHOTOELECTRIC SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
- B. Basis-of-Design Product: Subject to compliance with requirements, provide [product indicated on Drawings] <Insert manufacturer's name; product name or designation> or comparable product by one of the following:
1. Hubbell Building Automation, Inc.

2. Cooper Industries, Inc.
 3. Intermatic, Inc.
 4. NSi Industries LLC; TORK Products.
 5. Tyco Electronics; ALR Brand.
- C. Description: Solid state, with DPST dry contacts rated for 1800 VA, to operate connected load, complying with UL 773.
1. Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
 2. Light-Level Monitoring Range: 1.5 to 10 fc (16.14 to 108 lux), with an adjustment for turn-on and turn-off levels within that range.
 3. Time Delay: Thirty-second minimum, to prevent false operation.
 4. Lightning Arrester: Air-gap type.
 5. Mounting: Twist lock complying with NEMA C136.10, with base.

2.3 CONDUCTORS AND CABLES

- A. Power Wiring to Supply Side of Remote-Control Power Sources: Not smaller than No. 12 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- B. Classes 2 and 3 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 18 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."
- C. Class 1 Control Cable: Multiconductor cable with stranded-copper conductors not smaller than No. 14 AWG. Comply with requirements in Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

PART 3 - EXECUTION

3.1 SENSOR INSTALLATION

- A. Coordinate layout and installation of ceiling-mounted devices with other construction that penetrates ceilings or is supported by them, including light fixtures, HVAC equipment, smoke detectors, fire-suppression systems, and partition assemblies.
- B. 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.

3.2 WIRING INSTALLATION

- A. Wiring Method: Comply with Division 26 Section "Low-Voltage Electrical Power Conductors and Cables." Minimum conduit size is 1/2 inch.
- B. Wiring within Enclosures: Comply with NECA 1. Separate power-limited and nonpower-limited conductors according to conductor manufacturer's written instructions.
- C. Size conductors according to lighting control device manufacturer's written instructions unless otherwise indicated.

- D. Splices, Taps, and Terminations: Make connections only on numbered terminal strips in junction, pull, and outlet boxes; terminal cabinets; and equipment enclosures.

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 tests and inspections with the assistance of a factory-authorized service representative:
 - 1. Operational Test: After installing time switches and sensors, and after electrical circuitry has been energized, start units to confirm proper unit operation.
 - 2. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.
- B. Lighting control devices will be considered defective if they do not pass tests and inspections.
- C. Prepare test and inspection reports.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 2 months from 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.
 - 1. For occupancy and motion sensors, verify operation at outer limits of detector range. Set time delay to suit Owner's operations.
 - 2. For daylighting controls, adjust set points and deadband controls to suit Owner's operations.
 - 3. Align high-bay occupancy sensors using manufacturer's laser aiming tool.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain lighting control devices.

END OF SECTION 260923

SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Snap switches and wall-box dimmers.
 - 3. Floor service outlets, poke-through assemblies, service poles, and multioutlet assemblies.

1.3 DEFINITIONS

- A. EMI: Electromagnetic interference.
- B. GFCI: Ground-fault circuit interrupter.
- C. Pigtail: Short lead used to connect a device to a branch-circuit conductor.
- D. RFI: Radio-frequency interference.
- E. TVSS: Transient voltage surge suppressor.
- F. UTP: Unshielded twisted pair.

1.4 ACTION 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Field quality-control test reports.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For wiring devices to include in all manufacturers' packing label warnings and instruction manuals that include labeling conditions.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials described in subparagraphs below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

- 1. Floor Service Outlet Assemblies: One for every 10, but no fewer than one.

1.8 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.9 COORDINATION

- A. Receptacles for Owner-Furnished Equipment: Match plug configurations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour).

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 20 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper.
 - b. Hubbell.
 - c. Leviton.
 - d. Pass & Seymour.

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade, non-feed-through type. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 20 A:
 - 1. Products: Subject to compliance with requirements, provide one of the following:
 - a. Cooper.
 - b. Pass & Seymour.

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Key-Operated Switches, 120/277 V, 20 A:
 - 1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
 - 2. 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.
 - 3. Description: Single pole, with factory-supplied key in lieu of switch handle.

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: Smooth, high-impact thermoplastic.
 - 3. Material for Unfinished Spaces: Galvanized steel.
 - 4. Material for Damp Locations: Thermoplastic 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 thermoplastic with lockable cover.

2.6 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices: As selected by Architect, unless otherwise indicated or required by NFPA 70 or device listing.

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.
- D. Device Installation:
 - 1. Replace all devices that have been in temporary use during construction or that show signs that they were installed before building finishing operations were complete.
 - 2. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.
 - 3. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
 - 4. Connect devices to branch circuits using pigtails that are not less than 6 inches in length.
 - 5. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
 - 6. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
 - 7. When conductors larger than No. 12 AWG are installed on 15- or 20-A circuits, splice No. 12 AWG pigtails for device connections.
 - 8. Tighten unused terminal screws on the device.
 - 9. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
- E. Receptacle Orientation:
 - 1. Install ground pin of vertically mounted receptacles down, and on horizontally mounted receptacles to the left.
- F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

- G. Arrangement of Devices: Unless otherwise indicated, mount flush, with long dimension vertical. 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.
 - 2. Test Instrument for Convenience Receptacles: Digital wiring analyzer with digital readout or illuminated LED indicators of measurement.
- B. Tests for Convenience Receptacles:
 - 1. Line Voltage: Acceptable range is 105 to 132 V.
 - 2. Percent Voltage Drop under 15-A Load: A value of 5 percent or higher is not acceptable.
 - 3. Ground Impedance: Values of up to 2 ohms are acceptable.
 - 4. GFCI Trip: Test for tripping values specified in UL 1436 and UL 943.
 - 5. Using the test plug, verify that the device and its outlet box are securely mounted.
 - 6. The tests shall be diagnostic, indicating damaged conductors, high resistance at the circuit breaker, poor connections, inadequate fault current path, defective devices, or similar problems. Correct circuit conditions, remove malfunctioning units and replace with new ones, and retest as specified above.

END OF SECTION 262726

SECTION 262813 - FUSES

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. Cartridge fuses rated 600-V ac and less for use in control circuits, enclosed switches enclosed controllers and motor-control centers.
 - 2. Spare-fuse cabinets.

1.3 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated. Include construction details, material, dimensions, descriptions of individual components, and finishes for spare-fuse cabinets. Include the following for each fuse type indicated:
 - 1. Ambient Temperature Adjustment Information: If ratings of fuses have been adjusted to accommodate ambient temperatures, provide list of fuses with adjusted ratings.
 - a. For each fuse having adjusted ratings, include location of fuse, original fuse rating, local ambient temperature, and adjusted fuse rating.
 - b. Provide manufacturer's technical data on which ambient temperature adjustment calculations are based.
 - 2. Dimensions and manufacturer's technical data on features, performance, electrical characteristics, and ratings.
 - 3. Current-limitation curves for fuses with current-limiting characteristics.
 - 4. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.
 - 5. Coordination charts and tables and related data.
 - 6. Fuse sizes for elevator feeders and elevator disconnect switches.

1.4 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For fuses 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. Ambient temperature adjustment information.
 - 2. Current-limitation curves for fuses with current-limiting characteristics.
 - 3. Time-current coordination curves (average melt) and current-limitation curves (instantaneous peak let-through current) for each type and rating of fuse.

4. Coordination charts and tables and related data.

1.5 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than two of each size and type.

1.6 QUALITY ASSURANCE

- A. Source Limitations: Obtain fuses, for use within a specific product or circuit, from single source from single manufacturer.
- B. 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.
- C. Comply with NEMA FU 1 for cartridge fuses.
- D. Comply with NFPA 70.

1.7 PROJECT CONDITIONS

- A. Where ambient temperature to which fuses are directly exposed is less than 40 deg F or more than 100 deg F, apply manufacturer's ambient temperature adjustment factors to fuse ratings.

1.8 COORDINATION

- A. Coordinate fuse ratings with utilization equipment nameplate limitations of maximum fuse size and with system short-circuit current levels.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
 1. Cooper Bussmann, Inc.
 2. Edison Fuse, Inc.
 3. Ferraz Shawmut, Inc.
 4. Littelfuse, Inc.

2.2 CARTRIDGE FUSES

- A. Characteristics: NEMA FU 1, nonrenewable cartridge fuses with voltage ratings consistent with circuit voltages.

2.3 SPARE-FUSE CABINET

- A. Characteristics: Wall-mounted steel unit with full-length, recessed piano-hinged door and key-coded cam lock and pull.
 - 1. Size: Adequate for storage of spare fuses specified with 15 percent spare capacity minimum.
 - 2. Finish: Gray, baked enamel.
 - 3. Identification: "SPARE FUSES" in 1-1/2-inch-high letters on exterior of door.
 - 4. Fuse Pullers: For each size of fuse, where applicable and available, from fuse manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine fuses before installation. Reject fuses that are moisture damaged or physically damaged.
- B. Examine holders to receive fuses for compliance with installation tolerances and other conditions affecting performance, such as rejection features.
- C. Examine utilization equipment nameplates and installation instructions. Install fuses of sizes and with characteristics appropriate for each piece of equipment.
- D. Evaluate ambient temperatures to determine if fuse rating adjustment factors must be applied to fuse ratings.
- E. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 FUSE APPLICATIONS

- A. Cartridge Fuses:
 - 1. Service Entrance: Class J, time delay, dual element.
 - 2. Feeders: Class J, time delay.
 - 3. Motor Branch Circuits: Class RK5, time delay.
 - 4. Other Branch Circuits: Class J, time delay.
 - 5. Control Circuits: Class CC, time delay.

3.3 INSTALLATION

- A. Install fuses in fusible devices. Arrange fuses so rating information is readable without removing fuse.
- B. Install spare-fuse cabinet(s).

3.4 IDENTIFICATION

- A. Install labels complying with requirements for identification specified in Division 26 Section "Identification for Electrical Systems" and indicating fuse replacement information on inside door of each fused switch and adjacent to each fuse block, socket, and holder.

END OF SECTION 262813

SECTION 262816 - ENCLOSED SWITCHES AND CIRCUIT BREAKERS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fusible switches.
 - 2. Nonfusible switches.
 - 3. Molded-case circuit breakers (MCCBs).
 - 4. Molded-case switches.
 - 5. Enclosures.

1.3 DEFINITIONS

- A. NC: Normally closed.
- B. NO: Normally open.
- C. SPDT: Single pole, double throw.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of enclosed switch, circuit breaker, accessory, and component indicated. Include dimensioned elevations, sections, weights, and manufacturers' technical data on features, performance, electrical characteristics, ratings, accessories, and finishes.
 - 1. Enclosure types and details for types other than NEMA 250, Type 1.
 - 2. Current and voltage ratings.
 - 3. Short-circuit current ratings (interrupting and withstand, as appropriate).
 - 4. Detail features, characteristics, ratings, and factory settings of individual overcurrent protective devices, accessories, and auxiliary components.
 - 5. Include time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.
- 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.

1.5 INFORMATIONAL SUBMITTALS

- A. Qualification Data: For qualified testing agency.
- B. Field quality-control reports.
 - 1. Test procedures used.
 - 2. Test results that comply with requirements.
 - 3. Results of failed tests and corrective action taken to achieve test results that comply with requirements.
- C. Manufacturer's field service report.

1.6 CLOSEOUT SUBMITTALS

- A. Operation and Maintenance Data: For enclosed switches and circuit breakers to include in emergency, operation, and maintenance manuals. In addition to items specified in Division 01 Section "Operation and Maintenance Data," include the following:
 - 1. Manufacturer's written instructions for testing and adjusting enclosed switches and circuit breakers.
 - 2. Time-current coordination curves (average melt) for each type and rating of overcurrent protective device; include selectable ranges for each type of overcurrent protective device.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 - 1. Fuses: Equal to 10 percent of quantity installed for each size and type, but no fewer than three of each size and type.
 - 2. Fuse Pullers: Two for each size and type.

1.8 QUALITY ASSURANCE

- A. Source Limitations: Obtain enclosed switches and circuit breakers, overcurrent protective devices, components, and accessories, within same product category, from single source from single manufacturer.
- B. Product Selection for Restricted Space: Drawings indicate maximum dimensions for enclosed switches and circuit breakers, including clearances between enclosures, and adjacent surfaces and other items. Comply with indicated maximum dimensions.
- C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- D. Comply with NFPA 70.

1.9 PROJECT CONDITIONS

- A. Environmental Limitations: Rate equipment for continuous operation under the following conditions unless otherwise indicated:
1. Ambient Temperature: Not less than minus 22 deg F and not exceeding 104 deg F.
 2. Altitude: Not exceeding 6600 feet.

1.10 COORDINATION

- A. Coordinate layout and installation of switches, circuit breakers, and components with equipment served and adjacent surfaces. Maintain required workspace clearances and required clearances for equipment access doors and panels.

PART 2 - PRODUCTS

2.1 FUSIBLE SWITCHES

- A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Eaton Electrical Inc.; Cutler-Hammer Business Unit.
 2. General Electric Company; GE Consumer & Industrial - Electrical Distribution.
 3. Square D; a brand of Schneider Electric.
- B. Type GD, General Duty, Single Throw, 600-V ac, 800 A and Smaller: UL 98 and NEMA KS 1, horsepower rated, with cartridge fuse interiors to accommodate indicated fuses, lockable handle with capability to accept two 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. Auxiliary Contact Kit: One NO/NC (Form "C") auxiliary contact(s), arranged to activate before switch blades open.
 4. Hookstick Handle: Allows use of a hookstick to operate the handle.
 5. Lugs: Mechanical type, suitable for number, size, and conductor material.
 6. Service-Rated Switches: Labeled for use as service equipment.

2.2 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. Other Wet or Damp, Indoor Locations: NEMA 250, Type 4.
 4. Indoor Locations Subject to Dust, Falling Dirt, and Dripping Noncorrosive Liquids: NEMA 250, Type 12.

PART 3 - EXECUTION

3.1 EXAMINATION

- A. Examine elements and surfaces to receive enclosed switches and circuit breakers for compliance with installation tolerances and other conditions affecting performance of the Work.
- B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

- A. Install individual wall-mounted switches and circuit breakers with tops at uniform height unless otherwise indicated.
- B. Temporary Lifting Provisions: Remove temporary lifting eyes, channels, and brackets and temporary blocking of moving parts from enclosures and components.
- C. Install fuses in fusible devices.
- D. Comply with NECA 1.

3.3 IDENTIFICATION

- A. 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.

3.4 FIELD QUALITY CONTROL

- A. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- 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.
 - 3. Perform the following infrared scan tests and inspections and prepare reports:

- a. Initial Infrared Scanning: After Substantial Completion, but not more than 60 days after Final Acceptance, perform an infrared scan of each enclosed switch and circuit breaker. Remove front panels so joints and connections are accessible to portable scanner.
 - b. Follow-up Infrared Scanning: Perform an additional follow-up infrared scan of each enclosed switch and circuit breaker 11 months after date of Substantial Completion.
 - c. Instruments and Equipment: Use an infrared scanning device designed to measure temperature or to detect significant deviations from normal values. Provide calibration record for device.
- 4. Test and adjust controls, remote monitoring, and safeties. Replace damaged and malfunctioning controls and equipment.
- 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.

3.5 ADJUSTING

- A. Adjust moving parts and operable components to function smoothly, and lubricate as recommended by manufacturer.

END OF SECTION 262816

SECTION 265100 - INTERIOR LIGHTING

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. Interior lighting fixtures, lamps, and ballasts.
 - 2. Emergency lighting units.
 - 3. Exit signs.
 - 4. Lighting fixture supports.
- B. Related Sections:
 - 1. Division 26 Section "Lighting Control Devices" for automatic control of lighting, including time switches, photoelectric relays, occupancy sensors, and multipole lighting relays and contactors.
 - 2. Division 26 Section "Wiring Devices" for manual wall-box dimmers for incandescent lamps.

1.3 DEFINITIONS

- A. BF: Ballast factor.
- B. CCT: Correlated color temperature.
- C. CRI: Color-rendering index.
- D. HID: High-intensity discharge.
- E. LER: Luminaire efficacy rating.
- F. Lumen: Measured output of lamp and luminaire, or both.
- G. Luminaire: Complete lighting fixture, including ballast housing if provided.

1.4 ACTION SUBMITTALS

- A. Product Data: For each type of lighting fixture, arranged in order of fixture designation. Include data on features, accessories, finishes, and the following:
 - 1. Physical description of lighting fixture including dimensions.
 - 2. Emergency lighting units including battery and charger.

3. Ballast, including BF.
4. Energy-efficiency data.
5. Life, output (lumens, CCT, and CRI), and energy-efficiency data for lamps.
6. Photometric data and adjustment factors based on laboratory tests, complying with IESNA Lighting Measurements Testing & Calculation Guides, of each lighting fixture type. The adjustment factors shall be for lamps, ballasts, and accessories identical to those indicated for the lighting fixture as applied in this Project.

- a. Manufacturer Certified Data: Photometric data shall be certified by a manufacturer's laboratory with a current accreditation under the National Voluntary Laboratory Accreditation Program for Energy Efficient Lighting Products.

B. Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Wiring Diagrams: For power, signal, and control wiring.

C. Installation instructions.

1.5 INFORMATIONAL SUBMITTALS

A. Coordination Drawings: Reflected ceiling plan(s) and other details, drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Lighting fixtures.
2. Suspended ceiling components.
3. Partitions and millwork that penetrate the ceiling or extends to within 12 inches of the plane of the luminaires.
4. Ceiling-mounted projectors.
5. Structural members to which suspension systems for lighting fixtures will be attached.
6. Other items in finished ceiling including the following:
 - a. Air outlets and inlets.
 - b. Speakers.
 - c. Sprinklers.
 - d. Smoke and fire detectors.
 - e. Occupancy sensors.
 - f. Access panels.

7. Perimeter moldings.

B. Qualification Data: For qualified agencies providing photometric data for lighting fixtures.

C. Product Certificates: For each type of ballast for bi-level and dimmer-controlled fixtures, from manufacturer.

D. Warranty: Sample of special warranty.

1.6 CLOSEOUT SUBMITTALS

A. Operation and Maintenance Data: For lighting equipment and fixtures to include in emergency, operation, and maintenance manuals.

1. Provide a list of all lamp types used on Project; use ANSI and manufacturers' codes.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Lamps: 10 for every 100 of each type and rating installed. Furnish at least one of each type.
 2. Plastic Diffusers and Lenses: One for every 100 of each type and rating installed. Furnish at least one of each type.
 3. Fluorescent-fixture-mounted, emergency battery pack: One for every 20 emergency lighting unit.
 4. Ballasts: One for every 100 of each type and rating installed. Furnish at least one of each type.
 5. Globes and Guards: One for every 20 of each type and rating installed. Furnish at least one of each type.

1.8 QUALITY ASSURANCE

- A. Luminaire Photometric Data Testing Laboratory Qualifications: Provided by manufacturers' laboratories that are accredited under the National Volunteer Laboratory Accreditation Program for Energy Efficient Lighting Products.
- B. 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.
- C. Comply with NFPA 70.

1.9 COORDINATION

- A. Coordinate layout and installation of lighting fixtures and suspension system with other construction that penetrates ceilings or is supported by them, including HVAC equipment, fire-suppression system, and partition assemblies.

1.10 WARRANTY

- A. Special Warranty for Emergency Lighting Batteries: Manufacturer's standard form in which manufacturer of battery-powered emergency lighting unit agrees to repair or replace components of rechargeable batteries that fail in materials or workmanship within specified warranty period.
 1. Warranty Period for Emergency Lighting Unit Batteries: 10 years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining nine years.
 2. Warranty Period for Emergency Fluorescent Ballast and Self-Powered Exit Sign Batteries: Seven years from date of Substantial Completion. Full warranty shall apply for first year, and prorated warranty for the remaining six years.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Products: Subject to compliance with requirements, provide product indicated on Drawings.

2.2 GENERAL REQUIREMENTS FOR LIGHTING FIXTURES AND COMPONENTS

- A. Recessed Fixtures: Comply with NEMA LE 4 for ceiling compatibility for recessed fixtures.
- B. Incandescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5A.
- C. Fluorescent Fixtures: Comply with UL 1598. Where LER is specified, test according to NEMA LE 5 and NEMA LE 5A as applicable.
- D. Metal Parts: Free of burrs and sharp corners and edges.
- E. Sheet Metal Components: Steel unless otherwise indicated. Form and support to prevent warping and sagging.
- F. Doors, Frames, and Other Internal Access: Smooth operating, free of light leakage under operating conditions, and designed to permit relamping without use of tools. Designed to prevent doors, frames, lenses, diffusers, and other components from falling accidentally during relamping and when secured in operating position.
- G. Diffusers and Globes:
 - 1. Acrylic Lighting Diffusers: 100 percent virgin acrylic plastic. High resistance to yellowing and other changes due to aging, exposure to heat, and UV radiation.
 - a. Lens Thickness: At least 0.125 inch minimum unless otherwise indicated.
 - b. UV stabilized.
 - 2. Glass: Annealed crystal glass unless otherwise indicated.
- H. Factory-Applied Labels: Comply with UL 1598. Include recommended lamps and ballasts. Labels shall be located where they will be readily visible to service personnel, but not seen from normal viewing angles when lamps are in place.
 - 1. Label shall include the following lamp and ballast characteristics:
 - a. "USE ONLY" and include specific lamp type.
 - b. Lamp diameter code (T-4, T-5, T-8, T-12, etc.), tube configuration (twin, quad, triple, etc.), base type, and nominal wattage for fluorescent and compact fluorescent luminaires.
 - c. Lamp type, wattage, bulb type (ED17, BD56, etc.) and coating (clear or coated) for HID luminaires.
 - d. Start type (preheat, rapid start, instant start, etc.) for fluorescent and compact fluorescent luminaires.
 - e. ANSI ballast type (M98, M57, etc.) for HID luminaires.
 - f. CCT and CRI for all luminaires.

- I. Electromagnetic-Interference Filters: Factory installed to suppress conducted electromagnetic interference as required by MIL-STD-461E. Fabricate lighting fixtures with one filter on each ballast indicated to require a filter.

2.3 BALLASTS FOR LINEAR FLUORESCENT LAMPS

A. General Requirements for Electronic Ballasts:

- 1. Comply with UL 935 and with ANSI C82.11.
- 2. Designed for type and quantity of lamps served.
- 3. Ballasts shall be designed for full light output unless another BF, dimmer, or bi-level control is indicated.
- 4. Sound Rating: Class A.
- 5. Total Harmonic Distortion Rating: Less than 10 percent.
- 6. Transient Voltage Protection: IEEE C62.41.1 and IEEE C62.41.2, Category A or better.
- 7. Operating Frequency: 42 kHz or higher.
- 8. Lamp Current Crest Factor: 1.7 or less.
- 9. BF: 0.88 or higher.
- 10. Power Factor: 0.98 or higher.
- 11. Parallel Lamp Circuits: Multiple lamp ballasts shall comply with ANSI C82.11 and shall be connected to maintain full light output on surviving lamps if one or more lamps fail.

B. Luminaires controlled by occupancy sensors shall have programmed-start ballasts.

C. Electronic Programmed-Start Ballasts for T5 and T8 Lamps: Comply with ANSI C82.11 and the following:

- 1. Lamp end-of-life detection and shutdown circuit for T5 diameter lamps.
- 2. Automatic lamp starting after lamp replacement.

D. Ballasts for Low Electromagnetic-Interference Environments: Comply with 47 CFR 18, Ch. 1, Subpart C, for limitations on electromagnetic and radio-frequency interference for consumer equipment.

E. Ballasts for Dimmer-Controlled Lighting Fixtures: Electronic type.

- 1. Dimming Range: 100 to 10 percent of rated lamp lumens.
- 2. Ballast Input Watts: Can be reduced to 20 percent of normal.
- 3. Compatibility: Certified by manufacturer for use with specific dimming control system and lamp type indicated.
- 4. Control: Coordinate wiring from ballast to control device to ensure that the ballast, controller, and connecting wiring are compatible.

F. Ballasts for Bi-Level Controlled Lighting Fixtures: Electronic type.

- 1. Operating Modes: Ballast circuit and leads provide for remote control of the light output of the associated lamp between high- and low-level and off.
 - a. High-Level Operation: 100 percent of rated lamp lumens.
 - b. Low-Level Operation: 40 percent of rated lamp lumens. (+/- 10%)
- 2. Ballast shall provide equal current to each lamp in each operating mode.
- 3. Compatibility: Certified by manufacturer for use with specific bi-level control system and lamp type indicated.

2.4 EXIT SIGNS

- A. General Requirements for Exit Signs: Comply with UL 924; for sign colors, visibility, luminance, and lettering size, comply with authorities having jurisdiction.
- B. Internally Lighted Signs:
 - 1. Self-Powered Exit Signs (Battery Type): Integral automatic charger in a self-contained power pack.
 - a. Battery: Sealed, maintenance-free, nickel-cadmium type.
 - b. Charger: Fully automatic, solid-state type with sealed transfer relay.
 - c. Operation: Relay automatically energizes lamp from battery when circuit voltage drops to 80 percent of nominal voltage or below. When normal voltage is restored, relay disconnects lamps from battery, and battery is automatically recharged and floated on charger.
 - d. Test Push Button: Push-to-test type, in unit housing, simulates loss of normal power and demonstrates unit operability.
 - e. LED Indicator Light: Indicates normal power on. Normal glow indicates trickle charge; bright glow indicates charging at end of discharge cycle.

2.5 FLUORESCENT LAMPS

- A. T8 rapid-start lamps, rated 32 W maximum, nominal length of 48 inches, 2800 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life 20,000 hours unless otherwise indicated.
- B. T8 rapid-start lamps, rated 17 W maximum, nominal length of 24 inches, 1300 initial lumens (minimum), CRI 75 (minimum), color temperature 3500 K, and average rated life of 20,000 hours unless otherwise indicated.

2.6 LIGHTING FIXTURE SUPPORT COMPONENTS

- A. Comply with Division 26 Section "Hangers and Supports for Electrical Systems" for channel- and angle-iron supports and nonmetallic channel and angle supports.
- B. Single-Stem Hangers: 1/2-inch steel tubing with swivel ball fittings and ceiling canopy. Finish same as fixture.
- C. Twin-Stem Hangers: Two, 1/2-inch steel tubes with single canopy designed to mount a single fixture. Finish same as fixture.
- D. Wires: ASTM A 641/A 641M, Class 3, soft temper, zinc-coated steel, 12 gage.
- E. Wires for Humid Spaces: ASTM A 580/A 580M, Composition 302 or 304, annealed stainless steel, 12 gage.
- F. Rod Hangers: 3/16-inch minimum diameter, cadmium-plated, threaded steel rod.
- G. Hook Hangers: Integrated assembly matched to fixture and line voltage and equipped with threaded attachment, cord, and locking-type plug.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Lighting fixtures:

1. Set level, plumb, and square with ceilings and walls unless otherwise indicated.
2. Install lamps in each luminaire.

B. Temporary Lighting: If it is necessary, and approved by Architect, to use permanent luminaires for temporary lighting, install and energize the minimum number of luminaires necessary. When construction is sufficiently complete, remove the temporary luminaires, disassemble, clean thoroughly, install new lamps, and reinstall.

C. Lay-in Ceiling Lighting Fixtures Supports: Use grid as a support element.

1. Install four ceiling support system rods or wires, independent of the ceiling suspension devices, for each 2' x 4' and 2' x 2' 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 one independent support rod or wire 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.
4. Do not use grid as support for pendant luminaires. Connect support wires or rods to building structure.

E. Connect wiring according to Division 26 Section "Low-Voltage Electrical Power Conductors and Cables."

3.2 IDENTIFICATION

A. Install labels with panel and circuit numbers on concealed junction and outlet boxes. Comply with requirements for identification specified in Division 26 Section "Identification for Electrical Systems."

3.3 FIELD QUALITY CONTROL

A. Test for Emergency Lighting: Interrupt power supply to demonstrate proper operation. Verify transfer from normal power to battery and retransfer to normal.

- B. 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.

3.4 STARTUP SERVICE

- A. Burn-in all lamps that require specific aging period to operate properly, prior to occupancy by Owner. Burn-in fluorescent and compact fluorescent lamps intended to be dimmed, for at least 100 hours at full voltage.

3.5 ADJUSTING

- A. Occupancy Adjustments: When requested within 2 months of date of Substantial Completion, provide on-site assistance in adjusting aimable luminaires to suit actual occupied conditions. Provide up to two visits to Project during other-than-normal occupancy hours for this purpose. Some of this work may be required after dark.

- 1. Adjust aimable luminaires in the presence of Architect.

END OF SECTION 265100

SECTION 283111 - DIGITAL, ADDRESSABLE FIRE-ALARM SYSTEM

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

- A. Section Includes:
 - 1. Fire-alarm control unit.
 - 2. Manual fire-alarm boxes.
 - 3. System smoke detectors.
 - 4. Heat detectors.
 - 5. Notification appliances.
 - 6. Magnetic door holders.
 - 7. Remote annunciator.
 - 8. Addressable interface device.
 - 9. Digital alarm communicator transmitter.

1.3 DEFINITIONS

- A. LED: Light-emitting diode.
- B. NICET: National Institute for Certification in Engineering Technologies.

1.4 SYSTEM DESCRIPTION

- A. Existing noncoded, UL-certified addressable system, with multiplexed signal transmission, dedicated to fire-alarm service only, to be expanded to cover tenant fit out area or second floor.

1.5 ACTION SUBMITTALS

- A. Product Data: For each type of product indicated.
- B. 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 voice/alarm signaling-service equipment rack or console layout, grounding schematic, amplifier power calculation, and single-line connection diagram.
7. Include floor plans to indicate final outlet locations showing address of each addressable device. Show size and route of cable and conduits.

C. General Submittal Requirements:

1. Submittals shall be approved by authorities having jurisdiction prior to submitting them to Architect.
2. Shop Drawings shall be prepared by persons with the following qualifications:
 - a. Trained and certified by manufacturer in fire-alarm system design.
 - b. NICET-certified fire-alarm technician, Level III minimum.
 - c. Licensed or certified by authorities having jurisdiction.

D. Qualification Data: For qualified Installer.

E. Field quality-control reports.

1.6 CLOSEOUT SUBMITTALS

A. 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," deliver copies to authorities having jurisdiction and include the following:

1. Comply with the "Records" Section of the "Inspection, Testing and Maintenance" Chapter in NFPA 72.
2. Provide "Record of Completion Documents" according to NFPA 72 article "Permanent Records" in the "Records" Section of the "Inspection, Testing and Maintenance" Chapter.
3. Record copy of site-specific software.
4. Provide "Maintenance, Inspection and Testing Records" according to NFPA 72 article of the same name and include the following:
 - a. Frequency of testing of installed components.
 - b. Frequency of inspection of installed components.
 - c. Requirements and recommendations related to results of maintenance.
 - d. Manufacturer's user training manuals.
5. Manufacturer's required maintenance related to system warranty requirements.
6. Abbreviated operating instructions for mounting at fire-alarm control unit.

B. Software and Firmware Operational Documentation:

1. Software operating and upgrade manuals.

2. Program Software Backup: On magnetic media or compact disk, complete with data files.
3. Device address list.
4. Printout of software application and graphic screens.

1.7 MAINTENANCE MATERIAL SUBMITTALS

- A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
 1. Lamps for Remote Indicating Lamp Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
 2. Lamps for Strobe Units: Quantity equal to 10 percent of amount installed, but no fewer than 1 unit.
 3. Smoke Detectors, Fire Detectors: Quantity equal to 10 percent of amount of each type installed, but no fewer than 1 unit of each type.
 4. Detector Bases: Quantity equal to 2 percent of amount of each type installed, but no fewer than 1 unit of each type.
 5. Keys and Tools: One extra set for access to locked and tamperproofed components.
 6. Audible and Visual Notification Appliances: One of each type installed.
 7. Fuses: Two of each type installed in the system.

1.8 QUALITY ASSURANCE

- A. Installer Qualifications: Personnel shall be trained and certified by manufacturer for installation of units required for this Project.
- B. Installer Qualifications: Installation shall be by personnel certified by NICET as fire-alarm Level II technician and licensed in the State of Florida.
- C. Source Limitations for Fire-Alarm System and Components: Obtain fire-alarm system from single source from single manufacturer. Components shall be compatible with, and operate as, an extension of existing system.
- D. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- E. NFPA Certification: Obtain certification according to NFPA 72 by a UL-listed alarm company.

1.9 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.

1. Provide 30 days' notice to Owner to allow scheduling and access to system and to allow Owner to upgrade computer equipment if necessary.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers: Match existing system.

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. Duct smoke detectors.
 5. Verified automatic alarm operation of smoke detectors.
 6. Automatic sprinkler system water flow.
 7. Heat detectors in elevator shaft and pit.
 8. Fire standpipe system.
- B. Fire-alarm signal shall initiate the following actions:
 1. Continuously operate alarm notification appliances.
 2. Identify alarm at fire-alarm control unit and remote annunciators.
 3. Transmit an alarm signal to the remote alarm receiving station.
 4. Unlock electric door locks in designated egress paths.
 5. Release fire and smoke doors held open by magnetic door holders.
 6. Activate voice/alarm communication system.
 7. Switch heating, ventilating, and air-conditioning equipment controls to fire-alarm mode.
 8. Activate smoke-control system (smoke management) at firefighter smoke-control system panel.
 9. Activate stairwell and elevator-shaft pressurization systems.
 10. Close smoke dampers in air ducts of designated air-conditioning duct systems.
 11. Recall elevators to primary or alternate recall floors.
 12. Record events in the system memory.
- C. Supervisory signal initiation shall be by one or more of the following devices and actions:
 1. Valve supervisory switch.
 2. Elevator shunt-trip supervision.
- D. System trouble signal initiation shall be by one or more of the following devices and actions:
 1. Open circuits, shorts, and grounds in designated circuits.
 2. Opening, tampering with, or removing alarm-initiating and supervisory 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.
- E. System Trouble and Supervisory Signal Actions: Initiate notification appliance and annunciate at fire-alarm control unit and remote annunciators.

2.3 SYSTEM CHARACTERISTICS

A. Circuits:

1. Initiating Device, Notification Appliance, and Signaling Line Circuits: NFPA 72, Class A.
 - a. Initiating Device Circuits: Style E.
 - b. Notification Appliance Circuits: Style Z.
 - c. Signaling Line Circuits: Style 6.
 - d. Install no more than 50 addressable devices on each signaling line circuit.
2. Serial Interfaces: Two RS-232 or USB ports for printers.

B. Smoke-Alarm Verification:

1. Initiate audible and visible indication of an "alarm-verification" signal at fire-alarm control unit.
2. Activate an NRTL-listed and -approved "alarm-verification" sequence at fire-alarm control unit and detector.
3. Sound general alarm if the alarm is verified.
4. Cancel fire-alarm control unit indication and system reset if the alarm is not verified.

C. Elevator Recall:

1. Smoke detectors at the following locations shall initiate automatic elevator recall.
 - a. Elevator lobby detectors except the lobby detector on the designated floor.
 - b. Smoke detector in elevator machine room.
 - c. Smoke detectors in elevator hoistway.
2. Elevator lobby detectors located on the designated recall floors shall be programmed to move the cars to the alternate recall floor.
3. Water-flow alarm connected to sprinkler in an elevator shaft and elevator machine room shall shut down elevators associated with the location without time delay.
 - a. Water-flow switch associated with the sprinkler in the elevator pit may have a delay to allow elevators to move to the designated floor.

D. Door Controls: Door hold-open devices that are controlled by smoke detectors at doors in smoke barrier walls shall be connected to fire-alarm system.

E. Transmission to Remote Alarm Receiving Station: Automatically transmit alarm, supervisory, and trouble signals to a remote alarm station.

F. Log of Events: On receipt of signal, log alarm, supervisory, and trouble events. Identify zone, device, and function. Include type of signal (alarm, supervisory, or trouble) and date and time of occurrence. Differentiate alarm signals from all other logged indications. Also log system reset event, including same information for device, location, date, and time.

- G. Primary Power: 24-V dc obtained from 120-V ac service and a power-supply module. Initiating devices, notification appliances, signaling lines, trouble signals, supervisory and digital alarm communicator transmitters shall be powered by 24-V dc source.
 - 1. Alarm current draw of entire fire-alarm system shall not exceed 80 percent of the power-supply module rating.
- H. Secondary Power: 24-V dc supply system with batteries, automatic battery charger, and automatic transfer switch.
 - 1. Batteries: Sealed lead calcium, as required to existing system.
- I. Instructions: Computer printout or typewritten instruction card mounted behind a plastic or glass cover in a stainless-steel or aluminum frame. Include interpretation and describe appropriate response for displays and signals. Briefly describe the functional operation of the system under normal, alarm, and trouble conditions.

2.4 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. Weatherproof Protective Shield: Factory-fabricated clear plastic enclosure hinged at the top to permit lifting for access to initiate an alarm.

2.5 SYSTEM SMOKE DETECTORS

- A. General Requirements for System Smoke Detectors:
 - 1. Comply with UL 268; operating at 24-V dc, nominal.
 - 2. Detectors shall be two-wire type, four where required for auxiliary operations.
 - 3. Integral Addressable Module: Arranged to communicate detector status (normal, alarm, or trouble) to fire-alarm control unit.
 - 4. 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.
 - 5. Self-Restoring: Detectors do not require resetting or readjustment after actuation to restore them to normal operation.
 - 6. Integral Visual-Indicating Light: LED type indicating detector has operated and power-on status.
- B. Photoelectric Smoke Detectors:
 - 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
 - 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:

- a. Primary status.
- b. Device type.
- c. Present average value.
- d. Present sensitivity selected.
- e. Sensor range (normal, dirty, etc.).

C. Duct Smoke Detectors: Photoelectric type complying with UL 268A.

- 1. Detector address shall be accessible from fire-alarm control unit and shall be able to identify the detector's location within the system and its sensitivity setting.
- 2. An operator at fire-alarm control unit, having the designated access level, shall be able to manually access the following for each detector:
 - a. Primary status.
 - b. Device type.
 - c. Present average value.
 - d. Present sensitivity selected.
 - e. Sensor range (normal, dirty, etc.).
- 3. Weatherproof Duct Housing Enclosure: NEMA 250, Type 4X; NRTL listed for use with the supplied detector.
- 4. Each sensor shall have multiple levels of detection sensitivity.
- 5. Sampling Tubes: Design and dimensions as recommended by manufacturer for specific duct size, air velocity, and installation conditions where applied.
- 6. Relay Fan Shutdown: Rated to interrupt fan motor-control circuit.

2.6 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.

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.
- 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. 75 cd except where noted otherwise.
- 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.
- B. Material and Finish: Match door hardware.

2.9 REMOTE ANNUNCIATOR

- A. Description: Annunciator functions shall match those of fire-alarm control unit for alarm, supervisory, and trouble indications. Manual switching functions shall match those of fire-alarm control unit, including acknowledging, silencing, resetting, and testing.
 - 1. Mounting: Flush cabinet, NEMA 250, Type 1.
- B. Display Type and Functional Performance: Alphanumeric display and LED indicating lights shall match those of fire-alarm control unit. Provide controls to acknowledge, silence, reset, and test functions for alarm, supervisory, and trouble signals.

2.10 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. Smoke- or Heat-Detector Spacing:
 - 1. Comply with NFPA 72, "Smoke-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for smoke-detector spacing.
 - 2. Comply with NFPA 72, "Heat-Sensing Fire Detectors" Section in the "Initiating Devices" Chapter, for heat-detector spacing.
 - 3. Smooth ceiling spacing shall not exceed 30 feet.
 - 4. Spacing of detectors for irregular areas, for irregular ceiling construction, and for high ceiling areas shall be determined according to Appendix A or Appendix B in NFPA 72.
 - 5. 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.
- C. Duct Smoke Detectors: Comply with NFPA 72 and NFPA 90A. Install sampling tubes so they extend the full width of duct.
- D. Heat Detectors in Elevator Shafts: Coordinate temperature rating and location with sprinkler rating and location.
- E. 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.
- F. 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.
- G. Visible Alarm-Indicating Devices: Install adjacent to each alarm bell or alarm horn and at least 6 inches below the ceiling.
- H. Device Location-Indicating Lights: Locate in public space near the device they monitor.
- I. Annunciator: Install with top of panel not more than 72 inches above the finished floor.
- J. All wiring shall be in conduit, ½ inch minimum.

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. Smoke dampers in air ducts of designated air-conditioning duct systems.
 - 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. Perform tests and inspections.
 - 1. Manufacturer's Field Service: Engage a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.
- C. 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.
 - 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.
- D. Reacceptance Testing: Perform reacceptance testing to verify the proper operation of added or replaced devices and appliances.
- E. Fire-alarm system will be considered defective if it does not pass tests and inspections.
- F. Prepare test and inspection reports, include with O&M Manual.
- G. Maintenance Test and Inspection: Perform tests and inspections listed for weekly, monthly, quarterly, and semiannual periods. Use forms developed for initial tests and inspections.
- H. Annual Test and Inspection: One year after date of Substantial Completion, test fire-alarm system complying with visual and testing inspection requirements in NFPA 72. Use forms developed for initial tests and inspections.

3.6 DEMONSTRATION

- A. Train Owner's maintenance personnel to adjust, operate, and maintain fire-alarm system.

END OF SECTION 283111