INVITATION FOR BIDS
DODD MEADOWS COMMUNITY CENTER
Henderson County
Hendersonville, North Carolina

Sealed bids will be received by Henderson County in the King Street Meeting Room, 100 N. King Street, Hendersonville, NC 28792 until **1:00 pm Thursday, April 2, 2015**. Submitted bids will then be opened and read publicly at the after mentioned date and time for the furnishing of labor, materials and equipment for the construction of:

**Dodd Meadows Community Center – Partially funded by the NC Department of Commerce 2011 CDBG N.C. Catalyst Grant for Habitat for Humanity.**

Mailed proposals shall be sent to the following address: Mr. Joel Helms, Clark Nexsen, Inc., 1 West Pack Square, Suite 1501, Asheville, NC 28801. All proposals shall be lump sum single prime contract.

Complete plans, specifications and contract documents for this project will be open for inspection in the office of Clark Nexsen, Inc., 1 West Pack Square Suite 1501, Asheville, NC, 828-232-0608; and in the plan rooms of Carolinas Associated General Contractors; McGraw-Hill Dodge Corporation; and Minority Plan Rooms in: Hispanic contractors Association of the Carolinas (HCAC) in Winston-Salem, Charlotte and Raleigh areas 877-277-1680.

Contractors offering a bid on this project must be licensed to do contracting in the State of North Carolina in accordance with North Carolina General Statutes. Henderson County reserves the right to reject any or all bids for all proposals.

Henderson County encourages small, female minority and local Contractors to bid on this project. Henderson County also promotes Fair Housing, is an Equal Opportunity Employer and encourages others to provide equal employment opportunities. Henderson County does not discriminate on the basis of handicap status.

All facilities are handicapped accessible. All interested persons are invited to attend. Persons needing special assistance or non-English speaking persons desiring to participate should contact Karen Kiehna at (828) 251-6622 ext 137 at least 5 days prior to the bid opening. This information is available in Spanish or any other language upon request.

DODD MEADOWS COMMUNITY CENTER
CREST ROAD & EAST BLUE RIDGE ROAD
EAST FLAT ROCK, NC, 28726

CLARK NEXSEN, INC.
One West Pack Square, Suite 1501
Asheville, NC 28801

KLOESEL ENGINEERING, P.A.
8 Magnolia Avenue, Suite 100
Asheville, NC 28801

ESSENTIAL SYSTEMS ENGINEERING, PA
109 Central Avenue
Asheville, NC 28801

March 9, 2015
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Sealed proposals will be received by the Henderson County Habitat for Humanity in Hendersonville, NC, in the King Street Meeting Room, 100 North King Street, Hendersonville, NC 28792, up to 1:00 pm, on April 2, 2015, and immediately thereafter publicly opened and read for the furnishing of labor, material and equipment entering into the construction of the Dodd Meadows Community Center. Mailed proposals shall be sent to the following address: Mr. Joel Helms, Clark Nexsen, Inc., 1 West Pack Square, Suite 1501, Asheville, NC 28801. All proposals shall be lump sum single prime contract.

Complete plans, specifications and contract documents for this project will be open for inspection in the office of Clark Nexsen, Inc., 1 West Pack Square Suite 1501, Asheville, NC. Phone: 828-232-0608; and in the plan rooms of Carolinas Associated General Contractors; McGraw-Hill Dodge Corporation; and in Minority Plan Rooms in: Hispanic Contractors Association of the Carolinas (HCAC) in Winston-Salem, Charlotte and Raleigh areas – 877-227-1680

Plan Deposit: One Hundred dollars ($100.00) Per set. Plans may be obtained by contacting Clark Nexsen, Inc. Tel. (828) 232-0608, Fax. (828) 232-1606. 1West Pack Square Suite 1501, Asheville, NC 28801.

The Owner reserves the right to reject any and all proposals.

Signed: Mr. Ron Laughter
        Executive Director
        Henderson County Habitat for Humanity
NOTICE TO BIDDERS

Sealed proposals will be received from pre-qualified SINGLE PRIME CONTACTORS by the Henderson County Habitat for Humanity, on April 2, 2015 up to 1:00 pm, in the King Street Meeting Room, 100 North King Street, Hendersonville, NC, 28792. Proposals sent by mail or courier service should be sent to the attention of Mr. Joel Helms, Clark Nexsen, Inc. at 1 West Pack Square Suite 1501 Asheville, NC 28801. Contractors are responsible for delivery of the bid by the time noted above.

Complete plans, specifications and contract documents for this project will be open for inspection in the office of Clark Nexsen, Inc., 1 West Pack Square Suite 1501, Asheville, NC during normal office hours, or may be obtained by those qualified as prime bidders, upon deposit of One Hundred dollars ($100) in cash or certified check. The full plan deposit will be returned to those bidders provided all documents are returned in good, usable condition within ten (10) days after the bid date.

All contractors are hereby notified that they must have proper license as required under the state laws governing their respective trades.

Plan Deposit: One Hundred Dollars ($100.00). Plans may be obtained by contacting Clark Nexsen Inc., Tel. (828)-232-0608, Fax. (828)232-1606. One West Pack Square Suite 1501, Asheville, NC 28801.

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

General contractors are notified that Chapter 87, Article 1, General Statutes of North Carolina, will be observed in receiving and awarding general contracts. General contractors submitting bids on this project must have license classification for Building Contractor required by the NC General Contractors Licensing Board under G.S. 87-1.

NOTE: Under GS 87-1, a contractor that superintends or manages construction of any building, highway, public utility, grading, structure or improvement shall be deemed a “general contractor” and shall be so licensed. Therefor a single prime project that involves other trades will require the single prime contractor to hold a proper General Contractors license.

EXCEPT: On public buildings being bid single prime, where the total value of the general construction does not exceed 25% of the total construction value, contractors under GS87- Arts 2 and 4 (Plumbing, Mechanical & Electrical) may bid and contract directly with the Owner as a single prime. G887-1.1

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

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

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

No bid may be withdrawn after the scheduled closing time for the receipt of bids for a period of 30 days.
The owner reserves the right to reject any or all bids and to waive informalities.

Designer:      Owner:
Clark Nexsen, Inc.     Henderson County Habitat for Humanity
1 West Pack Square, Suite 1501
Asheville, NC 28801
828-232-0608
Instructions to Bidders

for the following PROJECT:
(Name and location or address)
Dodd Meadows Community Center
Crest Road & East Blue Ridge Road
East Flat Rock, NC, 28726

THE OWNER:
(Name, legal status and address)
Henderson County Habitat for Humanity

THE ARCHITECT:
(Name, legal status and address)
Clark Nexsen, Inc.
1 West Pack Square, Suite 1501
Asheville, NC 28801

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ADDITIONS AND DELETIONS:
The author of this document has added information needed for its completion. The author may also have revised the text of the original AIA standard form. An Additions and Deletions Report that notes added information as well as revisions to the standard form text is available from the author and should be reviewed.

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

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ARTICLE 1  DEFINITIONS
§ 1.1 Bidding Documents include the Bidding Requirements and the proposed Contract Documents. The Bidding Requirements consist of the Advertisement or Invitation to Bid, Instructions to Bidders, Supplementary Instructions to Bidders, the bid form, and other sample bidding and contract forms. The proposed Contract Documents consist of the form of Agreement between the Owner and Contractor, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications and all Addenda issued prior to execution of the Contract.

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

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

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

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

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

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

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

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

ARTICLE 2  BIDDER'S REPRESENTATIONS
§ 2.1 The Bidder by making a Bid represents that:
§ 2.1.1 The Bidder has read and understands the Bidding Documents or Contract Documents, to the extent that such documentation relates to the Work for which the Bid is submitted, and for other portions of the Project, if any, being bid concurrently or presently under construction.

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

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

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

ARTICLE 3  BIDDING DOCUMENTS
§ 3.1 COPIES
§ 3.1.1 Bidders may obtain complete sets of the Bidding Documents from the issuing office designated in the Advertisement or Invitation to Bid in the number and for the deposit sum, if any, stated therein. The deposit will be refunded to Bidders who submit a bona fide Bid and return the Bidding Documents in good condition within ten days after receipt of Bids. The cost of replacement of missing or damaged documents will be deducted from the deposit. A Bidder receiving a Contract award may retain the Bidding Documents and the Bidder’s deposit will be refunded.
§ 3.1.2 Bidding Documents will not be issued directly to Sub-bidders unless specifically offered in the Advertisement or Invitation to Bid, or in supplementary instructions to bidders.

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

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

§ 3.2 INTERPRETATION OR CORRECTION OF BIDDING DOCUMENTS

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

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

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

§ 3.3 SUBSTITUTIONS

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

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

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

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

§ 3.4 ADDENDA

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

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

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

§ 3.4.4 Each Bidder shall ascertain prior to submitting a Bid that the Bidder has received all Addenda issued, and the Bidder shall acknowledge their receipt in the Bid.
ARTICLE 4  BIDDING PROCEDURES
§ 4.1 PREPARATION OF BIDS
§ 4.1.1 Bids shall be submitted on the forms included with the Bidding Documents.

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

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

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

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

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

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

§ 4.2 BID SECURITY
§ 4.2.1 Each Bid shall be accompanied by a bid security in the form and amount required if so stipulated in the Instructions to Bidders. The Bidder pledges to enter into a Contract with the Owner on the terms stated in the Bid and will, if required, furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Should the Bidder refuse to enter into such Contract or fail to furnish such bonds if required, the amount of the bid security shall be forfeited to the Owner as liquidated damages, not as a penalty. The amount of the bid security shall not be forfeited to the Owner in the event the Owner fails to comply with Section 6.2.

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

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

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

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

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

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

§ 4.4 MODIFICATION OR WITHDRAWAL OF BID
§ 4.4.1 A Bid may not be modified, withdrawn or canceled by the Bidder during the stipulated time period following the time and date designated for the receipt of Bids, and each Bidder so agrees in submitting a Bid.
§ 4.4.2 Prior to the time and date designated for receipt of Bids, a Bid submitted may be modified or withdrawn by notice to the party receiving Bids at the place designated for receipt of Bids. Such notice shall be in writing over the signature of the Bidder. Written confirmation over the signature of the Bidder shall be received, and date- and time-stamped by the receiving party on or before the date and time set for receipt of Bids. A change shall be so worded as not to reveal the amount of the original Bid.

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

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

ARTICLE 5 CONSIDERATION OF BIDS
§ 5.1 OPENING OF BIDS
At the discretion of the Owner, if stipulated in the Advertisement or Invitation to Bid, the properly identified Bids received on time will be publicly opened and will be read aloud. An abstract of the Bids may be made available to Bidders.

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

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

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

ARTICLE 6 POST-BID INFORMATION
§ 6.1 CONTRACTOR'S QUALIFICATION STATEMENT
Bidders to whom award of a Contract is under consideration shall submit to the Architect, upon request, a properly executed AIA Document A305, Contractor's Qualification Statement, unless such a Statement has been previously required and submitted as a prerequisite to the issuance of Bidding Documents.

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

§ 6.3 SUBMITTALS
§ 6.3.1 The Bidder shall, as soon as practicable or as stipulated in the Bidding Documents, after notification of selection for the award of a Contract, furnish to the Owner through the Architect in writing:

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

§ 6.3.2 The Bidder will be required to establish to the satisfaction of the Architect and Owner the reliability and responsibility of the persons or entities proposed to furnish and perform the Work described in the Bidding Documents.
§ 6.3.3 Prior to the execution of the Contract, the Architect will notify the Bidder in writing if either the Owner or Architect, after due investigation, has reasonable objection to a person or entity proposed by the Bidder. If the Owner or Architect has reasonable objection to a proposed person or entity, the Bidder may, at the Bidder's option, (1) withdraw the Bid or (2) submit an acceptable substitute person or entity with an adjustment in the Base Bid or Alternate Bid to cover the difference in cost occasioned by such substitution. The Owner may accept the adjusted bid price or disqualify the Bidder. In the event of either withdrawal or disqualification, bid security will not be forfeited.

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

ARTICLE 7 PERFORMANCE BOND AND PAYMENT BOND
§ 7.1 BOND REQUIREMENTS
§ 7.1.1 If stipulated in the Bidding Documents, the Bidder shall furnish bonds covering the faithful performance of the Contract and payment of all obligations arising thereunder. Bonds may be secured through the Bidder's usual sources.

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

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

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

§ 7.2.2 Unless otherwise provided, the bonds shall be written on AIA Document A312, Performance Bond and Payment Bond. Both bonds shall be written in the amount of the Contract Sum.

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

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

ARTICLE 8 FORM OF AGREEMENT BETWEEN OWNER AND CONTRACTOR
Unless otherwise required in the Bidding Documents, the Agreement for the Work will be written on AIA Document A101, Standard Form of Agreement Between Owner and Contractor Where the Basis of Payment Is a Stipulated Sum.
for the following PROJECT:
(Name and location or address)
Dodd Meadows Community Center
Crest Road & East Blue Ridge Road
East Flat Rock, NC, 28726

THE OWNER:
(Name, legal status and address)
Henderson County Habitat for Humanity

THE ARCHITECT:
(Name, legal status and address)
Clark Nexsen, Inc.
1 West Pack Square, Suite 1501
Asheville, NC 28801

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ARTICLE 1  GENERAL PROVISIONS
§ 1.1 BASIC DEFINITIONS

§ 1.1.1 THE CONTRACT DOCUMENTS
The Contract Documents are enumerated in the Agreement between the Owner and Contractor (hereinafter the Agreement) and consist of the Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of the Contract, other documents listed in the Agreement and Modifications issued after execution of the Contract. A Modification is (1) a written amendment to the Contract signed by both parties, (2) a Change Order, (3) a Construction Change Directive or (4) a written order for a minor change in the Work issued by the Architect. Unless specifically enumerated in the Agreement, the Contract Documents do not include the advertisement or invitation to bid, Instructions to Bidders, sample forms, other information furnished by the Owner in anticipation of receiving bids or proposals, the Contractor’s bid or proposal, or portions of Addenda relating to bidding requirements.

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

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

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

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

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

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

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

§ 1.2 CORRELATION AND INTENT OF THE CONTRACT DOCUMENTS
§ 1.2.1 The intent of the Contract Documents is to include all items necessary for the proper execution and completion of the Work by the Contractor. The Contract Documents are complementary, and what is required by one shall be as binding as if required by all; performance by the Contractor shall be required only to the extent consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.
§ 1.2.2 Organization of the Specifications into divisions, sections and articles, and arrangement of Drawings shall not control the Contractor in dividing the Work among Subcontractors or in establishing the extent of Work to be performed by any trade.

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

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

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

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

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

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

ARTICLE 2   OWNER
§ 2.1 GENERAL
§ 2.1.1 The Owner is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Owner shall designate in writing a representative who shall have express authority to bind the Owner with respect to all matters requiring the Owner’s approval or authorization. Except as otherwise provided in Section 4.2.1, the Architect does not have such authority. The term “Owner” means the Owner or the Owner’s authorized representative.

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

§ 2.2 INFORMATION AND SERVICES REQUIRED OF THE OWNER
§ 2.2.1 Prior to commencement of the Work, the Contractor may request in writing that the Owner provide reasonable evidence that the Owner has made financial arrangements to fulfill the Owner’s obligations under the Contract. Thereafter, the Contractor may only request such evidence if (1) the Owner fails to make payments to the Contractor as the Contract Documents require; (2) a change in the Work materially changes the Contract Sum; or (3) the Contractor identifies in writing a reasonable concern regarding the Owner’s ability to make payment when due. The Owner shall furnish such evidence as a condition precedent to commencement or continuation of the Work or
the portion of the Work affected by a material change. After the Owner furnishes the evidence, the Owner shall not materially vary such financial arrangements without prior notice to the Contractor.

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

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

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

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

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

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

ARTICLE 3 CONTRACTOR
§ 3.1 GENERAL
§ 3.1.1 The Contractor is the person or entity identified as such in the Agreement and is referred to throughout the Contract Documents as if singular in number. The Contractor shall be lawfully licensed, if required in the jurisdiction where the Project is located. The Contractor shall designate in writing a representative who shall have express authority to bind the Contractor with respect to all matters under this Contract. The term “Contractor” means the Contractor or the Contractor’s authorized representative.

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

§ 3.1.3 The Contractor shall not be relieved of obligations to perform the Work in accordance with the Contract Documents either by activities or duties of the Architect in the Architect’s administration of the Contract, or by tests, inspections or approvals required or performed by persons or entities other than the Contractor.
§ 3.2 REVIEW OF CONTRACT DOCUMENTS AND FIELD CONDITIONS BY CONTRACTOR

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

§ 3.2.2 Because the Contract Documents are complementary, the Contractor shall, before starting each portion of the Work, carefully study and compare the various Contract Documents relative to that portion of the Work, as well as the information furnished by the Owner pursuant to Section 2.2.2, shall take field measurements of any existing conditions related to that portion of the Work, and shall observe any conditions at the site affecting it. These obligations are for the purpose of facilitating coordination and construction by the Contractor and are not for the purpose of discovering errors, omissions, or inconsistencies in the Contract Documents; however, the Contractor shall promptly report to the Architect any errors, inconsistencies or omissions discovered by or made known to the Contractor as a request for information in such form as the Architect may require. It is recognized that the Contractor’s review is made in the Contractor’s capacity as a contractor and not as a licensed design professional, unless otherwise specifically provided in the Contract Documents.

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

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

§ 3.3 SUPERVISION AND CONSTRUCTION PROCEDURES

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

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

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

§ 3.4 LABOR AND MATERIALS

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

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

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

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

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

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

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

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

§ 3.7.4 Concealed or Unknown Conditions. If the Contractor encounters conditions at the site that are (1) subsurface or otherwise concealed physical conditions that differ materially from those indicated in the Contract Documents or (2) unknown physical conditions of an unusual nature, that differ materially from those ordinarily found to exist and generally recognized as inherent in construction activities of the character provided for in the Contract Documents, the Contractor shall promptly provide notice to the Owner and the Architect before conditions are disturbed and in no event later than 21 days after first observance of the conditions. The Architect will promptly investigate such conditions and, if the Architect determines that they differ materially and cause an increase or decrease in the Contractor’s cost of, or time required for, performance of any part of the Work, will recommend an equitable adjustment in the Contract Sum or Contract Time, or both. If the Architect determines that the conditions at the site are not materially different from those indicated in the Contract Documents and that no change in the terms of the Contract is justified, the Architect shall promptly notify the Owner and Contractor in writing, stating the reasons. If either party disputes the Architect’s determination or recommendation, that party may proceed as provided in Article 15.

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

§ 3.8 ALLOWANCES

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

§ 3.8.2 Unless otherwise provided in the Contract Documents,

.1 Allowances shall cover the cost to the Contractor of materials and equipment delivered at the site and all required taxes, less applicable trade discounts;

.2 Contractor’s costs for unloading and handling at the site, labor, installation costs, overhead, profit and other expenses contemplated for stated allowance amounts shall be included in the Contract Sum but not in the allowances; and

.3 Whenever costs are more than or less than allowances, the Contract Sum shall be adjusted accordingly by Change Order. The amount of the Change Order shall reflect (1) the difference between actual costs and the allowances under Section 3.8.2.1 and (2) changes in Contractor’s costs under Section 3.8.2.2.

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

§ 3.9 SUPERINTENDENT

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

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

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

§ 3.10 CONTRACTOR’S CONSTRUCTION SCHEDULES

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

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

§ 3.10.3 The Contractor shall perform the Work in general accordance with the most recent schedules submitted to the Owner and Architect.
§ 3.11 DOCUMENTS AND SAMPLES AT THE SITE
The Contractor shall maintain at the site for the Owner one copy of the Drawings, Specifications, Addenda, Change Orders and other Modifications, in good order and marked currently to indicate field changes and selections made during construction, and one copy of approved Shop Drawings, Product Data, Samples and similar required submittals. These shall be available to the Architect and shall be delivered to the Architect for submittal to the Owner upon completion of the Work as a record of the Work as constructed.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 3.16 ACCESS TO WORK
The Contractor shall provide the Owner and Architect access to the Work in preparation and progress wherever
located.

§ 3.17 ROYALTIES, PATENTS AND COPYRIGHTS
The Contractor shall pay all royalties and license fees. The Contractor shall defend suits or claims for infringement
of copyrights and patent rights and shall hold the Owner and Architect harmless from loss on account thereof, but
shall not be responsible for such defense or loss when a particular design, process or product of a particular
manufacturer or manufacturers is required by the Contract Documents, or where the copyright violations are
contained in Drawings, Specifications or other documents prepared by the Owner or Architect. However, if the
Contractor has reason to believe that the required design, process or product is an infringement of a copyright or a
patent, the Contractor shall be responsible for such loss unless such information is promptly furnished to the
Architect.
§ 3.18 INDEMNIFICATION
§ 3.18.1 To the fullest extent permitted by law the Contractor shall indemnify and hold harmless the Owner, Architect, Architect’s consultants, and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys’ fees, arising out of or resulting from performance of the Work, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), but only to the extent caused by the negligent acts or omissions of the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of whether or not such claim, damage, loss or expense is caused in part by a party indemnified hereunder. Such obligation shall not be construed to negate, abridge, or reduce other rights or obligations of indemnity that would otherwise exist as to a party or person described in this Section 3.18.

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

ARTICLE 4 ARCHITECT
§ 4.1 GENERAL
§ 4.1.1 The Owner shall retain an architect lawfully licensed to practice architecture or an entity lawfully practicing architecture in the jurisdiction where the Project is located. That person or entity is identified as the Architect in the Agreement and is referred to throughout the Contract Documents as if singular in number.

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

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

§ 4.2 ADMINISTRATION OF THE CONTRACT
§ 4.2.1 The Architect will provide administration of the Contract as described in the Contract Documents and will be an Owner’s representative during construction until the date the Architect issues the final Certificate for Payment. The Architect will have authority to act on behalf of the Owner only to the extent provided in the Contract Documents.

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

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

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

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

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

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

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

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

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

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

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

§ 4.2.13 The Architect’s decisions on matters relating to aesthetic effect will be final if consistent with the intent expressed in the Contract Documents.
§ 4.2.14 The Architect will review and respond to requests for information about the Contract Documents. The Architect’s response to such requests will be made in writing within any time limits agreed upon or otherwise with reasonable promptness. If appropriate, the Architect will prepare and issue supplemental Drawings and Specifications in response to the requests for information.

ARTICLE 5 SUBCONTRACTORS
§ 5.1 DEFINITIONS
§ 5.1.1 A Subcontractor is a person or entity who has a direct contract with the Contractor to perform a portion of the Work at the site. The term “Subcontractor” is referred to throughout the Contract Documents as if singular in number and means a Subcontractor or an authorized representative of the Subcontractor. The term “Subcontractor” does not include a separate contractor or subcontractors of a separate contractor.

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

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

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

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

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

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

§ 5.4 CONTINGENT ASSIGNMENT OF SUBCONTRACTS

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

1. assignment is effective only after termination of the Contract by the Owner for cause pursuant to Section 14.2 and only for those subcontract agreements that the Owner accepts by notifying the Subcontractor and Contractor in writing; and

2. assignment is subject to the prior rights of the surety, if any, obligated under bond relating to the Contract.

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

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

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

ARTICLE 6 CONSTRUCTION BY OWNER OR BY SEPARATE CONTRACTORS

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

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

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

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

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

§ 6.2 MUTUAL RESPONSIBILITY

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

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

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

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

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

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

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

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

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

§ 7.2 CHANGE ORDERS
§ 7.2.1 A Change Order is a written instrument prepared by the Architect and signed by the Owner, Contractor and Architect stating their agreement upon all of the following:
.1 The change in the Work;
.2 The amount of the adjustment, if any, in the Contract Sum; and
.3 The extent of the adjustment, if any, in the Contract Time.

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

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

§ 7.3.3 If the Construction Change Directive provides for an adjustment to the Contract Sum, the adjustment shall be based on one of the following methods:
.1 Mutual acceptance of a lump sum properly itemized and supported by sufficient substantiating data to permit evaluation;
.2 Unit prices stated in the Contract Documents or subsequently agreed upon;
.3 Cost to be determined in a manner agreed upon by the parties and a mutually acceptable fixed or percentage fee; or
As provided in Section 7.3.7.

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

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

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

§ 7.3.7 If the Contractor does not respond promptly or disagrees with the method for adjustment in the Contract Sum, the Architect shall determine the method and the adjustment on the basis of reasonable expenditures and savings of those performing the Work attributable to the change, including, in case of an increase in the Contract Sum, an amount for overhead and profit as set forth in the Agreement, or if no such amount is set forth in the Agreement, a reasonable amount. In such case, and also under Section 7.3.3.3, the Contractor shall keep and present, in such form as the Architect may prescribe, an itemized accounting together with appropriate supporting data. Unless otherwise provided in the Contract Documents, costs for the purposes of this Section 7.3.7 shall be limited to the following:

.1 Costs of labor, including social security, old age and unemployment insurance, fringe benefits required by agreement or custom, and workers’ compensation insurance;

.2 Costs of materials, supplies and equipment, including cost of transportation, whether incorporated or consumed;

.3 Rental costs of machinery and equipment, exclusive of hand tools, whether rented from the Contractor or others;

.4 Costs of premiums for all bonds and insurance, permit fees, and sales, use or similar taxes related to the Work; and

.5 Additional costs of supervision and field office personnel directly attributable to the change.

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

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

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

§ 7.4 MINOR CHANGES IN THE WORK

The Architect has authority to order minor changes in the Work not involving adjustment in the Contract Sum or extension of the Contract Time and not inconsistent with the intent of the Contract Documents. Such changes will be effected by written order signed by the Architect and shall be binding on the Owner and Contractor.
ARTICLE 8   TIME
§ 8.1 DEFINITIONS
§ 8.1.1 Unless otherwise provided, Contract Time is the period of time, including authorized adjustments, allotted in the Contract Documents for Substantial Completion of the Work.

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

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

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

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

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

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

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

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

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

ARTICLE 9   PAYMENTS AND COMPLETION
§ 9.1 CONTRACT SUM
The Contract Sum is stated in the Agreement and, including authorized adjustments, is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents.

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

§ 9.3 APPLICATIONS FOR PAYMENT
§ 9.3.1 At least ten days before the date established for each progress payment, the Contractor shall submit to the Architect an itemized Application for Payment prepared in accordance with the schedule of values, if required under Section 9.2, for completed portions of the Work. Such application shall be notarized, if required, and supported by such data substantiating the Contractor’s right to payment as the Owner or Architect may require, such as copies of requisitions from Subcontractors and material suppliers, and shall reflect retainage if provided for in the Contract Documents.
§ 9.3.1.1 As provided in Section 7.3.9, such applications may include requests for payment on account of changes in the Work that have been properly authorized by Construction Change Directives, or by interim determinations of the Architect, but not yet included in Change Orders.

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

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

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

§ 9.4 CERTIFICATES FOR PAYMENT

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

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

§ 9.5 DECISIONS TO WITHHOLD CERTIFICATION

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

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

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

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

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

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

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

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

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

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

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

§ 9.7 FAILURE OF PAYMENT
If the Architect does not issue a Certificate for Payment, through no fault of the Contractor, within seven days after receipt of the Contractor’s Application for Payment, or if the Owner does not pay the Contractor within seven days after the date established in the Contract Documents the amount certified by the Architect or awarded by binding dispute resolution, then the Contractor may, upon seven additional days’ written notice to the Owner and Architect,
§ 9.8 SUBSTANTIAL COMPLETION
§ 9.8.1 Substantial Completion is the stage in the progress of the Work when the Work or designated portion thereof is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use.

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

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

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

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

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

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

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

§ 9.10 FINAL COMPLETION AND FINAL PAYMENT
§ 9.10.1 Upon receipt of the Contractor’s written notice that the Work is ready for final inspection and acceptance and upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Work is found to be complete in accordance with the Contract Documents, the Architect will issue a Certificate of Substantial Completion. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.

Upon receipt of a final Application for Payment, the Architect will promptly make such inspection and, when the Work is found to be complete in accordance with the Contract Documents, the Architect will issue a Certificate of Substantial Completion. Warranties required by the Contract Documents shall commence on the date of Substantial Completion of the Work or designated portion thereof unless otherwise provided in the Certificate of Substantial Completion.
§ 10.1 SAFETY PRECAUTIONS AND PROGRAMS

ARTICLE 10 PROTECTION OF PERSONS AND PROPERTY

§ 9.10.5 except that it shall not constitute a waiver of claims.

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

1. liens, Claims, security interests or encumbrances arising out of the Contract and unsettled;

2. failure of the Work to comply with the requirements of the Contract Documents; or

3. terms of special warranties required by the Contract Documents.

§ 9.10.3 If, after Substantial Completion of the Work, final completion thereof is materially delayed through no fault of the Contractor or by issuance of Change Orders affecting final completion, and the Architect so confirms, the Owner shall, upon application by the Contractor and certification by the Architect, and without terminating the Contract, make payment of the balance due for that portion of the Work fully completed and accepted. If the remaining balance for Work not fully completed or corrected is less than retainage stipulated in the Contract Documents, consent of surety, if any, to final payment and (5), if required by the Owner, other data establishing payment or satisfaction of obligations, such as receipts, releases and waivers of liens, claims, security interests or encumbrances arising out of the Contract, to the extent and in such form as may be designated by the Owner. If a Subcontractor refuses to furnish a release or waiver required by the Owner, the Contractor may furnish a bond satisfactory to the Owner to indemnify the Owner against such lien. If such lien remains unsatisfied after payments are made, the Contractor shall refund to the Owner all money that the Owner may be compelled to pay in discharging such lien, including all costs and reasonable attorneys' fees.

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

§ 10.2 SAFETY OF PERSONS AND PROPERTY

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

1. employees on the Work and other persons who may be affected thereby;

2. the Work and materials and equipment to be incorporated therein, whether in storage on or off the site, under care, custody or control of the Contractor or the Contractor’s Subcontractors or Sub-subcontractors; and

3. other property at the site or adjacent thereto, such as trees, shrubs, lawns, walks, pavements, roadways, structures and utilities not designated for removal, relocation or replacement in the course of construction.
§ 10.2.2 The Contractor shall comply with and give notices required by applicable laws, statutes, ordinances, codes, rules and regulations, and lawful orders of public authorities bearing on safety of persons or property or their protection from damage, injury or loss.

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

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

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

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

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

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

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

§ 10.3.2 Upon receipt of the Contractor’s written notice, the Owner shall obtain the services of a licensed laboratory to verify the presence or absence of the material or substance reported by the Contractor and, in the event such material or substance is found to be present, to cause it to be rendered harmless. Unless otherwise required by the Contract Documents, the Owner shall furnish in writing to the Contractor and Architect the names and qualifications of persons or entities who are to perform tests verifying the presence or absence of such material or substance or who are to perform the task of removal or safe containment of such material or substance. The Contractor and the Architect will promptly reply to the Owner in writing stating whether or not either has reasonable objection to the persons or entities proposed by the Owner. If either the Contractor or Architect has an objection to a person or entity proposed by the Owner, the Owner shall propose another to whom the Contractor and the Architect have no reasonable objection. When the material or substance has been rendered harmless, Work in the affected area shall resume upon written agreement of the Owner and Contractor. By Change Order, the Contract Time shall be extended appropriately and the Contract Sum shall be increased in the amount of the Contractor’s reasonable additional costs of shut-down, delay and start-up.
§ 10.3.3 To the fullest extent permitted by law, the Owner shall indemnify and hold harmless the Contractor, Subcontractors, Architect, Architect’s consultants and agents and employees of any of them from and against claims, damages, losses and expenses, including but not limited to attorneys’ fees, arising out of or resulting from performance of the Work in the affected area if in fact the material or substance presents the risk of bodily injury or death as described in Section 10.3.1 and has not been rendered harmless, provided that such claim, damage, loss or expense is attributable to bodily injury, sickness, disease or death, or to injury to or destruction of tangible property (other than the Work itself), except to the extent that such damage, loss or expense is due to the fault or negligence of the party seeking indemnity.

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

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

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

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

ARTICLE 11 INSURANCE AND BONDS
§ 11.1 CONTRACTOR’S LIABILITY INSURANCE
§ 11.1.1 The Contractor shall purchase from and maintain in a company or companies lawfully authorized to do business in the jurisdiction in which the Project is located such insurance as will protect the Contractor from claims set forth below which may arise out of or result from the Contractor’s operations and completed operations under the Contract and for which the Contractor may be legally liable, whether such operations be by the Contractor or by a Subcontractor or by anyone directly or indirectly employed by any of them, or by anyone for whose acts any of them may be liable:

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

§ 11.1.2 The insurance required by Section 11.1.1 shall be written for not less than limits of liability specified in the Contract Documents or required by law, whichever coverage is greater. Coverages, whether written on an occurrence or claims-made basis, shall be maintained without interruption from the date of commencement of the Work until the date of final payment and termination of any coverage required to be maintained after final payment, and, with respect to the Contractor’s completed operations coverage, until the expiration of the period for correction

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of Work or for such other period for maintenance of completed operations coverage as specified in the Contract Documents.

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

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

§ 11.2 OWNER’S LIABILITY INSURANCE
The Owner shall be responsible for purchasing and maintaining the Owner’s usual liability insurance.

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

§ 11.4 PERFORMANCE BOND AND PAYMENT BOND

§ 11.4.1 The Owner shall have the right to require the Contractor to furnish bonds covering faithful performance of the Contract and payment of obligations arising thereunder as stipulated in bidding requirements or specifically required in the Contract Documents on the date of execution of the Contract.

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

ARTICLE 12  UNCOVERING AND CORRECTION OF WORK

§ 12.1 UNCOVERING OF WORK

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

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

§ 12.2 CORRECTION OF WORK

§ 12.2.1 BEFORE OR AFTER SUBSTANTIAL COMPLETION

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

§ 12.2.2 AFTER SUBSTANTIAL COMPLETION

§ 12.2.2.1 In addition to the Contractor’s obligations under Section 3.5, if, within one year after the date of Substantial Completion of the Work or designated portion thereof or after the date for commencement of warranties established under Section 9.9.1, or by terms of an applicable special warranty required by the Contract Documents, any of the Work is found to be not in accordance with the requirements of the Contract Documents, the Contractor shall correct it promptly after receipt of written notice from the Owner to do so unless the Owner has previously given the Contractor a written acceptance of such condition. The Owner shall give such notice promptly after discovery of the condition. During the one-year period for correction of Work, if the Owner fails to notify the Contractor and give the Contractor an opportunity to make the correction, the Owner waives the rights to require correction by the Contractor and to make a claim for breach of warranty. If the Contractor fails to correct nonconforming Work within a reasonable time during that period after receipt of notice from the Owner or Architect, the Owner may correct it in accordance with Section 2.4.
§ 12.2.2 The one-year period for correction of Work shall be extended with respect to portions of Work first performed after Substantial Completion by the period of time between Substantial Completion and the actual completion of that portion of the Work.

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

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

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

ARTICLE 13 MISCELLANEOUS PROVISIONS
§ 13.1 GOVERNING LAW
The Contract shall be governed by the law of the place where the Project is located except that, if the parties have selected arbitration as the method of binding dispute resolution, the Federal Arbitration Act shall govern Section 15.4.

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

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

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

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

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

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

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

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

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

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

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

§ 13.6 INTEREST

Payments due and unpaid under the Contract Documents shall bear interest from the date payment is due at such rate as the parties may agree upon in writing or, in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

§ 13.7 TIME LIMITS ON CLAIMS

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

ARTICLE 14 TERMINATION OR SUSPENSION OF THE CONTRACT

§ 14.1 TERMINATION BY THE CONTRACTOR

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

.1 Issuance of an order of a court or other public authority having jurisdiction that requires all Work to be stopped;

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

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

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

§ 14.2 TERMINATION BY THE OWNER FOR CAUSE

§ 14.2.1 The Owner may terminate the Contract if the Contractor

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

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

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

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

§ 14.2.4 If the unpaid balance of the Contract Sum exceeds costs of finishing the Work, including compensation for the Architect’s services and expenses made necessary thereby, and other damages incurred by the Owner and not expressly waived, such excess shall be paid to the Contractor. If such costs and damages exceed the unpaid balance, the Contractor shall pay the difference to the Owner. The amount to be paid to the Contractor or Owner, as the case may be, shall be certified by the Initial Decision Maker, upon application, and this obligation for payment shall survive termination of the Contract.

§ 14.3 SUSPENSION BY THE OWNER FOR CONVENIENCE

§ 14.3.1 The Owner may, without cause, order the Contractor in writing to suspend, delay or interrupt the Work in whole or in part for such period of time as the Owner may determine.
§ 14.3.2 The Contract Sum and Contract Time shall be adjusted for increases in the cost and time caused by suspension, delay or interruption as described in Section 14.3.1. Adjustment of the Contract Sum shall include profit. No adjustment shall be made to the extent
1. that performance is, was or would have been so suspended, delayed or interrupted by another cause for which the Contractor is responsible; or
2. that an equitable adjustment is made or denied under another provision of the Contract.

§ 14.4 TERMINATION BY THE OWNER FOR CONVENIENCE

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

§ 14.4.2 Upon receipt of written notice from the Owner of such termination for the Owner’s convenience, the Contractor shall
1. cease operations as directed by the Owner in the notice;
2. take actions necessary, or that the Owner may direct, for the protection and preservation of the Work; and
3. except for Work directed to be performed prior to the effective date of termination stated in the notice, terminate all existing subcontracts and purchase orders and enter into no further subcontracts and purchase orders.

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

ARTICLE 15 CLAIMS AND DISPUTES

§ 15.1 CLAIMS

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

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

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

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

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

§ 15.1.5.2 If adverse weather conditions are the basis for a Claim for additional time, such Claim shall be documented by data substantiating that weather conditions were abnormal for the period of time, could not have been reasonably anticipated and had an adverse effect on the scheduled construction.
§ 15.1.6 CLAIMS FOR CONSEQUENTIAL DAMAGES
The Contractor and Owner waive Claims against each other for consequential damages arising out of or relating to this Contract. This mutual waiver includes:

1. damages incurred by the Owner for rental expenses, for losses of use, income, profit, financing, business and reputation, and for loss of management or employee productivity or of the services of such persons; and

2. damages incurred by the Contractor for principal office expenses including the compensation of personnel stationed there, for losses of financing, business and reputation, and for loss of profit except anticipated profit arising directly from the Work.

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

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

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

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

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

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

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

§ 15.2.6.1 Either party may, within 30 days from the date of an initial decision, demand in writing that the other party file for mediation within 60 days of the initial decision. If such a demand is made and the party receiving the demand fails to file for mediation within the time required, then both parties waive their rights to mediate or pursue binding dispute resolution proceedings with respect to the initial decision.
§ 15.2.7 In the event of a Claim against the Contractor, the Owner may, but is not obligated to, notify the surety, if any, of the nature and amount of the Claim. If the Claim relates to a possibility of a Contractor’s default, the Owner may, but is not obligated to, notify the surety and request the surety’s assistance in resolving the controversy.

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

§ 15.3 MEDIATION

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

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

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

§ 15.4 ARBITRATION

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

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

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

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

§ 15.4.4 CONSOLIDATION OR JOINDER

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

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

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

Henderson County Habitat for Humanity  Contractor:

Date: ________________________________

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

The Bidder proposes and agrees if this proposal is accepted to contract with Henderson County Habitat for Humanity in the form of contract specified below, to furnish all necessary materials, equipment, machinery, tools, apparatus, means of transportation and labor necessary to complete the construction of: **Dodd Meadows Community Center** in full in complete accordance with the plans, specifications and contract documents, to the full and entire satisfaction of the board and the architect with a definite understanding that no money will be allowed for extra work except as set forth in the General Conditions and the contract documents, for the sum of:

**SINGLE PRIME CONTRACT:**

Base Bid – Dodd Meadows Community Center:

_________________________________________ Dollars($) __________________

**ALTERNATE NO. A-1**  Provide…

(Add) (Deduct) ___________________________________ Dollars($) __________________

Plumbing Subcontractor:

_________________________________________ Lic __________________

Mechanical Subcontractor:

_________________________________________ Lic __________________

Electrical Subcontractor:

_________________________________________ Lic __________________

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

Proposal Signature Page

Respectfully submitted this day of ____________________________

_________________________________________________________

(Name of firm or corporation making bid)

WITNESS:

By: ____________________________

Title ____________________________

(Proprietorship or Partnership) (Owner/Partner/Pres./V.Pres)

Address ____________________________

License No. ____________________________

Federal I.D. No. ____________________________

ATTEST:

By: ____________________________

Title: ____________________________

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

Addendum received and used in computing bid:

Addendum No. 1 ________  Addendum No. 3 ________

Addendum No. 2 ________  Addendum No. 4 ________

Form of Proposal
FORM OF BID BOND

Dodd Meadows Community Center

KNOW ALL MEN BY THESE PRESENTS THAT ________________________________, as principal, and ________________________________, as surety, who is duly licensed to act as surety in North Carolina, are held and firmly bound unto the Henderson County Habitat for Humanity as obligee, in the penal sum of ________________________________ DOLLARS, lawful money of the United States of America, for the payment of which, well and truly to be made, we bind ourselves, our heirs, executors, administrators, successors and assigns, jointly and severally, firmly by these presents.

Signed, sealed and dated this _______ day of ____________________________ 20____.

WHEREAS, the said principal is herewith submitting proposal for and the principal desires to file this bid bond in lieu of making the cash deposit as required by G.S. 143-129.

NOW, THEREFORE, THE CONDITION OF THE ABOVE OBLIGATION is such, that if the principal shall be awarded the contract for which the bid is submitted and shall execute the contract and give bond for the faithful performance thereof within ten days after the award of same to the principal, then this obligation shall be null and void; but if the principal fails to so execute such contract and give performance bond as required by G.S. 143-129, the surety shall, upon demand, forthwith pay to the obligee the amount set forth in the first paragraph hereof. Provided further, that the bid may be withdrawn as provided by G.S. 143-129.1

(SEAL)

(SEAL)

(SEAL)

(SEAL)

(SEAL)
AIA® Document A101™ – 2007

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

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

BETWEEN

the Owner:

(Name, address and other information)

Henderson County Habitat for Humanity

and the Contractor:

(Name, address and other information)

for the following Project:

(Name, location, and detailed description)

Dodd Meadows Community Center
Crest Road & East Blue Ridge Road
East Flat Rock, NC, 28726

The Architect:

(Name, address and other information)

Clark Nexsen, Inc.
1 West Pack Square, Suite 1501
Asheville, NC 28801

The Owner and Contractor agree as follows.
TABLE OF ARTICLES

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

ARTICLE 1 THE CONTRACT DOCUMENTS
The Contract Documents consist of this Agreement, Conditions of the Contract (General, Supplementary and other Conditions), Drawings, Specifications, Addenda issued prior to execution of this Agreement, other documents listed in this Agreement and Modifications issued after execution of this Agreement, all of which form the Contract, and are as fully a part of the Contract as if attached to this Agreement or repeated herein. The Contract represents the entire and integrated agreement between the parties hereto and supersedes prior negotiations, representations or agreements, either written or oral. An enumeration of the Contract Documents, other than a Modification, appears in Article 9.

ARTICLE 2 THE WORK OF THIS CONTRACT
The Contractor shall fully execute the Work described in the Contract Documents, except as specifically indicated in the Contract Documents to be the responsibility of others.

ARTICLE 3 DATE OF COMMENCEMENT AND SUBSTANTIAL COMPLETION
§ 3.1 The date of commencement of the Work shall be the date of this Agreement unless a different date is stated below or provision is made for the date to be fixed in a notice to proceed issued by the Owner.
(Insert the date of commencement if it differs from the date of this Agreement or, if applicable, state that the date will be fixed in a notice to proceed.)

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

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

§ 3.3 The Contractor shall achieve Substantial Completion of the entire Work not later than (_____) days from the date of commencement, or as follows:
(Insert number of calendar days. Alternatively, a calendar date may be used when coordinated with the date of commencement. If appropriate, insert requirements for earlier Substantial Completion of certain portions of the Work.)
<table>
<thead>
<tr>
<th>Portion of Work</th>
<th>Substantial Completion Date</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

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

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

**ARTICLE 4 CONTRACT SUM**

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

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

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

§ 4.3 Unit prices, if any:

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Units and Limitations</th>
<th>Price Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
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</tbody>
</table>

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

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

<table>
<thead>
<tr>
<th>Item</th>
<th>Price</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
</tr>
</tbody>
</table>

**ARTICLE 5 PAYMENTS**

§ 5.1 PROGRESS PAYMENTS

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

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

§ 5.1.3 Provided that an Application for Payment is received by the Architect not later than the day of a month, the Owner shall make payment of the certified amount to the Contractor not later than the day of the same month. If an Application for Payment is received by the Architect after the application date fixed above, payment shall be made by the Owner not later than ( ) days after the Architect receives the Application for Payment.

(Federal, state or local laws may require payment within a certain period of time.)

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

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

1. Take that portion of the Contract Sum properly allocable to completed Work as determined by multiplying the percentage completion of each portion of the Work by the share of the Contract Sum allocated to that portion of the Work in the schedule of values, less retainage of ( ). Pending final determination of cost to the Owner of changes in the Work, amounts not in dispute shall be included as provided in Section 7.3.9 of AIA Document A201™–2007, General Conditions of the Contract for Construction;

2. Add that portion of the Contract Sum properly allocable to materials and equipment delivered and suitably stored at the site for subsequent incorporation in the completed construction (or, if approved in advance by the Owner, suitably stored off the site at a location agreed upon in writing), less retainage of ( );

3. Subtract the aggregate of previous payments made by the Owner; and

4. Subtract amounts, if any, for which the Architect has withheld or nullified a Certificate for Payment as provided in Section 7.3.9 of AIA Document A201–2007.

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

1. Add, upon Substantial Completion of the Work, a sum sufficient to increase the total payments to the full amount of the Contract Sum, less such amounts as the Architect shall determine for incomplete Work, retainage applicable to such work and unsettled claims; and

(Section 9.8.5 of AIA Document A201–2007 requires release of applicable retainage upon Substantial Completion of Work with consent of surety, if any.)

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

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

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

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

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

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

2. a final Certificate for Payment has been issued by the Architect.

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

ARTICLE 6  DISPUTE RESOLUTION
§ 6.1 INITIAL DECISION MAKER
The Architect will serve as Initial Decision Maker pursuant to Section 15.2 of AIA Document A201–2007, unless the parties appoint below another individual, not a party to this Agreement, to serve as Initial Decision Maker.
§ 6.2 BINDING DISPUTE RESOLUTION
For any Claim subject to, but not resolved by, mediation pursuant to Section 15.3 of AIA Document A201–2007, the method of binding dispute resolution shall be as follows:

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

[ ] Arbitration pursuant to Section 15.4 of AIA Document A201–2007
[ ] Litigation in a court of competent jurisdiction
[ ] Other (Specify)

ARTICLE 7  TERMINATION OR SUSPENSION

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

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

ARTICLE 8  MISCELLANEOUS PROVISIONS

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

§ 8.2 Payments due and unpaid under the Contract shall bear interest from the date payment is due at the rate stated below, or in the absence thereof, at the legal rate prevailing from time to time at the place where the Project is located.

(Insert rate of interest agreed upon, if any.)

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

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

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

§ 8.6 Other provisions:
ARTICLE 9 ENUMERATION OF CONTRACT DOCUMENTS

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

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

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

§ 9.1.3 The Supplementary and other Conditions of the Contract:

<table>
<thead>
<tr>
<th>Document</th>
<th>Title</th>
<th>Date</th>
<th>Pages</th>
</tr>
</thead>
</table>

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

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

§ 9.1.6 The Addenda, if any:

<table>
<thead>
<tr>
<th>Number</th>
<th>Date</th>
<th>Pages</th>
</tr>
</thead>
</table>

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

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

1. AIA Document E201™–2007, Digital Data Protocol Exhibit, if completed by the parties, or the following:

2. Other documents, if any, listed below:
(List here any additional documents that are intended to form part of the Contract Documents. AIA Document A201–2007 provides that bidding requirements such as advertisement or invitation to bid, Instructions to Bidders, sample forms and the Contractor’s bid are not part of the Contract Documents unless enumerated in this Agreement. They should be listed here only if intended to be part of the Contract Documents.)

ARTICLE 10 INSURANCE AND BONDS

The Contractor shall purchase and maintain insurance and provide bonds as set forth in Article 11 of AIA Document A201–2007.
(State bonding requirements, if any, and limits of liability for insurance required in Article 11 of AIA Document A201–2007.)

<table>
<thead>
<tr>
<th>Type of insurance or bond</th>
<th>Limit of liability or bond amount ($ 0.00)</th>
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</table>
This Agreement entered into as of the day and year first written above.

OWNER (Signature)  
(Printed name and title)  

CONTRACTOR (Signature)  
(Printed name and title)
FORM OF PERFORMANCE BOND

Date of Contract: ________________________________

Date of Execution: ________________________________

Name of Principal: ____________________________________________

(Contractor)

Name of Surety: _____________________________________________

Name of Contracting Body: Henderson County Habitat for Humanity

Amount of Bond: _____________________________________________

Project: ____________________________________________________

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the amount stated above for the payment of which sum well and truly to be made, we bind, ourselves, our heirs, executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain contract with the contracting body, identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of said contract during the original term of said contract and any extensions thereof that may be granted by the contracting body, with or without notice to the surety, and during the life of any guaranty required under the contract, and shall also well and truly perform and fulfill all the undertakings, covenants, terms, conditions and agreements of any and all duly authorized modifications of said contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then, this obligation to be void; otherwise to remain in full force and virtue.
IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in six (6) counterparts.

Witness:

____________________________________________________________________
(Proprietorship or Partnership)

Contractor: (Trade or Corporate Name)

By: ________________________________

Title: ________________________________
((Owner, Partner, or Corp. Pres. or Vice Pres. only)

By: ________________________________

Title: ________________________________
(Corp. Sec. or Asst. Sec. only)

(Corporate Seal)

(Surety Company)

Witness:

By: ________________________________

Title: ________________________________
(Attorney in Fact)

(Surety Corporate Seal)

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C. Regional or Branch Office Address
FORM OF PAYMENT BOND

Date of Contract: _______________________________________________________

Date of Execution: _____________________________________________________

Name of Principal: _____________________________________________________
(Contractor)

Name of Surety: _________________________________________________________

Name of Contracting Body:  Henderson County Habitat for Humanity

Amount of Bond: _________________________________________________________

Project:  ______________________________________________________________

KNOW ALL MEN BY THESE PRESENTS, that we, the principal and surety above named, are held and
firmly bound unto the above named contracting body, hereinafter called the contracting body, in the penal sum of the
amount stated above for the payment of which sum well and truly to be made, we bind ourselves, our heirs,
executors, administrators, and successors, jointly and severally, firmly by these presents.

THE CONDITION OF THIS OBLIGATION IS SUCH, that whereas the principal entered into a certain
contract with the contracting body identified as shown above and hereto attached:

NOW, THEREFORE, if the principal shall promptly make payment to all persons supplying labor/material
in the prosecution of the work provided for in said contract, and any and all duly authorized modifications of said
contract that may hereafter be made, notice of which modifications to the surety being hereby waived, then this
obligation to be void; otherwise to remain in full force and virtue.
IN WITNESS WHEREOF, the above-bounden parties have executed this instrument under their several seals on the date indicated above, the name and corporate seal of each corporate party being hereto affixed and these presents duly signed by its undersigned representative, pursuant to authority of its governing body.

Executed in six (6) counterparts.

Witness: __________________________________________

(Proprietorship or Partnership)

Attest: (Corporation)

By: __________________________________________

Title: __________________________________________

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

Contractor: (Trade or Corporate Name)

By: __________________________________________

Title: __________________________________________

((Owner, Partner, or Corp. Pres. or Vice Pres. only)

(Surety Company)

Witness:

By: __________________________________________

Title: __________________________________________

(Attorney in Fact)

Countersigned:

_______________________________________________

(Surety Corporate Seal)

(N.C. Licensed Resident Agent)

Name and Address-Surety Agency

Surety Company Name and N.C.
Regional or Branch Office Address
# Identification of HUB Certified/ Minority Business Participation

I, ______________________________, (Name of Bidder) do hereby certify that on this project, we will use the following HUB Certified/ minority business as construction subcontractors, vendors, suppliers or providers of professional services.

<table>
<thead>
<tr>
<th>Firm Name, Address and Phone #</th>
<th>Work Type</th>
<th>*Minority Category</th>
<th>**HUB Certified (Y/N)</th>
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</tbody>
</table>

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

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

The total value of minority business contracting will be ($) ________________.
AFFIDAVIT A – Listing of Good Faith Efforts

County of ____________________________

(Name of Bidder)

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

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

☐ 1 – (10 pts) Contacted minority businesses that reasonably could have been expected to submit a quote and that were known to the contractor, or available on State or local government maintained lists, at least 10 days before the bid date and notified them of the nature and scope of the work to be performed.

☐ 2 – (10 pts) Made the construction plans, specifications and requirements available for review by prospective minority businesses, or providing these documents to them at least 10 days before the bids are due.

☐ 3 – (15 pts) Broken down or combined elements of work into economically feasible units to facilitate minority participation.

☐ 4 – (10 pts) Worked with minority trade, community, or contractor organizations identified by the Office of Historically Underutilized Businesses and included in the bid documents that provide assistance in recruitment of minority businesses.

☐ 5 – (10 pts) Attended prebid meetings scheduled by the public owner.

☐ 6 – (20 pts) Provided assistance in getting required bonding or insurance or provided alternatives to bonding or insurance for subcontractors.

☐ 7 – (15 pts) Negotiated in good faith with interested minority businesses and did not reject them as unqualified without sound reasons based on their capabilities. Any rejection of a minority business based on lack of qualification should have the reasons documented in writing.

☐ 8 – (25 pts) Provided assistance to an otherwise qualified minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letters of credit, including waiving credit that is ordinarily required. Assisted minority businesses in obtaining the same unit pricing with the bidder's suppliers in order to help minority businesses in establishing credit.

☐ 9 – (20 pts) Negotiated joint venture and partnership arrangements with minority businesses in order to increase opportunities for minority business participation on a public construction or repair project when possible.

☐ 10 - (20 pts) Provided quick pay agreements and policies to enable minority contractors and suppliers to meet cash-flow demands.

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

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

Date: __________ Name of Authorized Officer: ____________________________

Signature: ____________________________ Title: ____________________________

State of ______________, County of ____________________________

Subscribed and sworn to before me this _____ day of ___________ 20____

Notary Public ____________________________

My commission expires ____________________

MBForms 2002-Revised July 2010
State of North Carolina --AFFIDAVIT B-- Intent to Perform Contract with Own Workforce.

County of ____________________

Affidavit of ________________________ (Name of Bidder)

I hereby certify that it is our intent to perform 100% of the work required for the ________________________ contract.

______________________________ (Name of Project)

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

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

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

Date: __________ Name of Authorized Officer: ________________________________

Signature: ________________________________

Title: ________________________________

State of ____________________, County of ________________________________

Subscribed and sworn to before me this __________ day of _______ 20___

Notary Public ________________________________

My commission expires ________________________________
Affidavit of ______________________________ I do hereby certify that on the

(Name of Bidder)

(Project Name)

Amount of Bid $ __________________

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

<table>
<thead>
<tr>
<th>Name and Phone Number</th>
<th>*Minority Category</th>
<th>**HUB Certified Y/N</th>
<th>Work Description</th>
<th>Dollar Value</th>
</tr>
</thead>
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*Minority categories: Black, African American (B), Hispanic (H), Asian American (A) American Indian (I), Female (F) Socially and Economically Disadvantaged (D)

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

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

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

Date: __________ Name of Authorized Officer: ________________________

Signature: ____________________________

Title: ________________________________

State of ___________________________, County of ________________________

Subscribed and sworn to before me this ______day of _______ 20____

Notary Public ________________________

My commission expires ________________

MBForms 2002-Revised July 2010
State of North Carolina  AFFIDAVIT D – Good Faith Efforts

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

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

Affidavit of __________________________________________ I do hereby certify that on the __________________________
(Name of Bidder) __________________________
(Project Name) __________________________________________
__________________________________________ Amount of Bid $ __________

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

<table>
<thead>
<tr>
<th>Name and Phone Number</th>
<th>*Minority Category</th>
<th>**HUB Certified Y/N</th>
<th>Work Description</th>
<th>Dollar Value</th>
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*Minority categories: Black, African American (B), Hispanic (H), Asian American (A) American Indian (I), Female (F) Socially and Economically Disadvantaged (D)

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

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

A. Copies of solicitations for quotes to at least three (3) minority business firms from the source list provided by the State for each subcontract to be let under this contract (if 3 or more firms are shown on the source list). Each solicitation shall contain a specific description of the work to be subcontracted, location where bid documents can be reviewed, representative of the Prime Bidder to contact, and location, date and time when quotes must be received.

B. Copies of quotes or responses received from each firm responding to the solicitation.

C. A telephone log of follow-up calls to each firm sent a solicitation.

D. For subcontracts where a minority business firm is not considered the lowest responsible sub-bidder, copies of quotes received from all firms submitting quotes for that particular subcontract.

E. Documentation of any contacts or correspondence to minority business, community, or contractor organizations in an attempt to meet the goal.

F. Copy of pre-bid roster

G. Letter documenting efforts to provide assistance in obtaining required bonding or insurance for minority business.

H. Letter detailing reasons for rejection of minority business due to lack of qualification.

I. Letter documenting proposed assistance offered to minority business in need of equipment, loan capital, lines of credit, or joint pay agreements to secure loans, supplies, or letter of credit, including waiving credit that is ordinarily required.

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

Pursuant to GS143-128.2(d), the undersigned will enter into a formal agreement with Minority Firms for work listed in this schedule conditional upon execution of a contract with the Owner. Failure to fulfill this commitment may constitute a breach of the contract.
The undersigned hereby certifies that he or she has read the terms of this commitment and is authorized to bind the bidder to the commitment herein set forth.

Date:____________ Name of Authorized Officer:__________________________________________

Signature:__________________________________________

Title:__________________________________________

State of______________________, County of _________________________

Subscribed and sworn to before me this ______day of ____________ 20____

Notary Public _________________________

My commission expires ____________
STATE OF NORTH CAROLINA
COUNTY SALES AND USE TAX REPORT
SUMMARY TOTALS AND CERTIFICATION

CONTRACTOR: ________________________________  Page 1 of _____

PROJECT: ________________________________  FOR PERIOD: ________________________________

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* Attach subcontractor(s) report(s)
** Must balance with Detail Sheet(s)

I certify that the above figures do not include any tax paid on supplies, tools and equipment which were used to perform this contract and only includes those building materials, supplies, fixtures and equipment which actually became a part of or annexed to the building or structure. I certify that, to the best of my knowledge, the information provided here is true, correct, and complete.

Sworn to and subscribed before me,

This the _______ day of ______________, 20___

______________________________
Signed

______________________________
Notary Public

My Commission Expires: __________________________

Print or Type Name of Above

NOTE:
This certified statement may be subject to audit.
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<tr>
<th>VENDOR NAME</th>
<th>INVOICE NUMBER</th>
<th>TYPE OF PROPERTY</th>
<th>INVOICE TOTAL</th>
<th>COUNTY OF SALE *</th>
<th>COUNTY TAX PAID</th>
<th>TOTAL</th>
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* If this is an out-of-state vendor, the County of Sale should be the county to which the merchandise was shipped.
SECTION 011000 - SUMMARY

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Type of the Contract.
   2. Use of premises.
   3. Work restrictions.
   4. Specification formats and conventions.

B. Related Sections include the following:
   1. Division 01 Section "Temporary Facilities and Controls" for limitations and procedures governing temporary use of Owner's facilities.

1.3 WORK COVERED BY CONTRACT DOCUMENTS

A. Project Identification: Dodd Meadows Community Center.

B. Owner: Henderson County Habitat for Humanity.
   1. Owner's Representative: Mr. Ron Laughter.

C. Architect: Clark Nexsen, Inc.

D. The Work consists of the following:
   1. The Work includes new Community Center structure and associated site work.

1.4 TYPE OF CONTRACT

A. Project will be constructed under a single prime contract.

1.5 OWNER-FURNISHED PRODUCTS

A. Owner will furnish products indicated. The Work includes providing support systems to receive Owner's equipment and making plumbing, mechanical, and electrical connections.
   1. Owner will arrange for and deliver Shop Drawings, Product Data, and Samples to Contractor.
2. Owner will arrange and pay for delivery of Owner-furnished items according to Contractor's Construction Schedule.
3. After delivery, Owner will inspect delivered items for damage. Contractor shall be present for and assist in Owner's inspection.
4. If Owner-furnished items are damaged, defective, or missing, Owner will arrange for replacement.
5. Owner will arrange for manufacturer's field services and for delivery of manufacturer's warranties to Contractor.
6. Owner will furnish Contractor the earliest possible delivery date for Owner-furnished products. Using Owner-furnished earliest possible delivery dates, Contractor shall designate delivery dates of Owner-furnished items in Contractor's Construction Schedule.
7. Contractor shall review Shop Drawings, Product Data, and Samples and return them to Architect noting discrepancies or anticipated problems in use of product.
8. Contractor is responsible for receiving, unloading, and handling Owner-furnished items at Project site.
9. Contractor is responsible for protecting Owner-furnished items from damage during storage and handling, including damage from exposure to the elements.
10. If Owner-furnished items are damaged as a result of Contractor's operations, Contractor shall repair or replace them.
11. Contractor shall install and otherwise incorporate Owner-furnished items into the Work.

B. Owner-Furnished Products:

1. None.

1.6 USE OF PREMISES

A. General: Contractor shall have full use of premises for construction operations, including use of Project site, during construction period. Contractor's use of premises is limited only by Owner's right to perform work or to retain other contractors on portions of Project.

B. Use of Site: Limit use of premises to areas within the Contract limits indicated. Do not disturb portions of Project site beyond areas in which the Work is indicated.

1. Limits: Confine constructions operations to:
   a. Limit site disturbance, including earthwork and clearing of vegetation, to 40 feet beyond building perimeter; 10 feet beyond surface walkways, patios, surface parking, and utilities less than 12 inches in diameter; 15 feet beyond primary roadway curbs and main utility branch trenches; and 25 feet beyond constructed areas with permeable surfaces (such as pervious paving areas, stormwater detention facilities, and playing fields) that require additional staging areas in order to limit compaction in the constructed area.

1.7 WORK RESTRICTIONS

A. On-Site Work Hours: Work shall be generally performed during normal business working hours of 7am a.m. to 8 p.m., Monday through Saturday, except otherwise indicated.

B. Existing Utility Interruptions: Do not interrupt utilities serving facilities occupied by Owner or others unless permitted under the following conditions and then only after arranging to provide temporary utility services according to requirements indicated:

1. Notify Architect Owner not less than 7 days in advance of proposed utility interruptions.
2. Do not proceed with utility interruptions without Architect's Owner's written permission.
C. Nonsmoking Building: Smoking is not permitted within the building or within 25 feet of entrances, operable windows, or outdoor air intakes.

1.8 SPECIFICATION FORMATS AND CONVENTIONS

A. Specification Format: The Specifications are organized into Divisions and Sections using the 50-division format and CSI/CSC's "MasterFormat" numbering system.

1. Section Identification: The Specifications use Section numbers and titles to help cross-referencing in the Contract Documents. Sections in the Project Manual are in numeric sequence; however, the sequence is incomplete because all available Section numbers are not used. Consult the table of contents at the beginning of the Project Manual to determine numbers and names of Sections in the Contract Documents.

2. Division 01: Sections in Division 01 govern the execution of the Work of all Sections in the Specifications.

B. Specification Content: The Specifications use certain conventions for the style of language and the intended meaning of certain terms, words, and phrases when used in particular situations. These conventions are as follows:

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

2. Imperative mood and streamlined language are generally used in the Specifications. Requirements expressed in the imperative mood are to be performed by Contractor. Occasionally, the indicative or subjunctive mood may be used in the Section Text for clarity to describe responsibilities that must be fulfilled indirectly by Contractor or by others when so noted.

   a. The words "shall," "shall be," or "shall comply with," depending on the context, are implied where a colon (:) is used within a sentence or phrase.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 011000
SECTION 012600 - CONTRACT MODIFICATION PROCEDURES

PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section specifies administrative and procedural requirements for handling and processing Contract modifications.
B. Related Sections include the following:
   1. Division 01 Section "Product Requirements" for administrative procedures for handling requests for substitutions made after Contract award.

1.3 MINOR CHANGES IN THE WORK
A. Architect will issue supplemental instructions authorizing Minor Changes in the Work, not involving adjustment to the Contract Sum or the Contract Time, on

1.4 PROPOSAL REQUESTS
A. Owner-Initiated Proposal Requests: will issue a detailed description of proposed changes in the Work that may require adjustment to the Contract Sum or the Contract Time. If necessary, the description will include supplemental or revised Drawings and Specifications.
   1. Proposal Requests issued by are for information only. Do not consider them instructions either to stop work in progress or to execute the proposed change.
   2. Within 14 calendar days after receipt of Proposal Request, submit a quotation estimating cost adjustments to the Contract Sum and the Contract Time necessary to execute the change.
      a. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.
      b. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.
      c. Include costs of labor and supervision directly attributable to the change.
      d. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.
B. Contractor-Initiated Proposals: If latent or unforeseen conditions require modifications to the Contract, Contractor may propose changes by submitting a request for a change to Architect.
   1. Include a statement outlining reasons for the change and the effect of the change on the Work.
Provide a complete description of the proposed change. Indicate the effect of the proposed change on the Contract Sum and the Contract Time.

2. Include a list of quantities of products required or eliminated and unit costs, with total amount of purchases and credits to be made. If requested, furnish survey data to substantiate quantities.

3. Indicate applicable taxes, delivery charges, equipment rental, and amounts of trade discounts.

4. Include costs of labor and supervision directly attributable to the change.

5. Include an updated Contractor's Construction Schedule that indicates the effect of the change, including, but not limited to, changes in activity duration, start and finish times, and activity relationship. Use available total float before requesting an extension of the Contract Time.

6. Comply with requirements in Division 01 Section "Product Requirements" if the proposed change requires substitution of one product or system for product or system specified.


1.5 CHANGE ORDER PROCEDURES

A. On Owner's approval of a Proposal Request, Architect will issue a Change Order for signatures of Owner and Contractor on latest version of North Carolina State Construction Change Order Form.

1.6 ARCHITECT’S FIELD ORDER

A. Change Directive: Architect may issue an Architect’s Field Order. Architect’s field instructs Contractor to proceed with a change in the Work, for subsequent inclusion in a Change Order.

1. Field order contains a complete description of change in the Work. It also designates method to be followed to determine change in the Contract Sum or the Contract Time.

B. Documentation: Maintain detailed records on a time and material basis of work required by the field order.

1. After completion of change, submit an itemized account and supporting data necessary to substantiate cost and time adjustments to the Contract.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012600
SECTION 012900 - PAYMENT PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section specifies administrative and procedural requirements necessary to prepare and process Applications for Payment.

B. Related Sections include the following:
   1. Division 01 Section "Contract Modification Procedures" for administrative procedures for handling changes to the Contract.
   2. Division 01 Section "Construction Progress Documentation" for administrative requirements governing preparation and submittal of Contractor's Construction Schedule and Submittals Schedule.

1.3 DEFINITIONS

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

1.4 SCHEDULE OF VALUES

A. Coordination: Coordinate preparation of the Schedule of Values with preparation of Contractor's Construction Schedule. Cost-loaded CPM Schedule may serve to satisfy requirements for the Schedule of Values.

1. Correlate line items in the Schedule of Values with other required administrative forms and schedules, including the following:
   a. Application for Payment forms with Continuation Sheets.
   b. Submittals Schedule.
   c. Contractor's Construction Schedule.

2. Submit the Schedule of Values to Architect at earliest possible date but no later than seven days before the date scheduled for submittal of initial Applications for Payment.

B. Format and Content: Use the Project Manual table of contents as a guide to establish line items for the Schedule of Values. Provide at least one line item for each Specification Section.

1. Identification: Include the following Project identification on the Schedule of Values:
   a. Project name and location.
   b. Name of Architect.
c. Architect's project number.
d. Contractor's name and address.
e. Date of submittal.

2. Submit draft of AIA Document G703 Continuation Sheets.
3. Arrange the Schedule of Values in tabular form with separate columns to indicate the following for each item listed:
   a. Related Specification Section or Division.
   b. Change Orders (numbers) that affect value.
   c. Dollar value.

   1) Percentage of the Contract Sum to nearest one-hundredth percent, adjusted to total 100 percent.

4. Provide a breakdown of the Contract Sum in enough detail to facilitate continued evaluation of Applications for Payment and progress reports. Coordinate with the Project Manual table of contents. Provide several line items for principal subcontract amounts, where appropriate. Include separate line items under required principal subcontracts for operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training in the amount of 1 percent of the Contract Sum.
5. Round amounts to nearest whole dollar; total shall equal the Contract Sum.
6. Provide a separate line item in the Schedule of Values for each part of the Work where Applications for Payment may include materials or equipment purchased or fabricated and stored, but not yet installed.
   a. Differentiate between items stored on-site and items stored off-site. Include evidence of insurance or bonded warehousing.

7. Provide separate line items in the Schedule of Values for initial cost of materials, for each subsequent stage of completion, and for total installed value of that part of the Work.
8. Allowances: Provide a separate line item in the Schedule of Values for each allowance. Show line-item value of unit-cost allowances, as a product of the unit cost, multiplied by measured quantity. Use information indicated in the Contract Documents to determine quantities.
9. Each item in the Schedule of Values and Applications for Payment shall be complete. Include total cost and proportionate share of general overhead and profit for each item.
   a. Temporary facilities and other major cost items that are not direct cost of actual work-in-place may be shown either as separate line items in the Schedule of Values or distributed as general overhead expense, at Contractor's option.
10. Schedule Updating: Update and resubmit the Schedule of Values before the next Applications for Payment when Change Orders or Construction Change Directives result in a change in the Contract Sum.

1.5 APPLICATIONS FOR PAYMENT

A. Each Application for Payment shall be consistent with previous applications and payments as certified by Architect and paid for by Owner.

1. Initial Application for Payment, Application for Payment at time of project acceptance, and final Application for Payment involve additional requirements.

B. Payment Application Times: Progress payments shall be submitted to Architect by the 25th of the
month. The period covered by each Application for Payment is one month, ending on the last day of the month. Provide a "pencil copy" to the architect no later than the 23rd of the month.

C. Payment Application Forms: Use AIA Document G702 and AIA Document G703 Continuation Sheets as form for Applications for Payment.

D. Application Preparation: Complete every entry on form. Notarize and execute by a person authorized to sign legal documents on behalf of Contractor. Architect will return incomplete applications without action.

1. Entries shall match data on the Schedule of Values and Contractor's Construction Schedule. Use updated schedules if revisions were made.
2. Include amounts of Change Orders and Construction Change Directives issued before last day of construction period covered by application.
3. Transmittal: Submit 5 signed and notarized original copies of each Application for Payment to Architect by a method ensuring receipt. Include copies of minority business participation forms and sales tax certificates. Transmit each copy with a transmittal form listing attachments and recording appropriate information about application.

E. Initial Application for Payment: Administrative actions and submittals that must precede or coincide with submittal of first Application for Payment include the following:

1. List of subcontractors.
2. Schedule of Values.
3. Contractor's Construction Schedule (preliminary if not final).
4. Submittals Schedule (preliminary if not final).
5. List of Contractor's staff assignments.
8. Initial progress report.

F. Application for Payment at project acceptance: After issuing the Certificate of project acceptance, submit an Application for Payment showing 100 percent completion for portion of the Work claimed as substantially complete.

1. Include documentation supporting claim that the Work is substantially complete and a statement showing an accounting of changes to the Contract Sum.
2. This application shall reflect Certificates of Partial project acceptance issued previously for Owner occupancy of designated portions of the Work.

G. Final Payment Application: Submit final Application for Payment with releases and supporting documentation not previously submitted and accepted, including, but not limited to the following:

1. Evidence of completion of Project closeout requirements.
2. Insurance certificates for products and completed operations where required and proof that taxes, fees, and similar obligations were paid.
3. Updated final statement, accounting for final changes to the Contract Sum.
4. AIA Document G706, "Contractor's Affidavit of Payment of Debts and Claims."
6. AIA Document G707, "Consent of Surety to Final Payment."
7. Evidence that claims have been settled.
8. Final meter readings for utilities, a measured record of stored fuel, and similar data as of date of project acceptance or when Owner took possession of and assumed responsibility for
corresponding elements of the Work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 012900
SECTION 013100 - PROJECT MANAGEMENT AND COORDINATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative provisions for coordinating construction operations on Project including, but not limited to, the following:

1. Coordination Drawings.
2. Administrative and supervisory personnel.
3. Project meetings.
4. Requests for Interpretation (RFIs).

B. Each contractor shall participate in coordination requirements. Certain areas of responsibility will be assigned to a specific contractor.

C. Related Sections include the following:

1. Division 01 Section "Construction Progress Documentation" for preparing and submitting Contractor's Construction Schedule.
2. Division 01 Section "Execution" for procedures for coordinating general installation and field-engineering services, including establishment of benchmarks and control points.
3. Division 01 Section "Closeout Procedures" for coordinating closeout of the Contract.

1.3 DEFINITIONS

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

1.4 COORDINATION

A. Coordination: Coordinate construction operations included in different Sections of the Specifications to ensure efficient and orderly installation of each part of the Work. Coordinate construction operations, included in different Sections, that depend on each other for proper installation, connection, and operation.

1. Schedule construction operations in sequence required to obtain the best results where installation of one part of the Work depends on installation of other components, before or after its own installation.
2. Coordinate installation of different components with other contractors to ensure maximum accessibility for required maintenance, service, and repair.
3. Make adequate provisions to accommodate items scheduled for later installation.
4. Where availability of space is limited, coordinate installation of different components to ensure maximum performance and accessibility for required maintenance, service, and repair of all...
components, including mechanical and electrical.

B. Prepare memoranda for distribution to each party involved, outlining special procedures required for coordination. Include such items as required notices, reports, and list of attendees at meetings.

1. Prepare similar memoranda for Owner and separate contractors if coordination of their Work is required.

C. Administrative Procedures: Coordinate scheduling and timing of required administrative procedures with other construction activities and activities of other contractors to avoid conflicts and to ensure orderly progress of the Work. Such administrative activities include, but are not limited to, the following:

1. Preparation of Contractor's Construction Schedule.
2. Preparation of the Schedule of Values.
3. Installation and removal of temporary facilities and controls.
4. Delivery and processing of submittals.
5. Progress meetings.
6. Preinstallation conferences.
7. Project closeout activities.
8. Startup and adjustment of systems.
9. Project closeout activities.

D. Conservation: Coordinate construction activities to ensure that operations are carried out with consideration given to conservation of energy, water, and materials.

1. Salvage materials and equipment involved in performance of, but not actually incorporated into, the Work. Refer to other Sections for disposition of salvaged materials that are designated as Owner's property.

1.5 SUBMITTALS

A. Coordination Drawings: Prepare Coordination Drawings to maximum utilization of space for efficient installation of different components or if coordination is required for installation of products and materials fabricated by separate entities.

1. Content: Project-specific information, drawn accurately to scale. Do not base Coordination Drawings on reproductions of the Contract Documents or standard printed data. Include the following information, as applicable:

a. Indicate functional and spatial relationships of components of architectural, structural, civil, mechanical, and electrical systems.

b. Indicate required installation sequences.

c. Indicate dimensions shown on the Contract Drawings and make specific note of dimensions that appear to be in conflict with submitted equipment and minimum clearance requirements. Provide alternate sketches to Architect for resolution of such conflicts. Minor dimension changes and difficult installations will not be considered changes to the Contract.

2. Sheet Size: At least 8-1/2 by 11 inches but no larger than 30 by 42 inches.

3. Number of Copies: Submit two opaque copies of each submittal. Architect will return 1 copy.

a. Submit five copies where Coordination Drawings are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark
up and retain one returned copy as a Project Record Drawing.

B. Key Personnel Names: Within 15 days of starting construction operations, submit a list of key personnel assignments, including superintendent and other personnel in attendance at Project site. Identify individuals and their duties and responsibilities; list addresses and telephone numbers, including home and office telephone numbers. Provide names, addresses, and telephone numbers of individuals assigned as standbys in the absence of individuals assigned to Project.

1. Post copies of list in Project meeting room, in temporary field office, and by each temporary telephone. Keep list current at all times.

1.6 ADMINISTRATIVE AND SUPERVISORY PERSONNEL

A. General: In addition to Project superintendent, provide other administrative and supervisory personnel as required for proper performance of the Work.

1.7 PROJECT MEETINGS

A. General: Schedule and conduct meetings and conferences at Project site, unless otherwise indicated.

1. Attendees: Inform participants and others involved, and individuals whose presence is required, of date and time of each meeting. Notify Owner and Architect of scheduled meeting dates and times.

2. Agenda: Prepare the meeting agenda. Distribute the agenda to all invited attendees.

3. Minutes: Record significant discussions and agreements achieved. Distribute the meeting minutes to everyone concerned, including Owner and Architect, within three days of the meeting.

4. Architect will conduct Pre-construction meeting and monthly progress meetings. Architect will record and distribute minutes from each.

B. Preconstruction Conference: Preconstruction schedule will be coordinated with Owner, Architect, State Construction representative, and Contractor.

1. Agenda: Discuss items of significance that could affect progress, including the following:

   a. Tentative construction schedule.
   b. Critical work sequencing and long-lead items.
   c. Designation of key personnel and their duties.
   d. Procedures for processing field decisions and Change Orders.
   e. Procedures for RFIs.
   f. Procedures for testing and inspecting.
   g. Procedures for processing Applications for Payment.
   h. Distribution of the Contract Documents.
   i. Submittal procedures.
   j. LEED requirements.
   k. Preparation of Record Documents.
   l. Work restrictions.
   m. Responsibility for temporary facilities and controls.
   n. Construction waste management and recycling.
   o. Parking availability.
   p. Office, work, and storage areas.
   q. Equipment deliveries and priorities.
   r. First aid.
   s. Security.
t. Progress cleaning.
u. Working hours.

2. Minutes: Architect will record and distribute meeting minutes.

C. Preinstallation Conferences: Conduct a preinstallation conference at Project site before each construction activity that requires coordination with other construction.

1. Attendees: Installer and representatives of manufacturers and fabricators involved in or affected by the installation and its coordination or integration with other materials and installations that have preceded or will follow, shall attend the meeting. Advise Architect of scheduled meeting dates.

2. Agenda: Review progress of other construction activities and preparations for the particular activity under consideration, including requirements for the following:
   b. Related RFI's.
   c. Related Change Orders.
   d. Purchases.
   e. Deliveries.
   f. Submittals.
   g. Review of mockups.
   h. Possible conflicts.
   i. Compatibility problems.
   j. Time schedules.
   k. Weather limitations.
   l. Manufacturer's written recommendations.
   m. Warranty requirements.
   n. Compatibility of materials.
   o. Acceptability of substrates.
   p. Temporary facilities and controls.
   q. Space and access limitations.
   r. Testing and inspecting requirements.
   s. Installation procedures.
   t. Coordination with other work.
   u. Required performance results.
   v. Protection of adjacent work.
   w. Protection of construction and personnel.

3. Record significant conference discussions, agreements, and disagreements, including required corrective measures and actions.

4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

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

D. Progress Meetings: Conduct progress meetings at weekly intervals. Coordinate dates of meetings with preparation of payment requests.

1. Attendees: In addition to representatives of Owner and Architect, each contractor, subcontractor, supplier, and other entity concerned with current progress or involved in planning, coordination, or performance of future activities shall be represented at these meetings. All participants at the conference shall be familiar with Project and authorized to conclude matters relating to the Work.

2. Agenda: Review and correct or approve minutes of previous progress meeting. Review other
items of significance that could affect progress. Include topics for discussion as appropriate to status of Project.

a. Contractor's Construction Schedule: Review progress since the last meeting. Determine whether each activity is on time, ahead of schedule, or behind schedule, in relation to Contractor's Construction Schedule. Determine how construction behind schedule will be expedited; secure commitments from parties involved to do so. Discuss whether schedule revisions are required to ensure that current and subsequent activities will be completed within the Contract Time.

1) Review schedule for next period.

b. Review present and future needs of each entity present, including the following:

1) Interface requirements.
2) Sequence of operations.
3) Status of submittals.
4) Deliveries.
5) Off-site fabrication.
6) Access.
7) Site utilization.
8) Progress cleaning.
9) Quality and work standards.
10) Status of correction of deficient items.
11) Field observations.
12) RFIs.
13) Status of proposal requests.
14) Pending changes.
15) Status of Change Orders.
16) Pending claims and disputes.
17) Documentation of information for payment requests.

3. Minutes: Architect will record and distribute to Contractor the meeting minutes.
4. Reporting: Distribute minutes of the meeting to each party present and to parties who should have been present.

a. Schedule Updating: Revise Contractor's Construction Schedule after each progress meeting where revisions to the schedule have been made or recognized. Issue revised schedule concurrently with the report of each meeting.

1.8 REQUESTS FOR INTERPRETATION (RFIs)

A. Procedure: Immediately on discovery of the need for interpretation of the Contract Documents, and if not possible to request interpretation at Project meeting, prepare and submit an RFI in the form specified.

1. RFIs shall originate with Contractor. RFIs submitted by entities other than Contractor will be returned with no response.
2. Coordinate and submit RFIs in a prompt manner so as to avoid delays in Contractor's work or work of subcontractors.

B. Content of the RFI: Include a detailed, legible description of item needing interpretation and the following:

1. Project name.
2. Date.
3. Name of Contractor.
5. RFI number, numbered sequentially.
6. Specification Section number and title and related paragraphs, as appropriate.
7. Drawing number and detail references, as appropriate.
8. Field dimensions and conditions, as appropriate.
9. Contractor's suggested solution(s). If Contractor's solution(s) impact the Contract Time or the Contract Sum, Contractor shall state impact in the RFI.
10. Contractor's signature.
11. Attachments: Include drawings, descriptions, measurements, photos, Product Data, Shop Drawings, and other information necessary to fully describe items needing interpretation.
   a. Supplementary drawings prepared by Contractor shall include dimensions, thicknesses, structural grid references, and details of affected materials, assemblies, and attachments.

C. Software-Generated RFIs: Software-generated form with substantially the same content as indicated above.
   1. Attachments shall be electronic files in Adobe Acrobat PDF format.

D. Architect's Action: Architect will review each RFI, determine action required, and return it. Allow 10 working days for Architect's response for each RFI. RFIs received after 1:00 p.m. will be considered as received the following working day.
   1. The following RFIs will be returned without action:
      a. Requests for approval of submittals.
      b. Requests for approval of substitutions.
      c. Requests for coordination information already indicated in the Contract Documents.
      d. Requests for adjustments in the Contract Time or the Contract Sum.
      e. Requests for interpretation of Architect's actions on submittals.
      f. Incomplete RFIs or RFIs with numerous errors.
   2. Architect's action may include a request for additional information, in which case Architect's time for response will start again.
   3. Architect's action on RFIs that may result in a change to the Contract Time or the Contract Sum may be eligible for Contractor to submit Change Proposal according to Division 01 Section "Contract Modification Procedures."
      a. If Contractor believes the RFI response warrants change in the Contract Time or the Contract Sum, notify Architect in writing within 10 days of receipt of the RFI response.

E. On receipt of Architect's action, update the RFI log and immediately distribute the RFI response to affected parties. Review response and notify Architect within seven days if Contractor disagrees with response.

F. RFI Log: Prepare, maintain, and submit a tabular log of RFIs organized by the RFI number. Submit log monthly. Software log with not less than the following:
   1. Project name.
   2. Name and address of Contractor.
   3. Name and address of Architect.
   4. RFI number including RFIs that were dropped and not submitted.
   5. RFI description.
6. Date the RFI was submitted.
7. Date Architect's response was received.
8. Identification of related Minor Change in the Work, Construction Change Directive, and Proposal Request, as appropriate.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 013100
PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for documenting the progress of construction during performance of the Work, including the following:

1. Contractor's Construction Schedule.
2. Submittals Schedule.
3. Daily construction reports.
4. Field condition reports.
5. Special reports.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes.
3. Division 01 Section "Submittal Procedures" for submitting schedules and reports.
4. Division 01 Section "Quality Requirements" for submitting a schedule of tests and inspections.

1.3 DEFINITIONS

A. Activity: A discrete part of a project that can be identified for planning, scheduling, monitoring, and controlling the construction project. Activities included in a construction schedule consume time and resources.

1. Critical activities are activities on the critical path. They must start and finish on the planned early start and finish times.
2. Predecessor Activity: An activity that precedes another activity in the network.
3. Successor Activity: An activity that follows another activity in the network.

B. Cost Loading: The allocation of the Schedule of Values for the completion of an activity as scheduled. The sum of costs for all activities must equal the total Contract Sum, unless otherwise approved by Architect.

C. CPM: Critical path method, which is a method of planning and scheduling a construction project where activities are arranged based on activity relationships. Network calculations determine when activities can be performed and the critical path of Project.

D. Critical Path: The longest connected chain of interdependent activities through the network schedule that establishes the minimum overall Project duration and contains no float.
E. Event: The starting or ending point of an activity.

F. Float: The measure of leeway in starting and completing an activity.
   1. Float time is not for the exclusive use or benefit of either Owner or Contractor, but is a jointly owned, expiring Project resource available to both parties as needed to meet schedule milestones and Contract completion date.
   2. Free float is the amount of time an activity can be delayed without adversely affecting the early start of the successor activity.
   3. Total float is the measure of leeway in starting or completing an activity without adversely affecting the planned Project completion date.

G. Fragnet: A partial or fragmentary network that breaks down activities into smaller activities for greater detail.

H. Major Area: A story of construction, a separate building, or a similar significant construction element.

I. Milestone: A key or critical point in time for reference or measurement.

J. Network Diagram: A graphic diagram of a network schedule, showing activities and activity relationships.

K. Resource Loading: The allocation of manpower and equipment necessary for the completion of an activity as scheduled.

1.4 SUBMITTALS

A. Qualification Data: For scheduling consultant.

B. Submittals Schedule: Submit three copies of schedule. Arrange the following information in a tabular format:
   1. Scheduled date for first submittal.
   2. Specification Section number and title.
   3. Submittal category (action or informational).
   4. Name of subcontractor.
   5. Description of the Work covered.
   6. Scheduled date for Architect's final release or approval.

C. Preliminary Network Diagram: Submit two opaque copies, large enough to show entire network for entire construction period. Show logic ties for activities.

D. Contractor's Construction Schedule: Submit two opaque copies of initial schedule, large enough to show entire schedule for entire construction period.
   1. Submit an electronic copy of schedule in a .XER file format on CD-R, and labeled to comply with requirements for submittals. Include type of schedule (Initial or Updated) and date on label.

E. CPM Reports: Concurrent with CPM schedule, submit three copies of each of the following computer-generated reports. Format for each activity in reports shall contain activity number, activity description, cost and resource loading, original duration, remaining duration, early start date, early finish date, late start date, late finish date, and total float in calendar days.
   1. Activity Report: List of all activities sorted by activity number and then early start date, or actual
start date if known.
2. Logic Report: List of preceding and succeeding activities for all activities, sorted in ascending order by activity number and then early start date, or actual start date if known.
3. Total Float Report: List of all activities sorted in ascending order of total float.
4. Earnings Report: Compilation of Contractor's total earnings from the Notice to Proceed until most recent Application for Payment.

F. Daily Construction Reports: Submit two copies at monthly intervals.

G. Field Condition Reports: Submit two copies at time of discovery of differing conditions.

H. Special Reports: Submit two copies at time of unusual event.

1.5 QUALITY ASSURANCE

A. Scheduling Consultant Qualifications: An experienced specialist in CPM scheduling and reporting, with capability of producing CPM reports and diagrams within 24 hours of Architect's request.

1.6 COORDINATION

A. Coordinate preparation and processing of schedules and reports with performance of construction activities and with scheduling and reporting of separate contractors.

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

PART 2 - PRODUCTS

2.1 SUBMITTALS SCHEDULE

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

2.2 CONTRACTOR'S CONSTRUCTION SCHEDULE, GENERAL

A. Procedures: Comply with procedures contained in AGC's "Construction Planning & Scheduling."
B. Time Frame: Extend schedule from date established for the Notice of Award to date of Final Completion.

1. Contract completion date shall not be changed by submission of a schedule that shows an early completion date, unless specifically authorized by Change Order.

C. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:

1. Activity Duration: Define activities so no activity is longer than 20 days, unless specifically allowed by Architect.
2. Procurement Activities: Include procurement process activities for the following long lead items and major items, requiring a cycle of more than 60 days, as separate activities in schedule. Procurement cycle activities include, but are not limited to, submittals, approvals, purchasing, fabrication, and delivery.
   a. HVAC equipment.
   b. Geothermal Well Drilling
   c. Owner provided equipment
   d. Lighting fixtures
4. Startup and Testing Time: Include not less than 30 days for startup and testing.
5. Project Acceptance: Indicate completion in advance of date established for project acceptance, and allow time for Architect's administrative procedures necessary for certification of project acceptance.

D. Constraints: Include constraints and work restrictions indicated in the Contract Documents and as follows in schedule, and show how the sequence of the Work is affected.

1. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 01 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
2. Work Restrictions: Show the effect of the following items on the schedule:
   a. Uninterruptible services.
   b. Environmental control.
3. Work Stages: Indicate important stages of construction for each major portion of the Work, including, but not limited to, the following:
   a. Submittals.
   b. Mockups.
   c. Fabrication.
   d. Sample testing.
   e. Deliveries.
   f. Installation.
   g. Tests and inspections.
   h. Adjusting.
   i. Curing.
   j. Startup and placement into final use and operation.

E. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not
limited to, the Notice to Proceed, project acceptance, and Final Completion, and the following interim milestones:

1. Building in the dry.
2. Temporary permanent power.
3. Commissioning.

F. Cost Correlation: At the head of schedule, provide a cost correlation line, indicating planned and actual costs. On the line, show dollar volume of the Work performed as of dates used for preparation of payment requests.

1. Refer to Division 01 Section "Payment Procedures" for cost reporting and payment procedures.
2. Contractor shall assign cost to construction activities on the CPM schedule. Costs shall not be assigned to submittal activities unless specified otherwise but may, with Architect's approval, be assigned to fabrication and delivery activities. Costs shall be under required principal subcontracts for testing and commissioning activities, operation and maintenance manuals, punch list activities, Project Record Documents, and demonstration and training (if applicable), in the amount of 5 percent of the Contract Sum.
3. Each activity cost shall reflect an accurate value subject to approval by Architect.
4. Total cost assigned to activities shall equal the total Contract Sum.

G. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragnets to demonstrate the effect of the proposed change on the overall project schedule.

H. Computer Software: Prepare schedules using a program that has been developed specifically to manage construction schedules.

2.3 CONTRACTOR'S CONSTRUCTION SCHEDULE (CPM SCHEDULE)

A. General: Prepare network diagrams using AON (activity-on-node) format.

B. Preliminary Network Diagram: Submit diagram within 14 days of date established for the Notice to Proceed. Outline significant construction activities for the first 60 days of construction. Include skeleton diagram for the remainder of the Work and a cash requirement prediction based on indicated activities.

C. CPM Schedule: Prepare Contractor's Construction Schedule using a computerized, time-scaled CPM network analysis diagram for the Work.

1. Develop network diagram in sufficient time to submit CPM schedule so it can be accepted for use no later than 30 days after date established for the Notice to Proceed.
   a. Failure to include any work item required for performance of this Contract shall not excuse Contractor from completing all work within applicable completion dates, regardless of Architect's approval of the schedule.

2. Conduct educational workshops to train and inform key Project personnel, including subcontractors' personnel, in proper methods of providing data and using CPM schedule information.

3. Establish procedures for monitoring and updating CPM schedule and for reporting progress. Coordinate procedures with progress meeting and payment request dates.

4. Use "one workday" as the unit of time. Include list of nonworking days and holidays incorporated into the schedule.
D. CPM Schedule Preparation: Prepare a list of all activities required to complete the Work. Using the preliminary network diagram, prepare a skeleton network to identify probable critical paths.

1. Activities: Indicate the estimated time duration, sequence requirements, and relationship of each activity in relation to other activities. Include estimated time frames for the following activities:
   a. Preparation and processing of submittals.
   b. Mobilization and demobilization.
   c. Purchase of materials.
   d. Delivery.
   e. Fabrication.
   f. Utility interruptions.
   g. Installation.
   h. Work by Owner that may affect or be affected by Contractor's activities.
   i. Testing and commissioning.

2. Critical Path Activities: Identify critical path activities, including those for interim completion dates. Scheduled start and completion dates shall be consistent with Contract milestone dates.

3. Processing: Process data to produce output data on a computer-drawn, time-scaled network. Revise data, reorganize activity sequences, and reproduce as often as necessary to produce the CPM schedule within the limitations of the Contract Time.

4. Format: Mark the critical path. Locate the critical path near center of network; locate paths with most float near the edges.
   a. Subnetworks on separate sheets are permissible for activities clearly off the critical path.

E. Initial Issue of Schedule: Prepare initial network diagram from a list of straight "early start-total float" sort. Identify critical activities. Prepare tabulated reports showing the following:

1. Contractor or subcontractor and the Work or activity.
2. Description of activity.
3. Principal events of activity.
4. Immediate preceding and succeeding activities.
5. Early and late start dates.
6. Early and late finish dates.
7. Activity duration in workdays.
8. Total float or slack time.
10. Dollar value of activity (coordinated with the Schedule of Values).

F. Schedule Updating: Concurrent with making revisions to schedule, prepare tabulated reports showing the following:

1. Identification of activities that have changed.
2. Changes in early and late start dates.
3. Changes in early and late finish dates.
5. Changes in the critical path.
6. Changes in total float or slack time.

G. Value Summaries: Prepare two cumulative value lists, sorted by finish dates.

1. In first list, tabulate activity number, early finish date, dollar value, and cumulative dollar value.
2. In second list, tabulate activity number, late finish date, dollar value, and cumulative dollar value.
3. In subsequent issues of both lists, substitute actual finish dates for activities completed as of list date.
4. Prepare list for ease of comparison with payment requests; coordinate timing with progress meetings.
   a. In both value summary lists, tabulate "actual percent complete" and "cumulative value completed" with total at bottom.
   b. Submit value summary printouts one week before each regularly scheduled progress meeting.

2.4 REPORTS

A. Daily Construction Reports: Prepare a daily construction report recording the following information concerning events at Project site:

1. List of subcontractors at Project site.
2. List of separate contractors at Project site.
3. Approximate count of personnel at Project site.
4. Equipment at Project site.
5. Material deliveries.
6. High and low temperatures and general weather conditions.
7. Accidents.
8. Meetings and significant decisions.
9. Unusual events (refer to special reports).
10. Stoppages, delays, shortages, and losses.
11. Change Orders received and implemented.
12. Construction Change Directives received and implemented.
13. Services connected and disconnected.

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

2.5 SPECIAL REPORTS

A. General: Submit special reports directly to Architect within one day(s) of an occurrence. Distribute copies of report to parties affected by the occurrence.

B. Reporting Unusual Events: When an event of an unusual and significant nature occurs at Project site, whether or not related directly to the Work, prepare and submit a special report. List chain of events, persons participating, response by Contractor's personnel, evaluation of results or effects, and similar pertinent information. Advise Owner in advance when these events are known or predictable.

PART 3 - EXECUTION

3.1 CONTRACTOR'S CONSTRUCTION SCHEDULE

A. Scheduling Consultant: Engage a consultant to provide planning, evaluation, and reporting using CPM scheduling.
1. In-House Option: Owner may waive the requirement to retain a consultant if Contractor employs skilled personnel with experience in CPM scheduling and reporting techniques. Submit qualifications.

2. Meetings: Scheduling consultant shall attend all meetings related to Project progress, alleged delays, and time impact.

B. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress and activities. Issue schedule one week before each regularly scheduled progress meeting.

   1. Revise schedule immediately after each meeting or other activity where revisions have been recognized or made. Issue updated schedule concurrently with the report of each such meeting.
   2. Include a report with updated schedule that indicates every change, including, but not limited to, changes in logic, durations, actual starts and finishes, and activity durations.
   3. As the Work progresses, indicate Actual Completion percentage for each activity.

C. Distribution: Distribute copies of approved schedule to Architect Owner, separate contractors, testing and inspecting agencies, and other parties identified by Contractor with a need-to-know schedule responsibility.

   1. Post copies in Project meeting rooms and temporary field offices.
   2. When revisions are made, distribute updated schedules to the same parties and post in the same locations. Delete parties from distribution when they have completed their assigned portion of the Work and are no longer involved in performance of construction activities.

END OF SECTION 013200
SECTION 013310 - SUBMITTAL PROCEDURES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for submitting Shop Drawings, Product Data, Samples, and other submittals.

B. Related Sections include the following:

1. Division 01 Section "Payment Procedures" for submitting Applications for Payment and the Schedule of Values.
2. Division 01 Section "Project Management and Coordination" for submitting and distributing meeting and conference minutes and for submitting Coordination Drawings.
3. Division 01 Section "Quality Requirements" for submitting test and inspection reports and for mockup requirements.
4. Division 01 Section "Closeout Procedures" for submitting warranties.
5. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
6. Division 01 Section "Operation and Maintenance Data" for submitting operation and maintenance manuals.
7. Division 01 Section "Demonstration and Training" for submitting videotapes of demonstration of equipment and training of Owner's personnel.
8. Divisions 02 through 49 Sections for specific requirements for submittals in those Sections.

1.3 DEFINITIONS

A. Action Submittals: Written and graphic information that requires Architect's responsive action.

B. Informational Submittals: Written information that does not require Architect's responsive action. Submittals may be rejected for not complying with requirements.

1.4 SUBMITTAL PROCEDURES

A. General: Electronic copies of CAD Drawings of the Contract Drawings will not be provided by Architect for Contractor's use in preparing submittals.

B. Coordination: Coordinate preparation and processing of submittals with performance of construction activities.

1. Coordinate each submittal with fabrication, purchasing, testing, delivery, other submittals, and related activities that require sequential activity.

2. Coordinate transmittal of different types of submittals for related parts of the Work so processing...
will not be delayed because of need to review submittals concurrently for coordination.

a. Architect reserves the right to withhold action on a submittal requiring coordination with other submittals until related submittals are received.

C. Submittals Schedule: Comply with requirements in Division 01 Section "Construction Progress Documentation" for list of submittals and time requirements for scheduled performance of related construction activities.

D. Processing Time: Allow enough time for submittal review, including time for resubmittals, as follows. Time for review shall commence on Architect's receipt of submittal. No extension of the Contract Time will be authorized because of failure to transmit submittals enough in advance of the Work to permit processing, including resubmittals.

1. Initial Review: Allow 15 days for initial review of each submittal. Allow additional time if coordination with subsequent submittals is required. Architect will advise Contractor when a submittal being processed must be delayed for coordination.

2. Intermediate Review: If intermediate submittal is necessary, process it in same manner as initial submittal.

3. Resubmittal Review: Allow 15 days for review of each resubmittal.

4. Sequential Review: Where sequential review of submittals by Architect's consultants, Owner, or other parties is indicated, allow 21 days for initial review of each submittal.

E. Identification: Place a permanent label or title block on each submittal for identification.

1. Indicate name of firm or entity that prepared each submittal on label or title block.

2. Provide a space approximately 6 by 8 inches on label or beside title block to record Contractor's review and approval markings and action taken by Architect.

3. Include the following information on label for processing and recording action taken:

   a. Project name.
   b. Date.
   c. Name and address of Architect.
   d. Name and address of Contractor.
   e. Name and address of subcontractor.
   f. Name and address of supplier.
   g. Name of manufacturer.
   h. Submittal number or other unique identifier, including revision identifier.

   1) Submittal number shall use Specification Section number followed by a decimal point and then a sequential number (e.g., 061000.01). Resubmittals shall include an alphabetic suffix after another decimal point (e.g., 061000.01.A).

   i. Number and title of appropriate Specification Section.
   j. Other necessary identification.

F. Deviations: Highlight, encircle, or otherwise specifically identify deviations from the Contract Documents on submittals.

G. Additional Copies: Unless additional copies are required for final submittal, and unless Architect observes noncompliance with provisions in the Contract Documents, initial submittal may serve as final submittal.

1. Submit one copy of submittal to concurrent reviewer in addition to specified number of copies to Architect.
2. Additional copies submitted for maintenance manuals will not be marked with action taken and will be returned.

H. Transmittal: Package each submittal individually and appropriately for transmittal and handling. Transmit each submittal using a transmittal form. Architect will return submittals, without review, received from sources other than Contractor.

1. Transmittal Form: Provide locations on form for the following information:
   a. Project name.
   b. Date.
   c. Destination (To:).
   d. Source (From:).
   e. Names of subcontractor, manufacturer, and supplier.
   f. Category and type of submittal.
   g. Submittal purpose and description.
   h. Specification Section number and title.
   i. Drawing number and detail references, as appropriate.
   j. Transmittal number, numbered consecutively.
   k. Submittal and transmittal distribution record.
   l. Remarks.
   m. Signature of transmitter.

2. On an attached separate sheet, prepared on Contractor's letterhead, record relevant information, requests for data, revisions other than those requested by Architect on previous submittals, and deviations from requirements in the Contract Documents, including minor variations and limitations. Include same label information as related submittal.

I. Resubmittals: Make resubmittals in same form and number of copies as initial submittal.

1. Note date and content of previous submittal.
2. Note date and content of revision in label or title block and clearly indicate extent of revision.
3. Resubmit submittals until they are marked "Approved, or approved as noted."

J. Distribution: Furnish copies of final submittals to manufacturers, subcontractors, suppliers, fabricators, installers, authorities having jurisdiction, and others as necessary for performance of construction activities. Show distribution on transmittal forms.

K. Use for Construction: Use only final submittals with mark indicating "Approved or approved as noted" taken by Architect.

1.5 CONTRACTOR'S USE OF ARCHITECT'S CAD FILES

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

1. Release of liability associated with the utilization of the files and submission of Architect's form for release.
2. Payment for administrative time associated with production of the files at $50/sheet.
3. Utilization of the files in the format provided by the architect without conversion to multiple file types. File type provided will be .dwg. Autocad version 2006 or later.
4. No adjustments for layering or formatting.
5. Availability of Architect's consultant’s files is limited and subject to their individual company policy.
PART 2 - PRODUCTS

2.1 ACTION SUBMITTALS

A. General: Prepare and submit Action Submittals required by individual Specification Sections.

1. Submit electronic submittals directly to FTP site specifically established for Project.

B. Product Data: Collect information into a single submittal for each element of construction and type of product or equipment.

1. If information must be specially prepared for submittal because standard printed data are not suitable for use, submit as Shop Drawings, not as Product Data.
2. Mark each copy of each submittal to show which products and options are applicable.
3. Include the following information, as applicable:
   a. Manufacturer's written recommendations.
   b. Manufacturer's product specifications.
   c. Manufacturer's installation instructions.
   d. Standard color charts.
   e. Manufacturer's catalog cuts.
   f. Wiring diagrams showing factory-installed wiring.
   g. Standard product operation and maintenance manuals.
   h. Compliance with specified referenced standards.
   i. Testing by recognized testing agency.
   j. Application of testing agency labels and seals.
   k. Notation of coordination requirements.

4. Submit Product Data before or concurrent with Samples.
5. Number of Copies: Submit three copies of Product Data, unless otherwise indicated. Architect will return two copies. Mark up and retain one returned copy as a Project Record Document.

C. Shop Drawings: Prepare Project-specific information, drawn accurately to scale. Do not base Shop Drawings on reproductions of the Contract Documents or standard printed data.

1. Preparation: Fully illustrate requirements in the Contract Documents. Include the following information, as applicable:
   a. Dimensions.
   b. Identification of products.
   c. Fabrication and installation drawings.
   d. Roughing-in and setting diagrams.
   e. Wiring diagrams showing field-installed wiring, including power, signal, and control wiring.
   f. Shopwork manufacturing instructions.
   g. Templates and patterns.
   h. Schedules.
   i. Design calculations.
   j. Compliance with specified standards.
   k. Notation of coordination requirements.
   l. Notation of dimensions established by field measurement.
   m. Relationship to adjoining construction clearly indicated.
   n. Seal and signature of professional engineer if specified.
o. Wiring Diagrams: Differentiate between manufacturer-installed and field-installed wiring.

2. Sheet Size: Except for templates, patterns, and similar full-size drawings, submit Shop Drawings on sheets at least 8-1/2 by 11 inches but no larger than 30 by 42 inches.

3. Number of Copies: Submit three opaque copies of each submittal, unless copies are required for operation and maintenance manuals. Submit five copies where copies are required for operation and maintenance manuals. Architect will retain two copies; remainder will be returned. Mark up and retain one returned copy as a Project Record Drawing.

D. Samples: Submit Samples for review of kind, color, pattern, and texture for a check of these characteristics with other elements and for a comparison of these characteristics between submittal and actual component as delivered and installed.

1. Transmit Samples that contain multiple, related components such as accessories together in one submittal package.

2. Identification: Attach label on unexposed side of Samples that includes the following:

   a. Generic description of Sample.
   b. Product name and name of manufacturer.
   c. Sample source.
   d. Number and title of appropriate Specification Section.

3. Disposition: Maintain sets of approved Samples at Project site, available for quality-control comparisons throughout the course of construction activity. Sample sets may be used to determine final acceptance of construction associated with each set.

   a. Samples that may be incorporated into the Work are indicated in individual Specification Sections. Such Samples must be in an undamaged condition at time of use.
   b. Samples not incorporated into the Work, or otherwise designated as Owner's property, are the property of Contractor.

4. Samples for Initial Selection: Submit manufacturer's color charts consisting of units or sections of units showing the full range of colors, textures, and patterns available.

   a. Number of Samples: Submit one full set(s) of available choices where color, pattern, texture, or similar characteristics are required to be selected from manufacturer's product line. Architect will return submittal with options selected.

5. Samples for Verification: Submit full-size units or Samples of size indicated, prepared from same material to be used for the Work, cured and finished in manner specified, and physically identical with material or product proposed for use, and that show full range of color and texture variations expected. Samples include, but are not limited to, the following: partial sections of manufactured or fabricated components; small cuts or containers of materials; complete units of repetitively used materials; swatches showing color, texture, and pattern; color range sets; and components used for independent testing and inspection.

   a. Number of Samples: Submit three sets of Samples. Architect will retain one Sample set; remainder will be returned.

      1) Submit a single Sample where assembly details, workmanship, fabrication techniques, connections, operation, and other similar characteristics are to be demonstrated.

      2) If variation in color, pattern, texture, or other characteristic is inherent in material or product represented by a Sample, submit at least three sets of paired units that show approximate limits of variations.
E. **Product Schedule or List:** As required in individual Specification Sections, prepare a written summary indicating types of products required for the Work and their intended location. Include the following information in tabular form:

1. **Type of product.** Include unique identifier for each product.
2. **Number and name of room or space.**
3. **Location within room or space.**
4. **Number of Copies:** Submit three copies of product schedule or list, unless otherwise indicated. Architect will return two copies.
   a. Mark up and retain one returned copy as a Project Record Document.

F. **Contractor's Construction Schedule:** Comply with requirements specified in Division 01 Section "Construction Progress Documentation" for Construction Manager's action.

G. **Submittals Schedule:** Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

H. **Application for Payment:** Comply with requirements specified in Division 01 Section "Payment Procedures."

I. **Schedule of Values:** Comply with requirements specified in Division 01 Section "Payment Procedures."

J. **Subcontract List:** Prepare a written summary identifying individuals or firms proposed for each portion of the Work, including those who are to furnish products or equipment fabricated to a special design. Include the following information in tabular form:

1. Name, address, and telephone number of entity performing subcontract or supplying products.
2. **Number and title of related Specification Section(s) covered by subcontract.**
3. **Drawing number and detail references, as appropriate, covered by subcontract.**
4. **Number of Copies:** Submit three copies of subcontractor list, unless otherwise indicated. Architect will return two copies.
   a. Mark up and retain one returned copy as a Project Record Document.

2.2 **INFORMATIONAL SUBMITTALS**

A. **General:** Prepare and submit Informational Submittals required by other Specification Sections.

1. **Number of Copies:** Submit two copies of each submittal, unless otherwise indicated. Architect will not return copies.
2. **Certificates and Certifications:** Provide a notarized statement that includes signature of entity responsible for preparing certification. Certificates and certifications shall be signed by an officer or other individual authorized to sign documents on behalf of that entity.
3. **Test and Inspection Reports:** Comply with requirements specified in Division 01 Section "Quality Requirements."

B. **Coordination Drawings:** Comply with requirements specified in Division 01 Section "Project Management and Coordination."

C. **Contractor's Construction Schedule:** Comply with requirements specified in Division 01 Section "Construction Progress Documentation."

D. **Qualification Data:** Prepare written information that demonstrates capabilities and experience of firm or
person. Include lists of completed projects with project names and addresses, names and addresses of architects and owners, and other information specified.

E. Welding Certificates: Prepare written certification that welding procedures and personnel comply with requirements in the Contract Documents. Submit record of Welding Procedure Specification (WPS) and Procedure Qualification Record (PQR) on AWS forms. Include names of firms and personnel certified.

F. Installer Certificates: Prepare written statements on manufacturer's letterhead certifying that Installer complies with requirements in the Contract Documents and, where required, is authorized by manufacturer for this specific Project.

G. Manufacturer Certificates: Prepare written statements on manufacturer's letterhead certifying that manufacturer complies with requirements in the Contract Documents. Include evidence of manufacturing experience where required.

H. Product Certificates: Prepare written statements on manufacturer's letterhead certifying that product complies with requirements in the Contract Documents.

I. Material Certificates: Prepare written statements on manufacturer's letterhead certifying that material complies with requirements in the Contract Documents.

J. Material Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting test results of material for compliance with requirements in the Contract Documents.

K. Product Test Reports: Prepare written reports indicating current product produced by manufacturer complies with requirements in the Contract Documents. Base reports on evaluation of tests performed by manufacturer and witnessed by a qualified testing agency, or on comprehensive tests performed by a qualified testing agency.

L. Research/Evaluation Reports: Prepare written evidence, from a model code organization acceptable to authorities having jurisdiction, that product complies with building code in effect for Project. Include the following information:

1. Name of evaluation organization.
2. Date of evaluation.
3. Time period when report is in effect.
4. Product and manufacturers' names.
5. Description of product.
6. Test procedures and results.
7. Limitations of use.

M. Schedule of Tests and Inspections: Comply with requirements specified in Division 01 Section "Quality Requirements."

N. Preconstruction Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of tests performed before installation of product, for compliance with performance requirements in the Contract Documents.

O. Compatibility Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of compatibility tests performed before installation of product. Include written recommendations for primers and substrate preparation needed for adhesion.

P. Field Test Reports: Prepare reports written by a qualified testing agency, on testing agency's standard form, indicating and interpreting results of field tests performed either during installation of product or
after product is installed in its final location, for compliance with requirements in the Contract Documents.

Q. Maintenance Data: Prepare written and graphic instructions and procedures for operation and normal maintenance of products and equipment. Comply with requirements specified in Division 01 Section "Operation and Maintenance Data."

R. Design Data: Prepare written and graphic information, including, but not limited to, performance and design criteria, list of applicable codes and regulations, and calculations. Include list of assumptions and other performance and design criteria and a summary of loads. Include load diagrams if applicable. Provide name and version of software, if any, used for calculations. Include page numbers.

S. Manufacturer's Instructions: Prepare written or published information that documents manufacturer's recommendations, guidelines, and procedures for installing or operating a product or equipment. Include name of product and name, address, and telephone number of manufacturer. Include the following, as applicable:

1. Preparation of substrates.
2. Required substrate tolerances.
3. Sequence of installation or erection.
4. Required installation tolerances.
5. Required adjustments.
6. Recommendations for cleaning and protection.

T. Manufacturer's Field Reports: Prepare written information documenting factory-authorized service representative's tests and inspections. Include the following, as applicable:

1. Name, address, and telephone number of factory-authorized service representative making report.
2. Statement on condition of substrates and their acceptability for installation of product.
3. Statement that products at Project site comply with requirements.
4. Summary of installation procedures being followed, whether they comply with requirements and, if not, what corrective action was taken.
5. Results of operational and other tests and a statement of whether observed performance complies with requirements.
6. Statement whether conditions, products, and installation will affect warranty.
7. Other required items indicated in individual Specification Sections.

U. Material Safety Data Sheets (MSDSs): Submit information directly to Owner; do not submit to Architect.

1. Architect will not review submittals that include MSDSs and will return the entire submittal for resubmittal.

2.3 DELEGATED DESIGN

A. Performance and Design Criteria: Where professional design services or certifications by a design professional are specifically required of Contractor by the Contract Documents, provide products and systems complying with specific performance and design criteria indicated.

1. If criteria indicated are not sufficient to perform services or certification required, submit a written request for additional information to Architect.

B. Delegated-Design Submittal: In addition to Shop Drawings, Product Data, and other required submittals, submit three copies of a statement, signed and sealed by the responsible design professional, for each
product and system specifically assigned to Contractor to be designed or certified by a design professional.

1. Indicate that products and systems comply with performance and design criteria in the Contract Documents. Include list of codes, loads, and other factors used in performing these services.

PART 3 - EXECUTION

3.1 CONTRACTOR'S REVIEW

A. Review each submittal and check for coordination with other Work of the Contract and for compliance with the Contract Documents. Note corrections and field dimensions. Mark with approval stamp before submitting to Architect.

B. Approval Stamp: Stamp each submittal with a uniform, approval stamp. Include Project name and location, submittal number, Specification Section title and number, name of reviewer, date of Contractor's approval, and statement certifying that submittal has been reviewed, checked, and approved for compliance with the Contract Documents.

3.2 ARCHITECT'S ACTION

A. General: Architect will not review submittals that do not bear Contractor's approval stamp and will return them without action.

B. Action Submittals: Architect will review each submittal, make marks to indicate corrections or modifications required, and return it. Architect will stamp each submittal with an action stamp and will mark stamp appropriately to indicate action taken, as follows:

C. Informational Submittals: Architect will review each submittal and will not return it, or will return it if it does not comply with requirements. Architect will forward each submittal to appropriate party.

D. Partial submittals are not acceptable, will be considered nonresponsive, and will be returned without review.

E. Submittals not required by the Contract Documents may not be reviewed and may be discarded.

END OF SECTION 013300
SECTION 014000 - QUALITY REQUIREMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for quality assurance and quality control.

B. Testing and inspecting services are required to verify compliance with requirements specified or indicated. These services do not relieve Contractor of responsibility for compliance with the Contract Document requirements.

1. Specific quality-assurance and -control requirements for individual construction activities are specified in the Sections that specify those activities. Requirements in those Sections may also cover production of standard products.

2. Specified tests, inspections, and related actions do not limit Contractor's other quality-assurance and -control procedures that facilitate compliance with the Contract Document requirements.

3. Requirements for Contractor to provide quality-assurance and -control services required by Architect, Owner, or authorities having jurisdiction are not limited by provisions of this Section.

C. Related Sections include the following:

1. Division 01 Section "Cutting and Patching" for repair and restoration of construction disturbed by testing and inspecting activities.

2. Divisions 02 through 49 Sections for specific test and inspection requirements.

1.3 DEFINITIONS

A. Quality-Assurance Services: Activities, actions, and procedures performed before and during execution of the Work to guard against defects and deficiencies and substantiate that proposed construction will comply with requirements.

B. Quality-Control Services: Tests, inspections, procedures, and related actions during and after execution of the Work to evaluate that actual products incorporated into the Work and completed construction comply with requirements. Services do not include contract enforcement activities performed by Architect.

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

D. Laboratory Mockups: Full-size, physical assemblies that are constructed at testing facility to verify performance characteristics.
E. Preconstruction Testing: Tests and inspections that are performed specifically for the Project before products and materials are incorporated into the Work to verify performance or compliance with specified criteria.

F. Product Testing: Tests and inspections that are performed by an NRTL, an NVLAP, or a testing agency qualified to conduct product testing and acceptable to authorities having jurisdiction, to establish product performance and compliance with industry standards.

G. Source Quality-Control Testing: Tests and inspections that are performed at the source, i.e., plant, mill, factory, or shop.

H. Field Quality-Control Testing: Tests and inspections that are performed on-site for installation of the Work and for completed Work.

I. Testing Agency: An entity engaged to perform specific tests, inspections, or both. Testing laboratory shall mean the same as testing agency.

J. Installer/Applicator/Erector: Contractor or another entity engaged by Contractor as an employee, Subcontractor, or Sub-subcontractor, to perform a particular construction operation, including installation, erection, application, and similar operations.

1. Using a term such as "carpentry" does not imply that certain construction activities must be performed by accredited or unionized individuals of a corresponding generic name, such as "carpenter." It also does not imply that requirements specified apply exclusively to tradespeople of the corresponding generic name.

K. Experienced: When used with an entity, "experienced" means having successfully completed a minimum of five previous projects similar in size and scope to this Project; being familiar with special requirements indicated; and having complied with requirements of authorities having jurisdiction.

1.4 CONFLICTING REQUIREMENTS

A. General: If compliance with two or more standards is specified and the standards establish different or conflicting requirements for minimum quantities or quality levels, comply with the most stringent requirement. Refer uncertainties and requirements that are different, but apparently equal, to Architect for a decision before proceeding.

B. Minimum Quantity or Quality Levels: The quantity or quality level shown or specified shall be the minimum provided or performed. The actual installation may comply exactly with the minimum quantity or quality specified, or it may exceed the minimum within reasonable limits. To comply with these requirements, indicated numeric values are minimum or maximum, as appropriate, for the context of requirements. Refer uncertainties to Architect for a decision before proceeding.

1.5 SUBMITTALS

A. Reports: Prepare and submit certified written reports that include the following:

1. Date of issue.
2. Project title and number.
3. Name, address, and telephone number of testing agency.
4. Dates and locations of samples and tests or inspections.
5. Names of individuals making tests and inspections.
6. Description of the Work and test and inspection method.
8. Complete test or inspection data.
9. Test and inspection results and an interpretation of test results.
10. Record of temperature and weather conditions at time of sample taking and testing and inspecting.
11. Comments or professional opinion on whether tested or inspected Work complies with the Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting and reinspecting.

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

1.6 QUALITY ASSURANCE

A. General: Qualifications paragraphs in this Article establish the minimum qualification levels required; individual Specification Sections specify additional requirements.

B. Installer Qualifications: A firm or individual experienced in installing, erecting, or assembling work similar in material, design, and extent to that indicated for this Project, whose work has resulted in construction with a record of successful in-service performance.

C. Manufacturer Qualifications: A firm experienced in manufacturing products or systems similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

D. Fabricator Qualifications: A firm experienced in producing products similar to those indicated for this Project and with a record of successful in-service performance, as well as sufficient production capacity to produce required units.

E. Professional Engineer Qualifications: A professional engineer who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing engineering services of the kind indicated. Engineering services are defined as those performed for installations of the system, assembly, or product that are similar to those indicated for this Project in material, design, and extent.

F. Specialists: Certain sections of the Specifications require that specific construction activities shall be performed by entities who are recognized experts in those operations. Specialists shall satisfy qualification requirements indicated and shall be engaged for the activities indicated.

1. Requirement for specialists shall not supersede building codes and regulations governing the Work.

G. Testing Agency Qualifications: An NRTL, an NVLAP, or an independent agency with the experience and capability to conduct testing and inspecting indicated, as documented according to ASTM E 548; and with additional qualifications specified in individual Sections; and where required by authorities having jurisdiction, that is acceptable to authorities.

1. NRTL: A nationally recognized testing laboratory according to 29 CFR 1910.7.
2. NVLAP: A testing agency accredited according to NIST's National Voluntary Laboratory Accreditation Program.

H. Factory-Authorized Service Representative Qualifications: An authorized representative of manufacturer who is trained and approved by manufacturer to inspect installation of manufacturer's products that are
similar in material, design, and extent to those indicated for this Project.

I. Preconstruction Testing: Where testing agency is indicated to perform preconstruction testing for compliance with specified requirements for performance and test methods, comply with the following:

1. Contractor responsibilities include the following:
   a. Provide test specimens representative of proposed products and construction.
   b. Submit specimens in a timely manner with sufficient time for testing and analyzing results to prevent delaying the Work.
   c. Provide sizes and configurations of test assemblies, mockups, and laboratory mockups to adequately demonstrate capability of products to comply with performance requirements.
   d. Build site-assembled test assemblies and mockups using installers who will perform same tasks for Project.
   e. Build laboratory mockups at testing facility using personnel, products, and methods of construction indicated for the completed Work.
   f. When testing is complete, remove test specimens, assemblies, mockups, and laboratory mockups; do not reuse products on Project.

2. Testing Agency Responsibilities: Submit a certified written report of each test, inspection, and similar quality-assurance service to Architect, with copy to Contractor. Interpret tests and inspections and state in each report whether tested and inspected work complies with or deviates from the Contract Documents.

J. Mockups: Before installing portions of the Work requiring mockups, build mockups for each form of construction and finish required to comply with the following requirements, using materials indicated for the completed Work:

1. Build mockups in location and of size indicated or, if not indicated, as directed by Architect.
2. Notify Architect seven days in advance of dates and times when mockups will be constructed.
3. Demonstrate the proposed range of aesthetic effects and workmanship.
4. Obtain Architect's approval of mockups before starting work, fabrication, or construction.
   a. Allow seven days for initial review and each re-review of each mockup.

5. Maintain mockups during construction in an undisturbed condition as a standard for judging the completed Work.
6. Demolish and remove mockups when directed, unless otherwise indicated.

K. Laboratory Mockups: Comply with requirements of preconstruction testing and those specified in individual Sections in Divisions 02 through 49.

1.7 QUALITY CONTROL

A. Owner Responsibilities: Where quality-control services are indicated as Owner's responsibility, Owner will engage a qualified testing agency to perform these services.

1. Owner will furnish Contractor with names, addresses, and telephone numbers of testing agencies engaged and a description of types of testing and inspecting they are engaged to perform.
2. Costs for retesting and reinspecting construction that replaces or is necessitated by work that failed to comply with the Contract Documents will be charged to Contractor, and the Contract Sum will be adjusted by Change Order.

B. Tests and inspections not explicitly assigned to Owner are Contractor's responsibility. Unless otherwise
indicated, provide quality-control services specified and those required by authorities having jurisdiction. Perform quality-control services required of Contractor by authorities having jurisdiction, whether specified or not.

1. Where services are indicated as Contractor's responsibility, engage a qualified testing agency to perform these quality-control services.

   a. Contractor shall not employ same entity engaged by Owner, unless agreed to in writing by Owner.

2. Notify testing agencies at least 24 hours in advance of time when Work that requires testing or inspecting will be performed.

3. Where quality-control services are indicated as Contractor's responsibility, submit a certified written report, in duplicate, of each quality-control service.

4. Testing and inspecting requested by Contractor and not required by the Contract Documents are Contractor's responsibility.

5. Submit additional copies of each written report directly to authorities having jurisdiction, when they so direct.

C. Manufacturer's Field Services: Where indicated, engage a factory-authorized service representative to inspect field-assembled components and equipment installation, including service connections. Report results in writing as specified in Division 01 Section "Submittal Procedures."

D. Retesting/Reinspecting: Regardless of whether original tests or inspections were Contractor's responsibility, provide quality-control services, including retesting and reinspecting, for construction that replaced Work that failed to comply with the Contract Documents.

E. Associated Services: Cooperate with agencies performing required tests, inspections, and similar quality-control services, and provide reasonable auxiliary services as requested. Notify agency sufficiently in advance of operations to permit assignment of personnel. Provide the following:

1. Access to the Work.

2. Incidental labor and facilities necessary to facilitate tests and inspections.

3. Adequate quantities of representative samples of materials that require testing and inspecting. Assist agency in obtaining samples.

4. Facilities for storage and field curing of test samples.

5. Delivery of samples to testing agencies.

6. Preliminary design mix proposed for use for material mixes that require control by testing agency.

7. Security and protection for samples and for testing and inspecting equipment at Project site.

F. Coordination: Coordinate sequence of activities to accommodate required quality-assurance and -control services with a minimum of delay and to avoid necessity of removing and replacing construction to accommodate testing and inspecting.

1. Schedule times for tests, inspections, obtaining samples, and similar activities.

G. Schedule of Tests and Inspections: Prepare a schedule of tests, inspections, and similar quality-control services required by the Contract Documents. Submit schedule within 30 days of date established for the Notice to Proceed.

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

1.8 SPECIAL TESTS AND INSPECTIONS
A. Special Tests and Inspections: Conducted by a qualified testing agency special inspector as required by authorities having jurisdiction, as indicated in individual Specification Sections, and as follows:

1. Verifying that manufacturer maintains detailed fabrication and quality-control procedures and reviewing the completeness and adequacy of those procedures to perform the Work.
2. Notifying Architect and Contractor promptly of irregularities and deficiencies observed in the Work during performance of its services.
3. Submitting a certified written report of each test, inspection, and similar quality-control service to Architect with copy to Contractor and to authorities having jurisdiction.
4. Submitting a final report of special tests and inspections at project acceptance, which includes a list of unresolved deficiencies.
5. Interpreting tests and inspections and stating in each report whether tested and inspected work complies with or deviates from the Contract Documents.
6. Retesting and reinspecting corrected work.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 TEST AND INSPECTION LOG

A. Prepare a record of tests and inspections. Include the following:

   1. Date test or inspection was conducted.
   2. Description of the Work tested or inspected.
   3. Date test or inspection results were transmitted to Architect.
   4. Identification of testing agency or special inspector conducting test or inspection.

B. Maintain log at Project site. Post changes and modifications as they occur. Provide access to test and inspection log for Architect's reference during normal working hours.

3.2 REPAIR AND PROTECTION

A. General: On completion of testing, inspecting, sample taking, and similar services, repair damaged construction and restore substrates and finishes.

   1. Provide materials and comply with installation requirements specified in other Specification Sections. Restore patched areas and extend restoration into adjoining areas with durable seams that are as invisible as possible.
   2. Comply with the Contract Document requirements for Division 01 Section "Cutting and Patching."

B. Protect construction exposed by or for quality-control service activities.

C. Repair and protection are Contractor's responsibility, regardless of the assignment of responsibility for quality-control services.

END OF SECTION 014000
SECTION 014200 - REFERENCES

PART 1 - GENERAL

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

1.2 DEFINITIONS
A. General: Basic Contract definitions are included in the Conditions of the Contract.
B. "Approved": When used to convey Architect's action on Contractor's submittals, applications, and requests, "approved" is limited to Architect's duties and responsibilities as stated in the Conditions of the Contract.
C. "Directed": A command or instruction by Architect. Other terms including "requested," "authorized," "selected," "required," and "permitted" have the same meaning as "directed."
D. "Indicated": Requirements expressed by graphic representations or in written form on Drawings, in Specifications, and in other Contract Documents. Other terms including "shown," "noted," "scheduled," and "specified" have the same meaning as "indicated."
E. "Regulations": Laws, ordinances, statutes, and lawful orders issued by authorities having jurisdiction, and rules, conventions, and agreements within the construction industry that control performance of the Work.
F. "Furnish": Supply and deliver to Project site, ready for unloading, unpacking, assembly, installation, and similar operations.
G. "Install": Operations at Project site including unloading, temporarily storing, unpacking, assembling, erecting, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations.
H. "Provide": Furnish and install, complete and ready for the intended use.
I. "Project Site": Space available for performing construction activities. The extent of Project site is shown on Drawings and may or may not be identical with the description of the land on which Project is to be built.

1.3 INDUSTRY STANDARDS
A. Applicability of Standards: Unless the Contract Documents include more stringent requirements, applicable construction industry standards have the same force and effect as if bound or copied directly into the Contract Documents to the extent referenced. Such standards are made a part of the Contract Documents by reference.
B. Publication Dates: Comply with standards in effect as of date of the Contract Documents unless otherwise indicated.
C. Copies of Standards: Each entity engaged in construction on Project should be familiar with industry standards applicable to its construction activity. Copies of applicable standards are not bound with the Contract Documents.

1. Where copies of standards are needed to perform a required construction activity, obtain copies directly from publication source.

1.4 ABBREVIATIONS AND ACRONYMS

A. Industry Organizations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the entities indicated in Thomson Gale's "Encyclopedia of Associations" or in Columbia Books' "National Trade & Professional Associations of the U.S."

AA Aluminum Association, Inc. (The) (703) 358-2960
www.aluminum.org

AAADM American Association of Automatic Door Manufacturers (216) 241-7333
www.aaadm.com

AABC Associated Air Balance Council (202) 737-0202
www.aabchq.com

AAMA American Architectural Manufacturers Association (847) 303-5664
www.aamanet.org

AASHTO American Association of State Highway and Transportation Officials (202) 624-5800
www.transportation.org

AATCC American Association of Textile Chemists and Colorists (The) (919) 549-8141
www.aatcc.org

ABAA Air Barrier Association of America (866) 956-5888
www.airbarrier.org

ABMA American Bearing Manufacturers Association (202) 367-1155
www.abma-dc.org

ACI ACI International (248) 848-3700
(American Concrete Institute)
www.aci-int.org

ACPA American Concrete Pipe Association (972) 506-7216
www.concrete-pipe.org

AEIC Association of Edison Illuminating Companies, Inc. (The) (205) 257-2530
www.aeic.org

AF&PA American Forest & Paper Association (800) 878-8878 www.afandpa.org (202) 463-2700

AGA American Gas Association (202) 824-7000 www.ag.org

AGC Associated General Contractors of America (The) (703) 548-3118 www.agc.org

AHA American Hardboard Association (Now part of CPA)

AI Asphalt Institute (859) 288-4960 www.asphaltinstitute.org

AIA American Institute of Architects (The) (800) 242-3837 www.aia.org (202) 626-7300

AISC American Institute of Steel Construction (800) 644-2400 www.aisc.org (312) 670-2400

AISI American Iron and Steel Institute (202) 452-7100 www.steel.org

AITC American Institute of Timber Construction (303) 792-9559 www.aite-glulam.org

ALCA Associated Landscape Contractors of America (Now PLANET - Professional Landcare Network)

ALSC American Lumber Standard Committee, Inc. (301) 972-1700 www.alsc.org


ANSI American National Standards Institute (202) 293-8020 www.ansi.org

AOSA Association of Official Seed Analysts, Inc. (405) 780-7372 www.aosaseed.com

APA Architectural Precast Association (239) 454-6989 www.archprecast.org

APA APA - The Engineered Wood Association (253) 565-6600
<table>
<thead>
<tr>
<th>Organization</th>
<th>Contact Information</th>
<th>Website</th>
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<tbody>
<tr>
<td>APA EWS - The Engineered Wood Association;</td>
<td>APA - The Engineered Wood Association; Engineered Wood Systems (See APA - The Engineered Wood Association)</td>
<td><a href="http://www.apawood.org">www.apawood.org</a></td>
</tr>
<tr>
<td>API American Petroleum Institute</td>
<td>(202) 682-8000</td>
<td><a href="http://www.api.org">www.api.org</a></td>
</tr>
<tr>
<td>ARI Air-Conditioning &amp; Refrigeration Institute</td>
<td>(703) 524-8800</td>
<td><a href="http://www.ari.org">www.ari.org</a></td>
</tr>
<tr>
<td>ARMA Asphalt Roofing Manufacturers Association</td>
<td>(202) 207-0917</td>
<td><a href="http://www.asphaltroofing.org">www.asphaltroofing.org</a></td>
</tr>
<tr>
<td>ASCE American Society of Civil Engineers</td>
<td>(800) 548-2723</td>
<td><a href="http://www.asce.org">www.asce.org</a> (703) 295-6300</td>
</tr>
<tr>
<td>ASCE/SEI American Society of Civil Engineers/</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Structural Engineering Institute</td>
<td></td>
<td>(See ASCE)</td>
</tr>
<tr>
<td>ASHRAE American Society of Heating, Refrigerating</td>
<td>(800) 527-4723</td>
<td><a href="http://www.ashe.org">www.ashe.org</a> (404) 636-8400</td>
</tr>
<tr>
<td>ASME ASME International (The American Society of</td>
<td>(800) 843-2763</td>
<td><a href="http://www.asme.org">www.asme.org</a></td>
</tr>
<tr>
<td>Mechanical Engineers International)</td>
<td>(973) 882-1170</td>
<td></td>
</tr>
<tr>
<td>ASSE American Society of Sanitary Engineering</td>
<td>(440) 835-3040</td>
<td><a href="http://www.asse-plumbing.org">www.asse-plumbing.org</a></td>
</tr>
<tr>
<td>ASTM ASTM International (American Society for</td>
<td>(610) 832-9585</td>
<td><a href="http://www.astm.org">www.astm.org</a></td>
</tr>
<tr>
<td>Testing and Materials International)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWCI AWCI International (Association of the Wall</td>
<td>(703) 534-8300</td>
<td><a href="http://www.awci.org">www.awci.org</a></td>
</tr>
<tr>
<td>and Ceiling Industry International)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWCMA American Window Covering Manufacturers</td>
<td>(571) 323-3636</td>
<td><a href="http://www.awcinet.org">www.awcinet.org</a></td>
</tr>
<tr>
<td>Association (Now WCSC)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>AWI Architectural Woodwork Institute</td>
<td></td>
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<tr>
<td>REFERENCES</td>
<td></td>
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</tr>
</tbody>
</table>
REFERENCES

AWPA American Wood-Preservers' Association (205) 733-4077
www.awpa.com

AWS American Welding Society (800) 443-9353
www.aws.org (305) 443-9353

AWWA American Water Works Association (800) 926-7337
www.awwa.org (303) 794-7711

BHMA Builders Hardware Manufacturers Association (212) 297-2122
www.buildershardware.com

BIA Brick Industry Association (The) (703) 620-0010
www.bia.org

BICSI BICSI (800) 242-7405
www.bicsi.org (813) 979-1991

BIFMA BIFMA International (616) 285-3963
(Business and Institutional Furniture Manufacturer's Association International)
www.bifma.com

CCC Carpet Cushion Council (610) 527-3880
www.carpetcushion.org

CDA Copper Development Association (800) 232-3282
www.copper.org (212) 251-7200

CFFA Chemical Fabrics & Film Association, Inc. (216) 241-7333
www.chemicalfabricsandfilm.com

CGA Compressed Gas Association (703) 788-2700
www.cganet.com

CIMA Cellulose Insulation Manufacturers Association (888) 881-2462
www.cellulose.org (937) 222-2462

CISCA Ceilings & Interior Systems Construction Association (630) 584-1919
www.cisca.org

CISPI Cast Iron Soil Pipe Institute (423) 892-0137
www.cispi.org

CLFMI Chain Link Fence Manufacturers Institute (301) 596-2583
www.chainlinkinfo.org
CRRC  Cool Roof Rating Council  (866) 465-2523
    www.coolroofs.org  (510) 485-7175

CPA  Composite Panel Association  (301) 670-0604
    www.pbmdf.com

CPPA  Corrugated Polyethylene Pipe Association  (800) 510-2772
    www.cppa-info.org  (202) 462-9607

CRI  Carpet & Rug Institute (The)  (800) 882-8846
    www.carpet-rug.com  (706) 278-3176

CRSI  Concrete Reinforcing Steel Institute  (847) 517-1200
    www.crsi.org

CSA  Canadian Standards Association  (800) 463-6727

CSA  CSA International  (866) 797-4272
    (Formerly: IAS - International Approval Services)  (416) 747-4000
    www.csa-international.org

CSI  Cast Stone Institute  (717) 272-3744
    www.caststone.org

CSI  Construction Specifications Institute (The)  (800) 689-2900
    www.csinet.org  (703) 684-0300

CSSB  Cedar Shake & Shingle Bureau  (604) 820-7700
    www.cedarbureau.org

CTI  Cooling Technology Institute  (281) 583-4087
    (Formerly: Cooling Tower Institute)
    www.cti.org

DHI  Door and Hardware Institute  (703) 222-2010
    www.dhi.org

EIA  Electronic Industries Alliance  (703) 907-7500
    www.eia.org

EIMA  EIFS Industry Members Association  (800) 294-3462
    www.eima.com  (770) 968-7945

EJCDC  Engineers Joint Contract Documents Committee  (703) 295-5000
    www.ejdc.org

EJMA  Expansion Joint Manufacturers Association, Inc.  (914) 332-0040
    www.ejma.org

ESD  ESD Association  (315) 339-6937
www.esda.org

FM Approvals  FM Approvals (781) 762-4300
www.fmglobal.com

FM Global  FM Global (401) 275-3000
(Formerly: FMG - FM Global)
www.fmglobal.com

FMRC Factory Mutual Research
(Now FM Global)

FSA Fluid Sealing Association (610) 971-4850
www.fluidsealing.com

FSC Forest Stewardship Council 49 228 367 66 0
www.fsc.org

GA Gypsum Association (202) 289-5440
www.gypsum.org

GANA Glass Association of North America (785) 271-0208
www.glasswebsite.com

GRI (Now GSI)

GS Green Seal (202) 872-6400
www.greenseal.org

GSI Geosynthetic Institute (610) 522-8440
www.geosynthetic-institute.org

HI Hydraulic Institute (888) 786-7744
www.pumps.org (973) 267-9700

HI Hydronics Institute (908) 464-8200
www.gamanet.org

HMMAHollow Metal Manufacturers Association
(Part of NAAMM)

HPVA Hardwood Plywood & Veneer Association (703) 435-2900
www.hpva.org

HPW H. P. White Laboratory, Inc. (410) 838-6550
www.hpwhite.com

REFERENCES
<table>
<thead>
<tr>
<th>Acronym</th>
<th>Description</th>
<th>Phone Number</th>
<th>Website</th>
</tr>
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<tbody>
<tr>
<td>IAS</td>
<td>International Approval Services (Now CSA International)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>ICEA</td>
<td>Insulated Cable Engineers Association, Inc.</td>
<td>(770) 830-0369</td>
<td><a href="http://www.icea.net">www.icea.net</a></td>
</tr>
<tr>
<td>ICRI</td>
<td>International Concrete Repair Institute, Inc.</td>
<td>(847) 827-0830</td>
<td><a href="http://www.icri.org">www.icri.org</a></td>
</tr>
<tr>
<td>IEC</td>
<td>International Electrotechnical Commission</td>
<td>41 22 919 02 11</td>
<td></td>
</tr>
<tr>
<td>IEEE</td>
<td>Institute of Electrical and Electronics Engineers, Inc. (The)</td>
<td>(212) 419-7900</td>
<td><a href="http://www.ieee.org">www.ieee.org</a></td>
</tr>
<tr>
<td>IESNA</td>
<td>Illuminating Engineering Society of North America</td>
<td>(212) 248-5000</td>
<td><a href="http://www.iesna.org">www.iesna.org</a></td>
</tr>
<tr>
<td>IEST</td>
<td>Institute of Environmental Sciences and Technology</td>
<td>(847) 255-1561</td>
<td><a href="http://www.iest.org">www.iest.org</a></td>
</tr>
<tr>
<td>IGCC</td>
<td>Insulating Glass Certification Council</td>
<td>(315) 646-2234</td>
<td><a href="http://www.igcc.org">www.igcc.org</a></td>
</tr>
<tr>
<td>IGMA</td>
<td>Insulating Glass Manufacturers Alliance</td>
<td>(613) 233-1510</td>
<td><a href="http://www.igmaonline.org">www.igmaonline.org</a></td>
</tr>
<tr>
<td>ISO</td>
<td>International Organization for Standardization</td>
<td>41 22 749 01 11</td>
<td><a href="http://www.iso.ch">www.iso.ch</a></td>
</tr>
<tr>
<td></td>
<td>Available from ANSI</td>
<td>(202) 293-8020</td>
<td><a href="http://www.ansi.org">www.ansi.org</a></td>
</tr>
<tr>
<td>ISSFA</td>
<td>International Solid Surface Fabricators Association</td>
<td>(877) 464-7732</td>
<td><a href="http://www.issfa.net">www.issfa.net</a></td>
</tr>
<tr>
<td></td>
<td></td>
<td>(702) 567-8150</td>
<td></td>
</tr>
<tr>
<td>ITS</td>
<td>Intertek Testing Service NA</td>
<td>(972) 238-5591</td>
<td><a href="http://www.intertek.com">www.intertek.com</a></td>
</tr>
<tr>
<td>ITU</td>
<td>International Telecommunication Union</td>
<td>41 22 730 51 11</td>
<td><a href="http://www.itu.int/home">www.itu.int/home</a></td>
</tr>
<tr>
<td>LMA</td>
<td>Laminating Materials Association</td>
<td></td>
<td>(Now part of CPA)</td>
</tr>
</tbody>
</table>
MBMA Metal Building Manufacturers Association  (216) 241-7333
www.mbma.com

MFMA Maple Flooring Manufacturers Association, Inc.  (847) 480-9138
www.maplefloor.org

MFMA Metal Framing Manufacturers Association, Inc.  (312) 644-6610
www.metalframingmfg.org

MH Material Handling
(Now MHIA)

MHIA Material Handling Industry of America  (800) 345-1815
www.mhia.org  (704) 676-1190

MIA Marble Institute of America  (440) 250-9222
www.marble-institute.com

MPI Master Painters Institute(888) 674-8937
www.paintinfo.com

MSS Manufacturers Standardization Society of
The Valve and Fittings Industry Inc.
(703) 281-6613
www.mss-hq.com

NAAMM National Association of Architectural Metal Manufacturers
(312) 332-0405
www.naamm.org

NACE NACE International  (800) 797-6623
(National Association of Corrosion Engineers International)
(281) 228-6200
www.nace.org

NADCA National Air Duct Cleaners Association  (202) 737-2926
www.nadca.com

NAIMA North American Insulation Manufacturers Association
(703) 684-0084
www.naima.org

NBGQA National Building Granite Quarries Association, Inc.
(800) 557-2848
www.nbgqa.com

NCMA National Concrete Masonry Association  (703) 713-1900
www.ncma.org
NCTA  National Cable and  (202) 775-3550  
Telecommunications Association  
www.ncta.com

NEBB  National Environmental Balancing Bureau  (301) 977-3698  
www.nebb.org

NECA  National Electrical Contractors Association  (301) 657-3110  
www.necanet.org

NeLMA  Northeastern Lumber Manufacturers' Association  (207) 829-6901  
www.nelma.org

NEMA  National Electrical Manufacturers Association  (703) 841-3200  
www.nema.org

NETA  InterNational Electrical Testing Association  (888) 300-6382  
www.netaworld.org  (303) 697-8441

NFPA  NFPA  (800) 344-3555  
(National Fire Protection Association)  (617) 770-3000  
www.nfpa.org

NFRC  National Fenestration Rating Council  (301) 589-1776  
www.nfrc.org

NGA  National Glass Association  (866) 342-5642  
www.glass.org  (703) 442-4890

NGA  National Glass Association  (866) 342-5642  
www.glass.org  (703) 442-4890

NHLA  National Hardwood Lumber Association  (800) 933-0318  
www.natlhardwood.org  (901) 377-1818

NLGA  National Lumber Grades Authority  (604) 524-2393  
www.nlga.org

NOFMA  NOFMA:  The Wood Flooring  (901) 526-5016  
Manufacturers Association  
(Formerly:  National Oak Flooring  
Manufacturers Association)  
www.nofma.com

NRCA  National Roofing Contractors Association  (800) 323-9545  
www.nrca.net  (847) 299-9070

NRMCA  National Ready Mixed Concrete Association  (888) 846-7622  
www.nrmca.org(301) 587-1400

NSF  NSF International  (800) 673-6275  
(National Sanitation Foundation International)  (734) 769-8010

REFERENCES
www.nsf.org

NSSGA National Stone, Sand & Gravel Association (800) 342-1415
www.nssga.org (703) 525-8788

NTMA National Terrazzo & Mosaic Association, Inc. (The)
(800) 323-9736
www.ntma.com (540) 751-0930

NTRMA National Tile Roofing Manufacturers Association
(Now TRI)

NWWDA National Wood Window and Door Association
(Now WDMA)

OPL Omega Point Laboratories, Inc.
(Now ITS)

PCI Precast/Prestressed Concrete Institute (312) 786-0300
www pci.org

PDCA Painting & Decorating Contractors of America (800) 332-7322
www pdca.com (314) 514-7322

PDI Plumbing & Drainage Institute (800) 589-8956
www pdionline.org (978) 557-0720

PGI PVC Geomembrane Institute (217) 333-3929
http://pgi-tc.ce.uiuc.edu

PLANET Professional Landcare Network (800) 395-2522
(Formerly: ACLA - (703) 736-9666
Associated Landscape Contractors of America)
www.landcarenetwork.org

PTI Post-Tensioning Institute (602) 870-7540
www.post-tensioning.org

RCSC Research Council on Structural Connections
www.boltcouncil.org

RFCI Resilient Floor Covering Institute (301) 340-8580
www.rfci.com

SAE SAE International (877) 606-7323
www.sae.org (724) 776-4841

SDI Steel Deck Institute (847) 458-4647
www.sdi.org

REFERENCES
SDI  Steel Door Institute  (440) 899-0010  
www.steeldoor.org

SEFA  Scientific Equipment and Furniture Association  (516) 294-5424  
www.sefalabs.com

SEI/ASCE  Structural Engineering Institute/ 
American Society of Civil Engineers  
(See ASCE)

SGCC  Safety Glazing Certification Council  (315) 646-2234  
www.sgcc.org

SIA  Security Industry Association  (703) 683-2075  
www.siaonline.org

SIGMA  Sealed Insulating Glass Manufacturers Association  
(Now IGMA)

SJI  Steel Joist Institute  (843) 626-1995  
www.steeljoist.org

SMA  Screen Manufacturers Association  (561) 533-0991  
www.smacentral.org

SMACNA  Sheet Metal and Air Conditioning Contractors' National Association  
(703) 803-2980  
www.smacna.org

SMPTE  Society of Motion Picture and Television Engineers  
(914) 761-1100  
www.smpte.org

SPFA  Spray Polyurethane Foam Alliance  (800) 523-6154  
(Formerly: SPI/SPFD - The Society of the Plastics Industry, Inc.; Spray Polyurethane Foam Division)  
www.sprayfoam.org

SPIB  Southern Pine Inspection Bureau (The)  (850) 434-2611  
www.spib.org

SPRI  Single Ply Roofing Industry  (781) 647-7026  
www.spri.org

SSINA  Specialty Steel Industry of North America  (800) 982-0355  
www.ssina.com (202) 342-8630

SSPC  SSPC: The Society for Protective Coatings  (877) 281-7772
<table>
<thead>
<tr>
<th>Reference</th>
<th>Organization Name</th>
<th>Phone</th>
<th>Website URL</th>
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<tr>
<td>STI</td>
<td>Steel Tank Institute</td>
<td>(847) 438-8265</td>
<td><a href="http://www.steeltank.com">www.steeltank.com</a></td>
</tr>
<tr>
<td>SWI</td>
<td>Steel Window Institute</td>
<td>(216) 241-7333</td>
<td><a href="http://www.steelwindows.com">www.steelwindows.com</a></td>
</tr>
<tr>
<td>SWRI</td>
<td>Sealant, Waterproofing, &amp; Restoration Institute</td>
<td>(816) 472-7974</td>
<td><a href="http://www.swrionline.org">www.swrionline.org</a></td>
</tr>
<tr>
<td>TCA</td>
<td>Tile Council of America, Inc.</td>
<td>(864) 646-8453</td>
<td><a href="http://www.tileusa.com">www.tileusa.com</a></td>
</tr>
<tr>
<td>TIA/EIA</td>
<td>Telecommunications Industry Association/ Electronic Industries Alliance</td>
<td>(703) 907-7700</td>
<td><a href="http://www.tiaonline.org">www.tiaonline.org</a></td>
</tr>
<tr>
<td>TMS</td>
<td>The Masonry Society</td>
<td>(303) 939-9700</td>
<td><a href="http://www.masonrysociety.org">www.masonrysociety.org</a></td>
</tr>
<tr>
<td>TPI</td>
<td>Truss Plate Institute, Inc.</td>
<td>(703) 683-1010</td>
<td><a href="http://www.tpinst.org">www.tpinst.org</a></td>
</tr>
<tr>
<td>TPI</td>
<td>Turfgrass Producers International</td>
<td>(800) 405-8873</td>
<td><a href="http://www.turfgrasssod.org">www.turfgrasssod.org</a></td>
</tr>
<tr>
<td>TRI</td>
<td>Tile Roofing Institute</td>
<td>(312) 670-4177</td>
<td><a href="http://www.tileroofing.org">www.tileroofing.org</a></td>
</tr>
<tr>
<td>UL</td>
<td>Underwriters Laboratories Inc.</td>
<td>(877) 854-3577</td>
<td><a href="http://www.ul.com">www.ul.com</a></td>
</tr>
<tr>
<td>UNI</td>
<td>Uni-Bell PVC Pipe Association</td>
<td>(972) 243-3902</td>
<td><a href="http://www.uni-bell.org">www.uni-bell.org</a></td>
</tr>
<tr>
<td>USGBC</td>
<td>U.S. Green Building Council</td>
<td>(202) 828-7422</td>
<td><a href="http://www.usgbc.org">www.usgbc.org</a></td>
</tr>
<tr>
<td>WASTEC</td>
<td>Waste Equipment Technology Association</td>
<td>(800) 424-2869</td>
<td><a href="http://www.wastec.org">www.wastec.org</a></td>
</tr>
<tr>
<td>WCMA</td>
<td>Window Covering Manufacturers Association</td>
<td></td>
<td></td>
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<tr>
<td>WCSC</td>
<td>Window Covering Safety Council</td>
<td>(800) 506-4636</td>
<td></td>
</tr>
</tbody>
</table>

Formerly: WCMA - (212) 297-2109
Window Covering Manufacturers Association
www.windowcoverings.org

WDMA Window & Door Manufacturers Association (800) 223-2301
(Formerly: NWWDA - (847) 299-5200
National Wood Window and Door Association)
www.wdma.com

WI Woodwork Institute (916) 372-9943
(Formerly: WIC - Woodwork Institute of California)
www.wicnet.org

WIC Woodwork Institute of California
(Now WI)

WMMPA Wood Moulding & Millwork Producers Association
(800) 550-7889
www.wmmpa.com (530) 661-9591

www.wwpa.org

B. Code Agencies: Where abbreviations and acronyms are used in Specifications or other Contract
Documents, they shall mean the recognized name of the entities in the following list. Names, telephone
numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the
date of the Contract Documents.

IAPMO International Association of Plumbing and Mechanical Officials
(909) 472-4100
www.iapmo.org

ICBO International Conference of Building Officials
(See ICC)

ICBO ES ICBO Evaluation Service, Inc.
(See ICC-ES)

ICC International Code Council (888) 422-7233
www.iccsafe.org (703) 931-4533

ICC-ES ICC Evaluation Service, Inc. (800) 423-6587
www.icc-es.org (562) 699-0543

SBCCI Southern Building Code Congress International, Inc.
(See ICC)

CE Army Corps of Engineers
www.usace.army.mil

REFERENCES
CPSC  Consumer Product Safety Commission  (800) 638-2772  
www.cpsc.gov  (301) 504-7923

DOC  Department of Commerce  (202) 482-2000  
www.commerce.gov

DOD  Department of Defense  (215) 697-6257  
http://dodssp.daps.dla.mil

DOE  Department of Energy  (202) 586-9220  
www.energy.gov

EPA  Environmental Protection Agency  (202) 272-0167  
www.epa.gov

FAA  Federal Aviation Administration(866) 835-5322  
www.faa.gov

FCC  Federal Communications Commission  (888) 225-5322  
www.fcc.gov

FDA  Food and Drug Administration  (888) 463-6332  
www.fda.gov

GSA  General Services Administration  (800) 488-3111  
www.gsa.gov

HUD  Department of Housing and Urban Development(202) 708-1112  
www.hud.gov

LBL  Lawrence Berkeley National Laboratory (510) 486-4000  
www.lbl.gov

NCHRP  National Cooperative Highway Research Program  
(See TRB)

NIST  National Institute of Standards and Technology  (301) 975-6478  
www.nist.gov

OSHA  Occupational Safety & Health Administration  (800) 321-6742  

PBS  Public Building Service  
(See GSA)

PHS  Office of Public Health and Science  (202) 690-7694  
www.osophs.dhhs.gov/ophs

RUS  Rural Utilities Service  (202) 720-9540  
(See USDA)
C. Standards and Regulations: Where abbreviations and acronyms are used in Specifications or other Contract Documents, they shall mean the recognized name of the standards and regulations in the following list. Names, telephone numbers, and Web sites are subject to change and are believed to be accurate and up-to-date as of the date of the Contract Documents.

ADAAG Americans with Disabilities Act (ADA) (800) 872-2253
Architectural Barriers Act (ABA) (202) 272-0080
Accessibility Guidelines for Buildings and Facilities
Available from Access Board
www.access-board.gov


www.gpoaccess.gov/cfr/index.html

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION (Not Used)

END OF SECTION 014200
SECTION 015000 - TEMPORARY FACILITIES AND CONTROLS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes requirements for temporary utilities, support facilities, and security and protection facilities.

B. Related Sections include the following:

1. Division 01 Section "Summary" for limitations on utility interruptions and other work restrictions.
2. Division 01 Section "Submittal Procedures" for procedures for submitting copies of implementation and termination schedule and utility reports.
3. Division 01 Section "Execution" for progress cleaning requirements.
4. Divisions 02 through 49 Sections for temporary heat, ventilation, and humidity requirements for products in those Sections.
5. Division 31 Section "Termite Control" for pest control.
6. Division 32 Section "Asphalt Paving" for construction and maintenance of asphalt paving for temporary roads and paved areas.
7. Division 32 Section "Concrete Paving" for construction and maintenance of cement concrete pavement for temporary roads and paved areas.

1.3 DEFINITIONS

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

1.4 USE CHARGES

A. General: Cost or use charges for temporary facilities shall be included in the Contract Sum. Allow other entities to use temporary services and facilities without cost, including, but not limited to, Owner's construction forces, Architect, testing agencies, and authorities having jurisdiction.

B. Sewer Service: Pay sewer service use charges for sewer usage by all entities for construction operations.

C. Water Service: Pay water service use charges for water used by all entities for construction operations.

D. Electric Power Service: Pay electric power service use charges for electricity used by all entities for construction operations.

1.5 QUALITY ASSURANCE

TEMPORARY FACILITIES AND CONTROLS 015000 - 1
A. Electric Service: Comply with NECA, NEMA, and UL standards and regulations for temporary electric service. Install service to comply with NFPA 70.

B. Tests and Inspections: Arrange for authorities having jurisdiction to test and inspect each temporary utility before use. Obtain required certifications and permits.

1.6 PROJECT CONDITIONS

A. Temporary Use of Permanent Facilities: Installer of each permanent service shall assume responsibility for operation, maintenance, and protection of each permanent service during its use as a construction facility before Owner's acceptance, regardless of previously assigned responsibilities.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Pavement: Comply with Division 32 Section "Asphalt Paving."

B. Portable Chain-Link Fencing: ALL SITE PROTECTION REQUIREMENTS ARE AT THE CONTRACTORS OPTION.

C. Paint: Comply with requirements in Division 09 painting Sections.

2.2 TEMPORARY FACILITIES

A. Field Offices, General: Prefabricated or mobile units with serviceable finishes, temperature controls, and foundations adequate for normal loading.

B. Common-Use Field Office: Of sufficient size to accommodate needs of construction personnel. Keep office clean and orderly. Furnish and equip offices as follows:

1. Furniture required for Project-site documents including file cabinets, plan tables, plan racks, and bookcases.
2. Conference room of sufficient size to accommodate meetings of 20 individuals. Provide electrical power service and 120-V ac duplex receptacles, with not less than 1 receptacle on each wall. Furnish room with conference table, chairs, and 4-foot-square tack board.
3. Drinking water and private toilet.
5. Heating and cooling equipment necessary to maintain a uniform indoor temperature of 68 to 72 deg F.
6. Lighting fixtures capable of maintaining average illumination of 20 fc at desk height.

2.3 EQUIPMENT

A. HVAC Equipment: Unless Owner authorizes use of permanent HVAC system, provide vented, self-contained, liquid-propane-gas or fuel-oil heaters with individual space thermostatic control.

1. Use of gasoline-burning space heaters, open-flame heaters, or salamander-type heating units is prohibited.
2. Heating Units: Listed and labeled for type of fuel being consumed, by a testing agency acceptable.
to authorities having jurisdiction, and marked for intended use.

3. Permanent HVAC System: If Owner authorizes use of permanent HVAC system for temporary use during construction, provide filter with MERV of 8 at each return air grille in system and remove at end of construction.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Locate facilities where they will serve Project adequately and result in minimum interference with performance of the Work. Relocate and modify facilities as required by progress of the Work.

1. Locate facilities to limit site disturbance as specified in Division 01 Section "Summary."

B. Provide each facility ready for use when needed to avoid delay. Do not remove until facilities are no longer needed or are replaced by authorized use of completed permanent facilities.

3.2 TEMPORARY UTILITY INSTALLATION

A. General: Install temporary service or connect to existing service.

1. Arrange with utility company, Owner, and existing users for time when service can be interrupted, if necessary, to make connections for temporary services.

B. Sewers and Drainage: Provide temporary utilities to remove effluent lawfully.

1. Connect temporary sewers to municipal system as directed by authorities having jurisdiction.

C. Water Service: Install water service and distribution piping in sizes and pressures adequate for construction.

D. Sanitary Facilities: Provide temporary toilets, wash facilities, and drinking water for use of construction personnel. Comply with authorities having jurisdiction for type, number, location, operation, and maintenance of fixtures and facilities.

E. Heating and Cooling: Provide temporary heating and cooling required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of low temperatures or high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed.

F. Ventilation and Humidity Control: Provide temporary ventilation required by construction activities for curing or drying of completed installations or for protecting installed construction from adverse effects of high humidity. Select equipment that will not have a harmful effect on completed installations or elements being installed. Coordinate ventilation requirements to produce ambient condition required and minimize energy consumption.

G. Electric Power Service: Provide electric power service and distribution system of sufficient size, capacity, and power characteristics required for construction operations.

H. Lighting: Provide temporary lighting with local switching that provides adequate illumination for construction operations, observations, inspections, and traffic conditions.
1. Install and operate temporary lighting that fulfills security and protection requirements without operating entire system.

I. Telephone Service: Provide temporary telephone service in common-use facilities for use by all construction personnel. Install one telephone line(s) for each field office.

1. Provide additional telephone lines for the following:
   a. Provide a dedicated telephone line for each facsimile machine and computer in each field office.

2. At each telephone, post a list of important telephone numbers.
   a. Police and fire departments.
   b. Ambulance service.
   c. Contractor's home office.
   d. Architect's office.
   e. Engineers' offices.
   f. Owner's office.
   g. Principal subcontractors' field and home offices.

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

J. Electronic Communication Service: Provide temporary electronic communication service, including electronic mail, in common-use facilities.

3.3 SUPPORT FACILITIES INSTALLATION

A. General: Comply with the following:

   1. Provide incombustible construction for offices, shops, and sheds located within construction area or within 30 feet of building lines. Comply with NFPA 241.
   2. Maintain support facilities until near project acceptance. Remove before project acceptance. Personnel remaining after project acceptance will be permitted to use permanent facilities, under conditions acceptable to Owner.

B. Temporary Roads and Paved Areas: Construct and maintain temporary roads and paved areas adequate for construction operations. Locate temporary roads and paved areas in same location as permanent roads and paved areas. Extend temporary roads and paved areas, within construction limits indicated, as necessary for construction operations.

   1. Coordinate elevations of temporary roads and paved areas with permanent roads and paved areas.
   2. Prepare subgrade and install subbase and base for temporary roads and paved areas according to Division 31 Section "Earth Moving."
   3. Recondition base after temporary use, including removing contaminated material, regrading, proofrolling, compacting, and testing.
   4. Delay installation of final course of permanent hot-mix asphalt pavement until immediately before project acceptance. Repair hot-mix asphalt base-course pavement before installation of final course according to Division 32 Section "Asphalt Paving."

C. Parking: Provide temporary parking areas for construction personnel.

D. Dewatering Facilities and Drains: Comply with requirements of authorities having jurisdiction.
Maintain Project site, excavations, and construction free of water.

1. Dispose of rainwater in a lawful manner that will not result in flooding Project or adjoining properties nor endanger permanent Work or temporary facilities.
2. Remove snow and ice as required to minimize accumulations.

E. Project Identification and Temporary Signs: Provide Project identification and other signs as indicated on Drawings. Install signs where indicated to inform public and individuals seeking entrance to Project. Unauthorized signs are not permitted.

1. Provide temporary, directional signs for construction personnel and visitors.
2. Maintain and touchup signs so they are legible at all times.

F. Waste Disposal Facilities: Comply with requirements specified in Division 01 Section "Construction Waste Management and Disposal."

G. Lifts and Hoists: Provide facilities necessary for hoisting materials and personnel.

1. Truck cranes and similar devices used for hoisting materials are considered "tools and equipment" and not temporary facilities.

H. Temporary Use of Permanent Stairs: Cover finished, permanent stairs with protective covering of plywood or similar material so finishes will be undamaged at time of acceptance.

3.4 SECURITY AND PROTECTION FACILITIES INSTALLATION

A. Environmental Protection: Provide protection, operate temporary facilities, and conduct construction in ways and by methods that comply with environmental regulations and that minimize possible air, waterway, and subsoil contamination or pollution or other undesirable effects.

1. Comply with work restrictions specified in Division 01 Section "Summary."

B. Temporary Erosion and Sedimentation Control: Comply with requirements specified in Division 31 Section "Site Clearing."

C. Stormwater Control: Comply with authorities having jurisdiction. Provide barriers in and around excavations and subgrade construction to prevent flooding by runoff of stormwater from heavy rains.

D. Pest Control: Engage pest-control service to recommend practices to minimize attraction and harboring of rodents, roaches, and other pests and to perform extermination and control procedures at regular intervals so Project will be free of pests and their residues at project acceptance. Obtain extended warranty for Owner. Perform control operations lawfully, using environmentally safe materials.

E. Site Enclosure Fence: When excavation begins, furnish and install site enclosure fence in a manner that will prevent people and animals from easily entering site except by entrance gates.

1. Extent of Fence: coordinate with Architect if contractor chooses to install fencing.

3.5 OPERATION, TERMINATION, AND REMOVAL

A. Supervision: Enforce strict discipline in use of temporary facilities. To minimize waste and abuse, limit availability of temporary facilities to essential and intended uses.
B. Maintenance: Maintain facilities in good operating condition until removal.

1. Maintain operation of temporary enclosures, heating, cooling, humidity control, ventilation, and similar facilities on a 24-hour basis where required to achieve indicated results and to avoid possibility of damage.

C. Temporary Facility Changeover: Do not change over from using temporary security and protection facilities to permanent facilities until project acceptance.

D. Termination and Removal: Remove each temporary facility when need for its service has ended, when it has been replaced by authorized use of a permanent facility, or no later than project acceptance. Complete or, if necessary, restore permanent construction that may have been delayed because of interference with temporary facility. Repair damaged Work, clean exposed surfaces, and replace construction that cannot be satisfactorily repaired.

1. Materials and facilities that constitute temporary facilities are property of Contractor. Owner reserves right to take possession of Project identification signs.
2. At project acceptance, clean and renovate permanent facilities used during construction period. Comply with final cleaning requirements specified in Division 01 Section "Closeout Procedures."

END OF SECTION 015000
SECTION 016000 - PRODUCT REQUIREMENTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Procedures for substitutions during bidding period.
   2. General product requirements, including:
      a. General specification requirements for all products.
      b. Product options.
      c. Procedures for substitution requests.
   3. General requirements for product documentation, including:
      a. Requirements and procedures for schedule of products.
      b. General requirements for operation and maintenance data.
      c. General requirements for warranties.
   4. General procedures for products including:
      a. Procedures for transportation and handling.
      b. Procedures for delivery and receiving.
      c. Procedures for storage.

1.2 DEFINITIONS

A. Damage: Any sort of deterioration whether due to weather, water, normal wear and tear, accident, or abuse, resulting in soiling, marring, breakage, corrosion, rotting, or impairment of function.

1.3 SUBMITTALS

A. Schedule of Products: Submit for approval.
B. Final Schedule of Products: Submit for project record.
C. Log of Servicing of Equipment in Long-term Storage: Submit for project record.
D. Operation and Maintenance Data: Submit for approval.
E. Warranties: Submit for project record.

PART 2 - PRODUCTS

2.1 GENERAL

A. Components required to be supplied in quantity within a specification section shall be identical, interchangeable, and made by the same manufacturer.
B. Do not use products removed from existing construction, unless specifically permitted by the contract documents or approved by the owner.
1. Verify that electrical characteristics of products are compatible with electrical systems. Notify architect of all discrepancies immediately prior to shop drawing submittal.

2. Where visual matching to an established physical sample or color scheme is required, the architect's decision will be final.

B. Do not use any substitute products which have not been approved in accordance with the requirements of the contract documents; formal substitution request is required.

C. Definition of Substitute Product: Any product which does not meet the requirements of the contract documents, whether in product characteristics, performance, quality, or manufacturer or brand names, is considered a substitute.

D. Product Options: Where products are specified using more than one method, such as description with a manufacturer list, use a product meeting the requirements of both specification methods.

E. Products Specified by Reference Standard: Use any product meeting the specification. Provisions of reference standards shall not modify the responsibilities of the owner or architect as defined in the contract documents.

F. Products Specified by Performance Requirements: Use any product meeting the specification.

G. Products Specified to Match a Physical Sample: Use any product that matches; obtain the architect's approval.

H. Products Specified by Listing a Brand Name Product as the "Basis of Design": Provide a product equivalent to the product specified within the limits of variation specified. Use of a product other than that specified constitutes a representation by the contractor that he will comply with all the conditions specified for acceptance of substitutions, although formal submittal of a request for substitution is not required.

I. Products Specified by Listing Brand Name(s): Provide a product at least equal to the brand name product, or products, listed; submit substitution request for any brand name product not listed.

J. Products Specified by Listing Manufacturer(s): Provide a product meeting the specification; submit substitution request for any manufacturer not listed.

3.2 SUBSTITUTIONS DURING THE BIDDING PERIOD

A. In order for substitution requests to be reviewed and considered for incorporation into an addenda, substitution requests submitted later than 10 days prior to the bid date will not be considered.

B. Acceptable substitutions will be added to the contract documents by written addendum only; no verbal approvals will be valid.

3.3 SUBSTITUTIONS AFTER AWARD OF THE CONTRACT

A. Substitutions will not be considered between the bid date and the award of the contract.

B. Substitutions will not be allowed after award of the contract except when, through no fault of the Project Expediter, none of the specified products are available. An unavailable product is defined as a product not available due to strikes, natural disaster or product discontinuance. Burden of proof of unavailability is the responsibility of the Project Expediter and shall be in the form of written documentation from the manufacturer to the Project Expediter. The Project Expediter shall submit certified check to the designer for his/her time expended to review the proposed substitution prior to the designer's return of the product review and his/her decision to approve or reject the substitution submitted for review. The designer shall not
be responsible for delays to the project schedule due to substitution request submittals for available products. The contractor making the substitution request, when specified products are available assumes full responsibility for any and all delays his/her substitution request may have on the progress schedule. The Project Expediter shall coordinate and obtain written approval of all other major sub-contractor's when the substitution request may effect the construction schedule.

3.4 SUBSTITUTION PROCEDURE

A. Submission of request for substitution shall constitute a representation that the entity making the request:
   1. Has investigated the proposed product and determined that it is equal to or better than the specified product. Absence of an explicit comparison of any characteristic of the proposed product to the specified product shall constitute a representation that the proposed product is equal to or better than the specified product with regard to that characteristic.
   2. Will provide the same warranty for the proposed product as for the specified product.
   3. Will coordinate the installation and make other changes which may be required for the work to be complete in all respects, including:
      a. Redesign.
      b. Additional components and capacity required by other work affected by the change.
   4. Waives all claims for additional costs including extended overhead and time extensions which subsequently may become apparent and which are caused by the change. He/she shall also assume full responsibility and liability from all claims for additional costs and time extensions from the other prime contractors which may be caused by the change.
   5. Will reimburse the designer for additional costs for evaluation of the substitution request, redesign if required, and re-approval by authorities having jurisdiction if required.

B. Substitutions will not be considered when acceptance would require substantial revision of the contract documents.

C. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals without separate written request.

D. Substitution requests will not be considered when submitted directly by a subcontractor or supplier.

E. Substitution Request Procedure: Submit written request with complete data substantiating compliance of the proposed product with the requirements of the contract documents.
   1. Submit request to the architect.
   2. Submit 2 copies of each request and accompanying data.
   3. Submit request accompanied by the transmittal form included in the project manual.
   4. Only one request for substitution will be considered for each product.

F. Data Required with Substitution Request: Provide at least the following data:
   1. Identify product by specification section and paragraph number.
   2. Manufacturer's name and address, trade name and model number of product (if applicable), and name of fabricator or supplier (if applicable).
   3. Complete product data.
   4. A list of other projects on which the proposed product has been used, with project name, the design professional's name, and owner contact.
   5. An itemized comparison of the proposed product to the specified product.
   6. Net amount of change to the contract sum.
   7. List of maintenance services and replacement materials available.
   8. Statement of the effect of the substitution on the construction schedule.
   9. Description of changes that will be required in other work or products if the substitute product is approved.

G. The architect will determine acceptability of the proposed substitution.
H. When the proposed substitution is not accepted, provide the product (or one of the products, as the case may be) specified.

3.5 SCHEDULE OF PRODUCTS

A. Prepare a complete schedule of products used, including the following for each product:
   1. Manufacturer's name.
   2. Brand or trade name.
   3. Model number, if applicable.
   4. Reference standard, if more than one is applicable.
   5. Arrange products in the schedule by specification sections; indicate paragraph where specified.

B. Prepare and submit a preliminary schedule within 30 days after award of contract; resubmit when revised; submit final schedule prior to final payment.

C. Schedule of products shall not be used to obtain approval of substitute products; make separate request for substitution.

3.6 OPERATION AND MAINTENANCE DATA

A. Provide operation and maintenance data as specified in individual product sections.
   1. Provide data sufficient for operation and maintenance by owner without further assistance from the manufacturer.
   2. Provide completed data at least 45 days prior to instruction of owner personnel.

B. Data Required For Products - General:
   1. Name of manufacturer and product.
   2. Name, address, and telephone number of subcontractor or supplier.
   3. Local source of replacements.
   4. Local source of replaceable parts and supplies.

C. Product Data: Where product data is specified for inclusion in operation and maintenance data, provide manufacturer's data sheets marked to indicate specific product and product options actually installed; delete inapplicable data.

D. Custom Manufactured Products: Provide all information needed for reordering.

E. Finish Materials: Manufacturer's product data, color/texture designations, manufacturer's instructions for care, cleaning, and maintenance, and recommended cleaning schedule.

F. Products Exposed to Weather and Products for Moisture Protection: Manufacturer's product data, recommended inspection schedule and procedures, maintenance and repair procedures, maintenance materials required, and installation details.

G. Equipment: Provide at least the following information:
   1. Product data giving equipment and function description, with normal operating characteristics and limiting conditions.
   2. Starting, operating, and troubleshooting procedures.
   3. Cleaning and maintenance requirements and procedures.
   4. External finish maintenance requirements.
   5. List of maintenance materials required.
   6. List of special tools required.
   7. Parts list: List all replaceable parts, with ordering data.
   8. Recommended quantity of spare parts to be maintained in storage.
9. Recommended maintenance schedule.

H. Systems: Provide overall function description, with diagrams, prepared especially for this project.

I. Form of Data: Prepare data in the form of an instructional manual.
   1. Arrange content logically, using section numbers and sequence of sections indicated on the table of contents of this project manual.
   2. When multiple volumes are used, arrange by related subjects; identify contents in cover title.
   3. Assemble into 3-ring binders with maximum 2-inch ring size.
      a. Hardback, cleanable plastic covers.
      b. Identify each book with title "Operation and Maintenance Instructions" and project name.
      c. Page size 8-1/2 by 11 inches, maximum.
      d. Prepare special typewritten data on minimum 20-pound paper.
      e. Provide tabbed divider for each product and system.
      f. Drawings: Bind in with other data; provide reinforced binding edge; fold larger drawings to size of pages.
         1. Do not use pockets or loose drawings.
   4. Provide table of contents for each volume listing:
      a. Name of the project.
      b. Name, address, telephone number, and contact name of:
         1. Architect.
         2. Project Expediter.
      c. Index of products and systems included in volume.

3.7 WARRANTIES

A. Provide warranties as specified in individual product sections.

B. Manufacturer Warranties: Manufacturer's standard product warranty running for the manufacturer's standard term, unless otherwise indicated.
   1. Submit copies of all manufacturer warranties which extend beyond the end of the contract correction period.

C. Special Project Warranties: Written warranty commencing at date of substantial completion, running for the term indicated, and signed by the entities specified.
   1. Where completion of warranty item is materially delayed beyond the date of substantial completion, provide warranty commencing on date of acceptance.
   2. Submit each special project warranty.

D. Provide at least 3 copies of each executed warranty.

E. Show actual date of commencement on each warranty.

3.8 TRANSPORTATION AND HANDLING

A. Require supplier to package finished products in a manner which will protect from damage during shipping, handling, and storage.

B. Transport products by methods which avoid damage.

C. Deliver in dry, undamaged condition in manufacturer's unopened packaging.

D. Provide equipment and personnel adequate to handle products by methods which prevent damage.

E. Provide additional protection during handling where necessary to prevent damage to products and
packaging.

F. Lift large and heavy components at designated lift points only.

3.9 DELIVERY AND RECEIVING

A. Arrange deliveries of products to allow time for inspection prior to installation.

B. Coordinate delivery to avoid conflict with the work and to take into account both the conditions at the site and the availability of personnel, handling equipment, and storage space.

C. Clearly mark partial deliveries to identify contents, to permit easy accumulation of entire delivery, and to facilitate assembly.

D. Promptly inspect shipments and remedy damage, incorrect quantity, incompleteness, improper or illegible labeling, and noncompliance with requirements of contract documents and approved submittals.

3.10 STORAGE

A. Off-site storage of products for which application for payment will be made: Reference Article 31 of the General Conditions of the Contract.

B. General Storage Procedures:
   1. Store products immediately on delivery.
   2. Store products in accordance with manufacturer's instructions, with seals and labels intact and legible.
   3. Store in a manner to prevent damage to the stored products and to the work.
   4. Store moisture-sensitive products in weathertight enclosures.
   5. Store indoors if necessary to keep temperature and humidity within ranges required by manufacturer.
   6. Store unpacked and loose products on shelves, in bins, or in neat groups of like items.
   7. Arrange storage to provide access for inspection and inventory.
   8. Periodically inspect and remedy damage and noncompliance with required conditions.

C. Loose Granular Materials: Store on solid surfaces in well-drained area; prevent mixing with foreign materials.

D. Exterior Storage:
   1. Cover products subject to weather damage with impervious sheet covering; provide ventilation to avoid condensation.
   2. Provide surface drainage to prevent runoff or ponded water from damaging stored products.
   3. Prevent damage and contamination from refuse and chemically injurious materials and liquids.
   4. Store fabricated products on substantial platforms, blocking, or skids above the ground, sloped to drain.

E. Long-Term Storage of Equipment:
   1. Service equipment on a regularly scheduled basis; keep log of servicing.
   2. Attach manufacturer's service instructions to each item, with notice of enclosed instructions on exterior of package.

END OF SECTION 01600
SUBSTITUTION REQUEST FORM

To: Joel Helms, AIA  
Clark Nexsen, Inc.  
1 West Pack Square Suite 1501  
Asheville, NC 28801

Project Name: Dodd Meadows Community Center.  
The undersigned request that the following product be considered for substitution in lieu of the specified item in Specifications:

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Proposed Substitution:  

The Contractor shall also submit with this request for approval the sworn and notarized statement below which includes all of the following representations by the Contractor:

1. He has thoroughly reviewed the plans and specifications.
2. He has investigated the proposed product or method and determined that it is equal or better in all respects to that specified and that it fully complies with all requirements of the Contract Documents;
3. He will meet all contract obligations with regard to this substitution.
4. He will coordinate installation of accepted substitutions into the work, making all such changes and any required schedule adjustments, at no additional cost to the Owner, as may be required for the Work to be complete in all respects;
5. He waives all claims for additional costs and additional time related to substitutions which consequently become apparent. He also agrees to hold the Owner harmless from claims for extra costs and time incurred by other subcontractors and suppliers, or additional services which may have to be performed by the Architect for changes for extra work that may, at some later date, be determined to be necessary in order for the Work to function in the manner intended in the Contract Documents;
6. He will provide the same warranty and guarantee, and perform any work required in accordance therewith, for the substitution that is applicable to the specified item for which the subject is requested;
7. Material will be installed, handled, stored, adjusted, tested and operated in accordance with that which, with manufacturer’s recommendation and as specified in the Contract Documents;
8. In all cases new materials will be used unless this provision is waived by notice from the Owner or his Architect, or unless otherwise specified in the Contract Documents;
9. All material and workmanship will be in every respect in accordance with that which, in the opinion of the Architect, is in conformity with approved modern practice;
10. He has provided accurate cost data on the proposed substitution in comparison with the product or method specified.
Signed this __________ day of ____________________________

(SEALS)

__________________________________________

__________________________________________

Title

State of North Carolina, County of ____________________________

Subscribed and sworn to before me this _______ day of __________ 19____.

Notary Public: ____________________________

My Commission Expires: ____________________________
SECTION 017300 - EXECUTION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes general procedural requirements governing execution of the Work including, but not limited to, the following:

2. Field engineering and surveying.
4. Coordination of Owner-installed products.
5. Progress cleaning.
6. Starting and adjusting.
7. Protection of installed construction.
8. Correction of the Work.

B. Related Sections include the following:

1. Division 01 Section "Project Management and Coordination" for procedures for coordinating field engineering with other construction activities.
2. Division 01 Section "Submittal Procedures" for submitting surveys.
3. Division 01 Section "Cutting and Patching" for procedural requirements for cutting and patching necessary for the installation or performance of other components of the Work.
4. Division 01 Section "Closeout Procedures" for submitting final property survey with Project Record Documents, recording of Owner-accepted deviations from indicated lines and levels, and final cleaning.

1.3 SUBMITTALS

A. Qualification Data: For land surveyor.

B. Certificates: Submit certificate signed by land surveyor certifying that location and elevation of improvements comply with requirements.

C. Certified Surveys: Submit two copies signed by land surveyor.

1.4 QUALITY ASSURANCE

A. Land Surveyor Qualifications: A professional land surveyor who is legally qualified to practice in jurisdiction where Project is located and who is experienced in providing land-surveying services of the kind indicated.
PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 EXAMINATION

A. Existing Conditions: The existence and location of site improvements, utilities, and other construction indicated as existing are not guaranteed. Before beginning work, investigate and verify the existence and location of mechanical and electrical systems and other construction affecting the Work.

1. Before construction, verify the location and points of connection of utility services.

B. Existing Utilities: The existence and location of underground and other utilities and construction indicated as existing are not guaranteed. Before beginning sitework, investigate and verify the existence and location of underground utilities and other construction affecting the Work.

1. Before construction, verify the location and invert elevation at points of connection of sanitary sewer, storm sewer, and water-service piping; and underground electrical services.
2. Furnish location data for work related to Project that must be performed by public utilities serving Project site.

C. Acceptance of Conditions: Examine substrates, areas, and conditions, with Installer or Applicator present where indicated, for compliance with requirements for installation tolerances and other conditions affecting performance. Record observations.

1. Verify compatibility with and suitability of substrates, including compatibility with existing finishes or primers.
2. Examine roughing-in for mechanical and electrical systems to verify actual locations of connections before equipment and fixture installation.
3. Examine walls, floors, and roofs for suitable conditions where products and systems are to be installed.
4. Proceed with installation only after unsatisfactory conditions have been corrected. Proceeding with the Work indicates acceptance of surfaces and conditions.

3.2 PREPARATION

A. Existing Utility Information: Furnish information to Owner that is necessary to adjust, move, or relocate existing utility structures, utility poles, lines, services, or other utility appurtenances located in or affected by construction. Coordinate with authorities having jurisdiction.

B. Field Measurements: Take field measurements as required to fit the Work properly. Recheck measurements before installing each product. Where portions of the Work are indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

C. Space Requirements: Verify space requirements and dimensions of items shown diagrammatically on Drawings.

3.3 CONSTRUCTION LAYOUT

A. Verification: Before proceeding to lay out the Work, verify layout information shown on Drawings, in relation to the property survey and existing benchmarks. If discrepancies are discovered, notify Architect promptly.

B. General: Engage a land surveyor to lay out the Work using accepted surveying practices.

1. Establish benchmarks and control points to set lines and levels at each story of construction and elsewhere as needed to locate each element of Project.
2. Establish dimensions within tolerances indicated. Do not scale Drawings to obtain required dimensions.
3. Inform installers of lines and levels to which they must comply.
4. Check the location, level and plumb, of every major element as the Work progresses.
5. Notify Architect when deviations from required lines and levels exceed allowable tolerances.
6. Close site surveys with an error of closure equal to or less than the standard established by authorities having jurisdiction.

C. Site Improvements: Locate and lay out site improvements, including pavements, grading, fill and topsoil placement, utility slopes, and invert elevations.

D. Building Lines and Levels: Locate and lay out control lines and levels for structures, building foundations, column grids, and floor levels, including those required for mechanical and electrical work. Transfer survey markings and elevations for use with control lines and levels. Level foundations and piers from two or more locations.

E. Record Log: Maintain a log of layout control work. Record deviations from required lines and levels. Include beginning and ending dates and times of surveys, weather conditions, name and duty of each survey party member, and types of instruments and tapes used. Make the log available for reference by Architect.

3.4 FIELD ENGINEERING

A. Identification: Owner will identify existing benchmarks, control points, and property corners on the survey.

B. Reference Points: Locate existing permanent benchmarks, control points, and similar reference points before beginning the Work. Preserve and protect permanent benchmarks and control points during construction operations.

1. Do not change or relocate existing benchmarks or control points without prior written approval of Architect. Report lost or destroyed permanent benchmarks or control points promptly. Report the need to relocate permanent benchmarks or control points to Architect before proceeding.
2. Replace lost or destroyed permanent benchmarks and control points promptly. Base replacements on the original survey control points.

C. Benchmarks: Establish and maintain a minimum of two permanent benchmarks on Project site, referenced to data established by survey control points. Comply with authorities having jurisdiction for type and size of benchmark.

1. Record benchmark locations, with horizontal and vertical data, on Project Record Documents.
2. Where the actual location or elevation of layout points cannot be marked, provide temporary reference points sufficient to locate the Work.
3. Remove temporary reference points when no longer needed. Restore marked construction to its
original condition.

3.5 INSTALLATION

A. General: Locate the Work and components of the Work accurately, in correct alignment and elevation, as indicated.

1. Make vertical work plumb and make horizontal work level.
2. Where space is limited, install components to maximize space available for maintenance and ease of removal for replacement.
3. Conceal pipes, ducts, and wiring in finished areas, unless otherwise indicated.
4. Maintain minimum headroom clearance of 8 feet in spaces without a suspended ceiling.

B. Comply with manufacturer's written instructions and recommendations for installing products in applications indicated.

C. Install products at the time and under conditions that will ensure the best possible results. Maintain conditions required for product performance until project acceptance.

D. Conduct construction operations so no part of the Work is subjected to damaging operations or loading in excess of that expected during normal conditions of occupancy.

E. Tools and Equipment: Do not use tools or equipment that produce harmful noise levels.

F. Templates: Obtain and distribute to the parties involved templates for work specified to be factory prepared and field installed. Check Shop Drawings of other work to confirm that adequate provisions are made for locating and installing products to comply with indicated requirements.

G. Anchors and Fasteners: Provide anchors and fasteners as required to anchor each component securely in place, accurately located and aligned with other portions of the Work.

1. Mounting Heights: Where mounting heights are not indicated, mount components at heights directed by Architect.
2. Allow for building movement, including thermal expansion and contraction.
3. Coordinate installation of anchorages. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors, that are to be embedded in concrete or masonry. Deliver such items to Project site in time for installation.

H. Joints: Make joints of uniform width. Where joint locations in exposed work are not indicated, arrange joints for the best visual effect. Fit exposed connections together to form hairline joints.

I. Hazardous Materials: Use products, cleaners, and installation materials that are not considered hazardous.

3.6 OWNER-INSTALLED PRODUCTS

A. Site Access: Provide access to Project site for Owner's construction forces.

B. Coordination: Coordinate construction and operations of the Work with work performed by Owner's construction forces.

1. Construction Schedule: Inform Owner of Contractor's preferred construction schedule for Owner's
portion of the Work. Adjust construction schedule based on a mutually agreeable timetable. Notify Owner if changes to schedule are required due to differences in actual construction progress.

2. Preinstallation Conferences: Include Owner's construction forces at preinstallation conferences covering portions of the Work that are to receive Owner's work. Attend preinstallation conferences conducted by Owner's construction forces if portions of the Work depend on Owner's construction.

3.7 PROGRESS CLEANING

A. General: Clean Project site and work areas daily, including common areas. Coordinate progress cleaning for joint-use areas where more than one installer has worked. Enforce requirements strictly. Dispose of materials lawfully.

2. Do not hold materials more than 7 days during normal weather or 3 days if the temperature is expected to rise above 80 deg F.
3. Containerize hazardous and unsanitary waste materials separately from other waste. Mark containers appropriately and dispose of legally, according to regulations.

B. Site: Maintain Project site free of waste materials and debris.

C. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the Work.

1. Remove liquid spills promptly.
2. Where dust would impair proper execution of the Work, broom-clean or vacuum the entire work area, as appropriate.

D. Installed Work: Keep installed work clean. Clean installed surfaces according to written instructions of manufacturer or fabricator of product installed, using only cleaning materials specifically recommended. If specific cleaning materials are not recommended, use cleaning materials that are not hazardous to health or property and that will not damage exposed surfaces.

E. Concealed Spaces: Remove debris from concealed spaces before enclosing the space.

F. Exposed Surfaces in Finished Areas: Clean exposed surfaces and protect as necessary to ensure freedom from damage and deterioration at time of project acceptance.

G. Waste Disposal: Burying or burning waste materials on-site will not be permitted. Washing waste materials down sewers or into waterways will not be permitted.

H. During handling and installation, clean and protect construction in progress and adjoining materials already in place. Apply protective covering where required to ensure protection from damage or deterioration at project acceptance.

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

J. Limiting Exposures: Supervise construction operations to assure that no part of the construction, completed or in progress, is subject to harmful, dangerous, damaging, or otherwise deleterious exposure during the construction period.
3.8 STARTING AND ADJUSTING

A. Start equipment and operating components to confirm proper operation. Remove malfunctioning units, replace with new units, and retest.

B. Adjust operating components for proper operation without binding. Adjust equipment for proper operation.

C. Test each piece of equipment to verify proper operation. Test and adjust controls and safeties. Replace damaged and malfunctioning controls and equipment.

D. Manufacturer's Field Service: If a factory-authorized service representative is required to inspect field-assembled components and equipment installation, comply with qualification requirements in Division 01 Section "Quality Requirements."

3.9 PROTECTION OF INSTALLED CONSTRUCTION

A. Provide final protection and maintain conditions that ensure installed Work is without damage or deterioration at time of project acceptance.

B. Comply with manufacturer's written instructions for temperature and relative humidity.

3.10 CORRECTION OF THE WORK

A. Repair or remove and replace defective construction. Restore damaged substrates and finishes. Comply with requirements in Division 01 Section "Cutting and Patching."

   1. Repairing includes replacing defective parts, refinishing damaged surfaces, touching up with matching materials, and properly adjusting operating equipment.

B. Restore permanent facilities used during construction to their specified condition.

C. Remove and replace damaged surfaces that are exposed to view if surfaces cannot be repaired without visible evidence of repair.

D. Repair components that do not operate properly. Remove and replace operating components that cannot be repaired.

E. Remove and replace chipped, scratched, and broken glass or reflective surfaces.

END OF SECTION 017300
SECTION 017329 - CUTTING AND PATCHING

PART 1 - GENERAL

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

1.2 SUMMARY
A. This Section includes procedural requirements for cutting and patching.
B. Related Sections include the following:
   1. Divisions 02 through 49 Sections for specific requirements and limitations applicable to cutting and patching individual parts of the Work.

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

1.4 QUALITY ASSURANCE
A. Structural Elements: Do not cut and patch structural elements in a manner that could change their load-carrying capacity or load-deflection ratio.
   1. Primary operational systems and equipment.
   2. Air or smoke barriers.
   3. Fire-suppression systems.
   4. Mechanical systems piping and ducts.
   5. Control systems.
   6. Communication systems.
   7. Conveying systems.
   8. Electrical wiring systems.
   9. Water, moisture, or vapor barriers.
   10. Membranes and flashings.
   11. Exterior curtain-wall construction.
   12. Equipment supports.
   13. Piping, ductwork, vessels, and equipment.
B. Visual Requirements: Do not cut and patch construction in a manner that results in visual evidence of cutting and patching. Do not cut and patch construction exposed on the exterior or in occupied spaces in...
a manner that would, in Architect's opinion, reduce the building's aesthetic qualities. Remove and replace construction that has been cut and patched in a visually unsatisfactory manner.

PART 2 - PRODUCTS

2.1 MATERIALS

A. General: Comply with requirements specified in other Sections.

B. In-Place Materials: Use materials identical to in-place materials. For exposed surfaces, use materials that visually match in-place adjacent surfaces to the fullest extent possible.
   1. If identical materials are unavailable or cannot be used, use materials that, when installed, will match the visual and functional performance of in-place materials.

PART 3 - EXECUTION

3.1 EXAMINATION

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

3.2 PREPARATION

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

B. Protection: Protect in-place construction during cutting and patching to prevent damage. Provide protection from adverse weather conditions for portions of Project that might be exposed during cutting and patching operations.

C. Adjoining Areas: Avoid interference with use of adjoining areas or interruption of free passage to adjoining areas.

3.3 PERFORMANCE

A. General: Employ skilled workers to perform cutting and patching. Proceed with cutting and patching at the earliest feasible time, and complete without delay.
   1. Cut in-place construction to provide for installation of other components or performance of other construction, and subsequently patch as required to restore surfaces to their original condition.

B. Cutting: Cut in-place construction by sawing, drilling, breaking, chipping, grinding, and similar operations, including excavation, using methods least likely to damage elements retained or adjoining construction. If possible, review proposed procedures with original Installer; comply with original
Installer's written recommendations.

1. In general, use hand or small power tools designed for sawing and grinding, not hammering and chopping. Cut holes and slots as small as possible, neatly to size required, and with minimum disturbance of adjacent surfaces. Temporarily cover openings when not in use.

2. Finished Surfaces: Cut or drill from the exposed or finished side into concealed surfaces.

3. Excavating and Backfilling: Comply with requirements in applicable Division 31 Sections where required by cutting and patching operations.

4. Mechanical and Electrical Services: Cut off pipe or conduit in walls or partitions to be removed. Cap, valve, or plug and seal remaining portion of pipe or conduit to prevent entrance of moisture or other foreign matter after cutting.

5. Proceed with patching after construction operations requiring cutting are complete.

C. Patching: Patch construction by filling, repairing, refinishing, closing up, and similar operations following performance of other Work. Patch with durable seams that are as invisible as possible. Provide materials and comply with installation requirements specified in other Sections.

1. Inspection: Where feasible, test and inspect patched areas after completion to demonstrate integrity of installation.

2. Exposed Finishes: Restore exposed finishes of patched areas and extend finish restoration into retained adjoining construction in a manner that will eliminate evidence of patching and refinishing.

   a. Clean piping, conduit, and similar features before applying paint or other finishing materials.

   b. Restore damaged pipe covering to its original condition.

D. Cleaning: Clean areas and spaces where cutting and patching are performed. Completely remove paint, mortar, oils, putty, and similar materials.

END OF SECTION 017329
SECTION 017419 - CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

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 administrative and procedural requirements for the following:
   1. Recycling nonhazardous construction waste.
   2. Disposing of nonhazardous construction waste.

B. Related Sections include the following:
   1. Division 31 Section "Site Clearing" for disposition of waste resulting from site clearing and removal of above- and below-grade improvements.

1.3 DEFINITIONS

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

B. 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.

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

1.4 PERFORMANCE REQUIREMENTS

A. 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.

1. Construction Waste:
   a. Site-clearing waste.
   b. Masonry and CMU.
   c. Lumber.
   d. Wood sheet materials.
   e. Wood trim.
   f. Metals.
   g. Roofing.
   h. Insulation.
   i. Carpet and pad.
   j. Gypsum board.
   k. Piping.
1. Electrical conduit.

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

1) Paper.
2) Cardboard.
3) Boxes.
4) Plastic sheet and film.
5) Polystyrene packaging.
7) Plastic pails.

1.5 SUBMITTALS

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

B. Waste Reduction Progress Reports: Concurrent with each Application for Payment, submit three copies of report. Include the following information:

1. Material category.
2. Generation point of waste.
3. Total quantity of waste in tons.
4. Quantity of waste recycled, both estimated and actual in tons.
5. Total quantity of waste recovered (salvaged plus recycled) in tons.
6. Total quantity of waste recovered (salvaged plus recycled) as a percentage of total waste.

C. 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.

D. 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.

1.6 QUALITY ASSURANCE

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

B. Waste Management Conference: Conduct conference at Project site to comply with requirements in Division 01 Section "Project Management and Coordination." Review methods and procedures related to waste management including, but not limited to, the following:

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

A. General: Develop plan consisting of waste identification, waste reduction work plan, and cost/revenue analysis. Indicate quantities by weight or volume, but use same units of measure throughout waste management plan.


C. 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.

1. Recycled Materials: Include list of local receivers and processors and type of recycled materials each will accept. Include names, addresses, and telephone numbers.
2. Disposed Materials: Indicate how and where materials will be disposed of. Include name, address, and telephone number of each landfill and incinerator facility.
3. 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.

D. 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:

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

E. Forms: Prepare waste management plan on forms included at end of Part 3.

PART 2 - PRODUCTS (Not Used)

PART 3 - EXECUTION

3.1 PLAN IMPLEMENTATION

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

1. Comply with Division 01 Section "Temporary Facilities and Controls" for operation, termination, and removal requirements.

B. 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.

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

1. Distribute waste management plan to everyone concerned within three days of submittal return.
2. Distribute waste management plan to entities when they first begin work on-site. Review plan procedures and locations established for salvage, recycling, and disposal.

D. 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.

1. Designate and label specific areas on Project site necessary for separating materials that are to be salvaged, recycled, reused, donated, and sold.
2. Comply with Division 01 Section "Temporary Facilities and Controls" for controlling dust and dirt, environmental protection, and noise control.

3.2 RECYCLING CONSTRUCTION WASTE, GENERAL

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

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

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

1. 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.
   a. Inspect containers and bins for contamination and remove contaminated materials if found.

2. Stockpile processed materials on-site without intermixing with other materials. Place, grade, and shape stockpiles to drain surface water. Cover to prevent windblown dust.
3. Stockpile materials away from construction area. Do not store within drip line of remaining trees.
4. Store components off the ground and protect from the weather.
5. Remove recyclable waste off Owner's property and transport to recycling receiver or processor.

3.3 RECYCLING CONSTRUCTION WASTE

A. Packaging:

1. Cardboard and Boxes: Break down packaging into flat sheets. Bundle and store in a dry location.
3. 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.
4. Crates: Break down crates into component wood pieces and comply with requirements for recycling wood.

B. Site-Clearing Wastes: Chip brush, branches, and trees on-site.
1. Comply with requirements in Division 32 Section "Plants" for use of chipped organic waste as organic mulch.

C. Wood Materials:
1. Clean Cut-Offs of Lumber: Grind or chip into small pieces.
2. Clean Sawdust: Bag sawdust that does not contain painted or treated wood.
   a. Comply with requirements in Division 32 Section "Plants." for use of clean sawdust as organic mulch.

D. Gypsum Board: Stack large clean pieces on wood pallets and store in a dry location.
1. Clean Gypsum Board: Grind scraps of clean gypsum board using small mobile chipper or hammer mill. Screen out paper after grinding.
   a. Comply with requirements in Division 32 Section "Plants." for use of clean ground gypsum board as inorganic soil amendment.

3.4 DISPOSAL OF WASTE

A. General: Except for items or materials to be salvaged, recycled, or otherwise reused, remove waste materials from Project site and legally dispose of them in a landfill or incinerator acceptable to authorities having jurisdiction.
   1. Except as otherwise specified, do not allow waste materials that are to be disposed of accumulate on-site.
   2. Remove and transport debris in a manner that will prevent spillage on adjacent surfaces and areas.

B. Burning: Do not burn waste materials.

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

END OF SECTION 017419
SECTION 017700 - CLOSEOUT PROCEDURES

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes administrative and procedural requirements for contract closeout, including, but not limited to, the following:
      1. Inspection procedures.
      2. Warranties.
      3. Final cleaning.
   B. Related Sections include the following:
      1. Division 01 Section "Payment Procedures" for requirements for Applications for Payment for Substantial and Final Completion.
      2. Division 01 Section "Execution" for progress cleaning of Project site.
      3. Division 01 Section "Project Record Documents" for submitting Record Drawings, Record Specifications, and Record Product Data.
      4. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
      5. Division 01 Section "Demonstration and Training" for requirements for instructing Owner's personnel.
      6. Divisions 02 through 49 Sections for specific closeout and special cleaning requirements for the Work in those Sections.

1.3 PROJECT ACCEPTANCE
   A. Preliminary Procedures: Before requesting inspection for determining date of project acceptance, complete the following. List items below that are incomplete in request.
      1. Prepare a list of items to be completed and corrected (punch list), the value of items on the list, and reasons why the Work is not complete.
      2. Advise Owner of pending insurance changeover requirements.
      3. Submit specific warranties, workmanship bonds, maintenance service agreements, final certifications, and similar documents.
      4. Make final changeover of permanent locks and deliver keys to Owner. Advise Owner's personnel of changeover in security provisions.
      5. Complete startup testing of systems.
      7. Terminate and remove temporary facilities from Project site, along with mockups, construction tools, and similar elements.
      8. Advise Owner of changeover in heat and other utilities.
      9. Submit changeover information related to Owner's occupancy, use, operation, and maintenance.
10. Complete final cleaning requirements, including touchup painting.
11. Touch up and otherwise repair and restore marred exposed finishes to eliminate visual defects.

12. Inspection: Submit a written request for inspection for project acceptance. On receipt of request, Architect Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

13. Results of completed inspection will form the basis of requirements for Final Completion.

1.4 FINAL COMPLETION

A. Preliminary Procedures: Before requesting final inspection for determining date of Final Completion, complete the following:

1. Submit a final Application for Payment according to Division 01 Section "Payment Procedures."
2. Submit certified copy of Architect's project acceptance inspection list of items to be completed or corrected (punch list), endorsed and dated by Architect. The certified copy of the list shall state that each item has been completed or otherwise resolved for acceptance.
3. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
4. Submit pest-control final inspection report and warranty.

5. Inspection: Submit a written request for final inspection for acceptance. On receipt of request, Architect Reinspection: Request reinspection when the Work identified in previous inspections as incomplete is completed or corrected.

1.5 LIST OF INCOMPLETE ITEMS (PUNCH LIST)

1. Preparation: Submit Organize list of spaces in sequential order, Organize items applying to each space by major element, including categories for ceiling, individual walls, floors, equipment, and building systems.
2. Include the following information at the top of each page:
   a. Project name.
   b. Date.

1.6 WARRANTIES

A. Submittal Time: Submit written warranties on request of Architect for designated portions of the Work where commencement of warranties other than date of project acceptance is indicated.

B. Organize warranty documents into an orderly sequence based on the table of contents of the Project Manual.

1. Bind warranties and bonds in heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, thickness as necessary to accommodate contents, and sized to receive 8-1/2-by-11-inch paper.
2. Provide heavy paper dividers with plastic-covered tabs for each separate warranty. Mark tab to identify the product or installation. Provide a typed description of the product or installation, including the name of the product and the name, address, and telephone number of Installer.
3. Identify each binder on the front and spine with the typed or printed title "WARRANTIES," Project name, and name of Contractor.

C. Provide additional copies of each warranty to include in operation and maintenance manuals.
PART 2 - PRODUCTS

2.1 MATERIALS

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

PART 3 - EXECUTION

3.1 FINAL CLEANING

A. General: Provide final cleaning. Conduct cleaning and waste-removal operations to comply with local laws and ordinances and Federal and local environmental and antipollution regulations.

B. Cleaning: Employ experienced workers or professional cleaners for final cleaning. Clean each surface or unit to condition expected in an average commercial building cleaning and maintenance program. Comply with manufacturer's written instructions.

1. Complete the following cleaning operations before requesting inspection for certification of project acceptance for entire Project or for a portion of Project:

   a. Clean Project site, yard, and grounds, in areas disturbed by construction activities, including landscape development areas, of rubbish, waste material, litter, and other foreign substances.
   
   b. Sweep paved areas broom clean. Remove petrochemical spills, stains, and other foreign deposits.
   
   c. Rake grounds that are neither planted nor paved to a smooth, even-textured surface.
   
   d. Remove tools, construction equipment, machinery, and surplus material from Project site.
   
   e. Remove snow and ice to provide safe access to building.
   
   f. Clean exposed exterior and interior hard-surfaced finishes to a dirt-free condition, free of stains, films, and similar foreign substances. Avoid disturbing natural weathering of exterior surfaces. Restore reflective surfaces to their original condition.
   
   g. Remove debris and surface dust from limited access spaces, including roofs, plenums, shafts, trenches, equipment vaults, manholes, attics, and similar spaces.
   
   h. Sweep concrete floors broom clean in unoccupied spaces.
   
   i. Vacuum carpet and similar soft surfaces, removing debris and excess nap; shampoo if visible soil or stains remain.
   
   j. Clean transparent materials, including mirrors and glass in doors and windows. Remove glazing compounds and other noticeable, vision-obscuring materials. Replace chipped or broken glass and other damaged transparent materials. Polish mirrors and glass, taking care not to scratch surfaces.
   
   k. Remove labels that are not permanent.
   
   l. Touch up and otherwise repair and restore marred, exposed finishes and surfaces. Replace finishes and surfaces that cannot be satisfactorily repaired or restored or that already show evidence of repair or restoration.
   
   1) Do not paint over "UL" and similar labels, including mechanical and electrical nameplates.
   
   m. Wipe surfaces of mechanical and electrical equipment. Replace parts subject to unusual operating conditions.
   
   n. Clean plumbing fixtures to a sanitary condition, free of stains, including stains resulting
from water exposure.

o. Replace disposable air filters and clean permanent air filters. Clean exposed surfaces of diffusers, registers, and grills.

p. Clean ducts, blowers, and coils if units were operated without filters during construction.

q. Clean light fixtures, lamps, globes, and reflectors to function with full efficiency. Replace burned-out bulbs, and those noticeably dimmed by hours of use, and defective and noisy starters in fluorescent and mercury vapor fixtures to comply with requirements for new fixtures.

r. Leave Project clean and ready for occupancy.

C. Pest Control: Engage an experienced, licensed exterminator to make a final inspection and rid Project of rodents, insects, and other pests. Prepare a report.

D. Comply with safety standards for cleaning. Do not burn waste materials. Do not bury debris or excess materials on Owner's property. Do not discharge volatile, harmful, or dangerous materials into drainage systems. Remove waste materials from Project site and dispose of lawfully.

END OF SECTION 017700
SECTION 017823 - OPERATION AND MAINTENANCE DATA

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for preparing operation and maintenance manuals, including the following:

1. Operation and maintenance documentation directory.
2. Emergency manuals.
3. Operation manuals for systems, subsystems, and equipment.
4. Maintenance manuals for the care and maintenance of products, materials, and finishes systems and equipment.

B. Related Sections include the following:

1. Division 01 Section "Submittal Procedures" for submitting copies of submittals for operation and maintenance manuals.
2. Division 01 Section "Closeout Procedures" for submitting operation and maintenance manuals.
3. Division 01 Section "Project Record Documents" for preparing Record Drawings for operation and maintenance manuals.
4. Divisions 02 through 49 Sections for specific operation and maintenance manual requirements for the Work in those Sections.

1.3 DEFINITIONS

A. System: An organized collection of parts, equipment, or subsystems united by regular interaction.

B. Subsystem: A portion of a system with characteristics similar to a system.

1.4 SUBMITTALS

A. Final Submittal: Submit 3 copies of each manual in final form at least 15 days before final inspection. Architect will return copy with comments within 15 days after final inspection.

1. Correct or modify each manual to comply with Architect's comments. Submit 3 copies of each corrected manual within 15 days of receipt of Architect's comments.

1.5 COORDINATION

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

PART 2 - PRODUCTS

2.1 OPERATION AND MAINTENANCE DOCUMENTATION DIRECTORY

A. Organization: Include a section in the directory for each of the following:

1. List of documents.
2. List of systems.
3. List of equipment.
4. Table of contents.

B. List of Systems and Subsystems: List systems alphabetically. Include references to operation and maintenance manuals that contain information about each system.

C. List of Equipment: List equipment for each system, organized alphabetically by system. For pieces of equipment not part of system, list alphabetically in separate list.

D. Tables of Contents: Include a table of contents for each emergency, operation, and maintenance manual.

E. Identification: In the documentation directory and in each operation and maintenance manual, identify each system, subsystem, and piece of equipment with same designation used in the Contract Documents. If no designation exists, assign a designation according to ASHRAE Guideline 4, "Preparation of Operating and Maintenance Documentation for Building Systems."

2.2 MANUALS, GENERAL

A. Organization: Unless otherwise indicated, organize each manual into a separate section for each system and subsystem, and a separate section for each piece of equipment not part of a system. Each manual shall contain the following materials, in the order listed:

1. Title page.
2. Table of contents.

B. Title Page: Enclose title page in transparent plastic sleeve. Include the following information:

1. Subject matter included in manual.
2. Name and address of Project.
3. Name and address of Owner.
4. Date of submittal.
5. Name, address, and telephone number of Contractor.
6. Name and address of Architect.
7. Cross-reference to related systems in other operation and maintenance manuals.

C. Table of Contents: List each product included in manual, identified by product name, indexed to the content of the volume, and cross-referenced to Specification Section number in Project Manual.

1. If operation or maintenance documentation requires more than one volume to accommodate data, include comprehensive table of contents for all volumes in each volume of the set.
D. Manual Contents: Organize into sets of manageable size. Arrange contents alphabetically by system, subsystem, and equipment. If possible, assemble instructions for subsystems, equipment, and components of one system into a single binder.

1. Binders: Heavy-duty, 3-ring, vinyl-covered, loose-leaf binders, in thickness necessary to accommodate contents, sized to hold 8-1/2-by-11-inch paper; with clear plastic sleeve on spine to hold label describing contents and with pockets inside covers to hold folded oversize sheets.
   a. If two or more binders are necessary to accommodate data of a system, organize data in each binder into groupings by subsystem and related components. Cross-reference other binders if necessary to provide essential information for proper operation or maintenance of equipment or system.
   b. Identify each binder on front and spine, with printed title "OPERATION AND MAINTENANCE MANUAL," Project title or name, and subject matter of contents. Indicate volume number for multiple-volume sets.

2. Dividers: Heavy-paper dividers with plastic-covered tabs for each section. Mark each tab to indicate contents. Include typed list of products and major components of equipment included in the section on each divider, cross-referenced to Specification Section number and title of Project Manual.

3. Protective Plastic Sleeves: Transparent plastic sleeves designed to enclose diagnostic software diskettes for computerized electronic equipment.


5. Drawings: Attach reinforced, punched binder tabs on drawings and bind with text.
   a. If oversize drawings are necessary, fold drawings to same size as text pages and use as foldouts.
   b. If drawings are too large to be used as foldouts, fold and place drawings in labeled envelopes and bind envelopes in rear of manual. At appropriate locations in manual, insert typewritten pages indicating drawing titles, descriptions of contents, and drawing locations.

2.3 EMERGENCY MANUALS

A. Content: Organize manual into a separate section for each of the following:
   1. Type of emergency.
   2. Emergency instructions.
   3. Emergency procedures.

B. Type of Emergency: Where applicable for each type of emergency indicated below, include instructions and procedures for each system, subsystem, piece of equipment, and component:
   1. Fire.
   2. Flood.
   5. Power failure.
   7. System, subsystem, or equipment failure.
   8. Chemical release or spill.

C. Emergency Instructions: Describe and explain warnings, trouble indications, error messages, and similar codes and signals. Include responsibilities of Owner’s operating personnel for notification of Installer, supplier, and manufacturer to maintain warranties.
D. Emergency Procedures: Include the following, as applicable:

1. Instructions on stopping.
2. Shutdown instructions for each type of emergency.
3. Operating instructions for conditions outside normal operating limits.
4. Required sequences for electric or electronic systems.
5. Special operating instructions and procedures.

2.4 OPERATION MANUALS

A. Content: In addition to requirements in this Section, include operation data required in individual Specification Sections and the following information:

1. System, subsystem, and equipment descriptions.
2. Performance and design criteria if Contractor is delegated design responsibility.
3. Operating standards.
4. Operating procedures.
5. Operating logs.
6. Wiring diagrams.
7. Control diagrams.
8. Piped system diagrams.
9. Precautions against improper use.
10. License requirements including inspection and renewal dates.

B. Descriptions: Include the following:

1. Product name and model number.
2. Manufacturer's name.
3. Equipment identification with serial number of each component.
4. Equipment function.
5. Operating characteristics.
6. Limiting conditions.
7. Performance curves.
8. Engineering data and tests.
9. Complete nomenclature and number of replacement parts.

C. Operating Procedures: Include the following, as applicable:

1. Startup procedures.
2. Equipment or system break-in procedures.
3. Routine and normal operating instructions.
4. Regulation and control procedures.
5. Instructions on stopping.
7. Seasonal and weekend operating instructions.
8. Required sequences for electric or electronic systems.
9. Special operating instructions and procedures.

D. Systems and Equipment Controls: Describe the sequence of operation, and diagram controls as installed.

E. Piped Systems: Diagram piping as installed, and identify color-coding where required for identification.

2.5 PRODUCT MAINTENANCE MANUAL
A. Content: Organize manual into a separate section for each product, material, and finish. Include source information, product information, maintenance procedures, repair materials and sources, and warranties and bonds, as described below.

B. Source Information: List each product included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Product Information: Include the following, as applicable:
   1. Product name and model number.
   2. Manufacturer's name.
   3. Color, pattern, and texture.
   5. Reordering information for specially manufactured products.

D. Maintenance Procedures: Include manufacturer's written recommendations and the following:
   1. Inspection procedures.
   2. Types of cleaning agents to be used and methods of cleaning.
   3. List of cleaning agents and methods of cleaning detrimental to product.
   4. Schedule for routine cleaning and maintenance.
   5. Repair instructions.

E. Repair Materials and Sources: Include lists of materials and local sources of materials and related services.

F. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.
   1. Include procedures to follow and required notifications for warranty claims.

2.6 SYSTEMS AND EQUIPMENT MAINTENANCE MANUAL

A. Content: For each system, subsystem, and piece of equipment not part of a system, include source information, manufacturers' maintenance documentation, maintenance procedures, maintenance and service schedules, spare parts list and source information, maintenance service contracts, and warranty and bond information, as described below.

B. Source Information: List each system, subsystem, and piece of equipment included in manual, identified by product name and arranged to match manual's table of contents. For each product, list name, address, and telephone number of Installer or supplier and maintenance service agent, and cross-reference Specification Section number and title in Project Manual.

C. Manufacturers' Maintenance Documentation: Manufacturers' maintenance documentation including the following information for each component part or piece of equipment:
   1. Standard printed maintenance instructions and bulletins.
   2. Drawings, diagrams, and instructions required for maintenance, including disassembly and component removal, replacement, and assembly.
   3. Identification and nomenclature of parts and components.
   4. List of items recommended to be stocked as spare parts.
D. Maintenance Procedures: Include the following information and items that detail essential maintenance procedures:

1. Test and inspection instructions.
2. Troubleshooting guide.
3. Precautions against improper maintenance.
4. Disassembly; component removal, repair, and replacement; and reassembly instructions.
5. Aligning, adjusting, and checking instructions.
6. Demonstration and training videotape, if available.

E. Maintenance and Service Schedules: Include service and lubrication requirements, list of required lubricants for equipment, and separate schedules for preventive and routine maintenance and service with standard time allotment.

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

F. Spare Parts List and Source Information: Include lists of replacement and repair parts, with parts identified and cross-referenced to manufacturers' maintenance documentation and local sources of maintenance materials and related services.

G. Warranties and Bonds: Include copies of warranties and bonds and lists of circumstances and conditions that would affect validity of warranties or bonds.

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

PART 3 - EXECUTION

3.1 MANUAL PREPARATION

A. Operation and Maintenance Documentation Directory: Prepare a separate manual that provides an organized reference to emergency, operation, and maintenance manuals.

B. Emergency Manual: Assemble a complete set of emergency information indicating procedures for use by emergency personnel and by Owner's operating personnel for types of emergencies indicated.

C. Product Maintenance Manual: Assemble a complete set of maintenance data indicating care and maintenance of each product, material, and finish incorporated into the Work.

D. Operation and Maintenance Manuals: Assemble a complete set of operation and maintenance data indicating operation and maintenance of each system, subsystem, and piece of equipment not part of a system.

1. Engage a factory-authorized service representative to assemble and prepare information for each system, subsystem, and piece of equipment not part of a system.
2. Prepare a separate manual for each system and subsystem, in the form of an instructional manual for use by Owner's operating personnel.

E. Manufacturers' Data: Where manuals contain manufacturers' standard printed data, include only sheets pertinent to product or component installed. Mark each sheet to identify each product or component incorporated into the Work. If data include more than one item in a tabular format, identify each item using appropriate references from the Contract Documents. Identify data applicable to the Work and
delete references to information not applicable.

1. Prepare supplementary text if manufacturers' standard printed data are not available and where the information is necessary for proper operation and maintenance of equipment or systems.

F. Drawings: Prepare drawings supplementing manufacturers' printed data to illustrate the relationship of component parts of equipment and systems and to illustrate control sequence and flow diagrams. Coordinate these drawings with information contained in Record Drawings to ensure correct illustration of completed installation.

1. Do not use original Project Record Documents as part of operation and maintenance manuals.
2. Comply with requirements of newly prepared Record Drawings in Division 01 Section "Project Record Documents."

G. Comply with Division 01 Section "Closeout Procedures" for schedule for submitting operation and maintenance documentation.

END OF SECTION 017823
SECTION 017839 - PROJECT RECORD DOCUMENTS

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes administrative and procedural requirements for Project Record Documents, including the following:

1. Record Drawings.

B. Related Sections include the following:

1. Division 01 Section "Closeout Procedures" for general closeout procedures.
2. Division 01 Section "Operation and Maintenance Data" for operation and maintenance manual requirements.
3. Divisions 02 through 49 Sections for specific requirements for Project Record Documents of the Work in those Sections.

1.3 SUBMITTALS

A. Record Drawings: Comply with the following:

1. Number of Copies: Submit one set(s) of marked-up Record Prints.
2. Number of Copies: Submit copies of Record Drawings as follows:

   a. Initial Submittal: Submit set(s) of and one set(s) of marked-up Record Prints. Architect will initial and date each plot and mark whether general scope of changes, additional information recorded, and quality of drafting are acceptable. Architect will return plots and prints for organizing into sets, printing, binding, and final submittal.

PART 2 - PRODUCTS

2.1 RECORD DRAWINGS

A. Record Prints: Maintain one set of blue- or black-line white prints of the Contract Drawings and Shop Drawings. Contractor is to mark the drawings. Architect will prepare CAD drawings for owner.

1. Preparation: Mark Record Prints to show the actual installation where installation varies from that shown originally. Require individual or entity who obtained record data, whether individual or entity is Installer, subcontractor, or similar entity, to prepare the marked-up Record Prints.
a. Give particular attention to information on concealed elements that would be difficult to identify or measure and record later.
b. Accurately record information in an understandable drawing technique.
c. Record data as soon as possible after obtaining it. Record and check the markup before enclosing concealed installations.

2. Content: Types of items requiring marking include, but are not limited to, the following:

a. Dimensional changes to Drawings.
b. Revisions to details shown on Drawings.
c. Depths of foundations below first floor.
d. Locations and depths of underground utilities.
e. Revisions to routing of piping and conduits.
f. Revisions to electrical circuitry.
g. Actual equipment locations.
h. Duct size and routing.
i. Locations of concealed internal utilities.
j. Changes made by Change Order or Construction Change Directive.
k. Changes made following Architect's written orders.
l. Details not on the original Contract Drawings.
m. Field records for variable and concealed conditions.
n. Record information on the Work that is shown only schematically.

3. Mark the Contract Drawings or Shop Drawings, whichever is most capable of showing actual physical conditions, completely and accurately. If Shop Drawings are marked, show cross-reference on the Contract Drawings.

4. Mark record sets with erasable, red-colored pencil. Use other colors to distinguish between changes for different categories of the Work at same location.

5. Mark important additional information that was either shown schematically or omitted from original Drawings.

6. Note Construction Change Directive numbers, alternate numbers, Change Order numbers, and similar identification, where applicable.

B. Format: Identify and date each Record Drawing; include the designation "PROJECT RECORD DRAWING" in a prominent location.

1. Record Prints: Organize Record Prints and newly prepared Record Drawings into manageable sets. Bind each set with durable paper cover sheets. Include identification on cover sheets.

2. Identification: As follows:

a. Project name.
b. Date.
c. Designation "PROJECT RECORD DRAWINGS."
d. Name of Architect.
e. Name of Contractor.

2.2 MISCELLANEOUS RECORD SUBMITTALS

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

A. Recording: Maintain one copy of each submittal during the construction period for Project Record Document purposes. Post changes and modifications to Project Record Documents as they occur; do not wait until the end of Project.

B. Maintenance of Record Documents and Samples: Store Record Documents and Samples in the field office apart from the Contract Documents used for construction. Do not use Project Record Documents for construction purposes. Maintain Record Documents in good order and in a clean, dry, legible condition, protected from deterioration and loss. Provide access to Project Record Documents for Architect's reference during normal working hours.

END OF SECTION 017839
SECTION 017900 - DEMONSTRATION AND TRAINING

PART 1 - GENERAL

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

1.2 SUMMARY
   A. This Section includes administrative and procedural requirements for instructing Owner's personnel, including the following:
      1. Demonstration of operation of systems, subsystems, and equipment.
      2. Training in operation and maintenance of systems, subsystems, and equipment.
   B. Related Sections include the following:
      1. Division 01 Section "Project Management and Coordination" for requirements for preinstruction conferences.
      2. Divisions 02 through 49 Sections for specific requirements for demonstration and training for products in those Sections.

1.3 SUBMITTALS
   A. Attendance Record: For each training module, submit list of participants and length of instruction time.

1.4 QUALITY ASSURANCE
   A. Facilitator Qualifications: A firm or individual experienced in training or educating maintenance personnel in a training program similar in content and extent to that indicated for this Project, and whose work has resulted in training or education with a record of successful learning performance.
   B. Instructor Qualifications: A factory-authorized service representative, complying with requirements in Division 01 Section "Quality Requirements," experienced in operation and maintenance procedures and training.

1.5 COORDINATION
   A. Coordinate instruction schedule with Owner's operations. Adjust schedule as required to minimize disrupting Owner's operations.
   B. Coordinate instructors, including providing notification of dates, times, length of instruction time, and course content.
   C. Coordinate content of training modules with content of approved emergency, operation, and maintenance manuals. Do not submit instruction program until operation and maintenance data has been reviewed.
and approved by Architect.

PART 2 - PRODUCTS

2.1 INSTRUCTION PROGRAM

A. Program Structure: Develop an instruction program that includes individual training modules for each system and equipment not part of a system, as required by individual Specification Sections, and as follows:

B. Fire-protection systems, including Conveying systems, including Heat generation, including Training Modules: Develop a learning objective and teaching outline for each module. Include a description of specific skills and knowledge that participant is expected to master. For each module, include instruction for the following:

1. Basis of System Design, Operational Requirements, and Criteria: Include the following:
   a. System, subsystem, and equipment descriptions.
   b. Performance and design criteria if Contractor is delegated design responsibility.
   c. Operating standards.
   d. Regulatory requirements.
   e. Equipment function.
   f. Operating characteristics.
   g. Limiting conditions.
   h. Performance curves.

2. Documentation: Review the following items in detail:
   a. Emergency manuals.
   b. Operations manuals.
   c. Maintenance manuals.
   d. Project Record Documents.
   e. Identification systems.
   f. Warranties and bonds.
   g. Maintenance service agreements and similar continuing commitments.

3. Emergencies: Include the following, as applicable:
   a. Instructions on meaning of warnings, trouble indications, and error messages.
   b. Instructions on stopping.
   c. Shutdown instructions for each type of emergency.
   d. Operating instructions for conditions outside of normal operating limits.
   e. Sequences for electric or electronic systems.
   f. Special operating instructions and procedures.

4. Operations: Include the following, as applicable:
   a. Startup procedures.
   b. Equipment or system break-in procedures.
   c. Routine and normal operating instructions.
   d. Regulation and control procedures.
   e. Control sequences.
   f. Safety procedures.
g. Instructions on stopping.
h. Normal shutdown instructions.
i. Operating procedures for emergencies.
j. Operating procedures for system, subsystem, or equipment failure.
k. Seasonal and weekend operating instructions.
l. Required sequences for electric or electronic systems.
m. Special operating instructions and procedures.

5. Adjustments: Include the following:
   a. Alignments.
   b. Checking adjustments.
   c. Noise and vibration adjustments.
   d. Economy and efficiency adjustments.

6. Troubleshooting: Include the following:
   a. Diagnostic instructions.
   b. Test and inspection procedures.

7. Maintenance: Include the following:
   a. Inspection procedures.
   b. Types of cleaning agents to be used and methods of cleaning.
   c. List of cleaning agents and methods of cleaning detrimental to product.
   d. Procedures for routine cleaning
   e. Procedures for preventive maintenance.
   f. Procedures for routine maintenance.
   g. Instruction on use of special tools.

8. Repairs: Include the following:
   a. Diagnosis instructions.
   b. Repair instructions.
   c. Disassembly; component removal, repair, and replacement; and reassembly instructions.
   d. Instructions for identifying parts and components.
   e. Review of spare parts needed for operation and maintenance.

PART 3 - EXECUTION

3.1 PREPARATION

A. Assemble educational materials necessary for instruction, including documentation and training module. Assemble training modules into a combined training manual.

B. Set up instructional equipment at instruction location.

3.2 INSTRUCTION

A. Facilitator: Engage a qualified facilitator to prepare instruction program and training modules, to coordinate instructors, and to coordinate between Contractor and Owner for number of participants, instruction times, and location.
B. Engage qualified instructors to instruct Owner's personnel to adjust, operate, and maintain systems, subsystems, and equipment not part of a system.

1. Architect will furnish an instructor to describe basis of system design, operational requirements, criteria, and regulatory requirements.
2. Owner will furnish an instructor to describe Owner's operational philosophy.
3. Owner will furnish Contractor with names and positions of participants.

C. Scheduling: Provide instruction at mutually agreed on times. For equipment that requires seasonal operation, provide similar instruction at start of each season.

END OF SECTION 017900
SECTION 033000 - 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. This Section specifies cast-in-place concrete, including formwork, reinforcement, concrete materials, mixture design, placement procedures, and finishes, for the following:

1. Footings.
2. Foundation walls.
3. Slabs-on-grade.

B. Related Sections include the following:
1. Division 32 Section "Concrete Paving" for concrete pavement and walks.

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 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.

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

F. 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. Adhesives.
9. Vapor retarders.
10. Semirigid joint filler.
12. Repair materials.

G. Field quality-control test and inspection reports.

H. Minutes of pre-installation conference.

1.5 QUALITY ASSURANCE

A. Installer Qualifications: A qualified installer who employs on Project personnel qualified as ACI-certified Flatwork Technician and Finisher and a supervisor who is an ACI-certified Concrete Flatwork Technician.

B. Manufacturer Qualifications: A firm experienced in manufacturing ready-mixed concrete products and that complies with ASTM C 94/C 94M requirements for production facilities and equipment.

1. Manufacturer certified according to NRMCA’s "Certification of Ready Mixed Concrete Production Facilities."

C. Testing Agency Qualifications: An independent agency qualified according to ASTM C 1077 and ASTM E 329 for testing indicated, as documented according to ASTM E 548.

1. Personnel conducting field tests shall be qualified as ACI Concrete Field Testing Technician, Grade 1, according to ACI CP-01 or an equivalent certification program.
2. Personnel performing laboratory tests shall be ACI-certified Concrete Strength Testing Technician and Concrete Laboratory Testing Technician - Grade I. Testing Agency laboratory supervisor shall be an ACI-certified Concrete Laboratory Testing Technician - Grade II.

D. Source Limitations: Obtain each type or class of cementitious material of the same brand from the same manufacturer's plant, obtain aggregate from one source, and obtain admixtures through one source from a single manufacturer.

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

F. ACI Publications: Comply with the following unless modified by requirements in the Contract Documents:
1. ACI 301, "Specification for Structural Concrete," Sections 1 through 5.
2. ACI 117, "Specifications for Tolerances for Concrete Construction and Materials."

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

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

1. Before submitting design mixtures, review concrete design mixture and examine procedures for ensuring quality of concrete materials. Require representatives of each entity directly concerned with cast-in-place concrete to attend, including the following:
   a. Contractor's superintendent.
   b. Independent testing agency responsible for concrete design mixtures.
   c. Ready-mix concrete manufacturer.
   d. Concrete subcontractor.

2. Review special inspection and testing and inspecting agency procedures for field quality control, concrete finishes and finishing, cold- and hot-weather concreting procedures, curing procedures, construction contraction and isolation joints, and joint-filler strips, forms and form removal limitations, vapor-retarder installation, anchor rod and anchorage device installation tolerances, steel reinforcement installation, floor and slab flatness and levelness measurement, concrete repair procedures, and concrete protection.

1.6 DELIVERY, STORAGE, AND HANDLING

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

B. Waterstops: Store waterstops under cover to protect from moisture, sunlight, dirt, oil, and other contaminants.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, products specified.

2. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, manufacturers specified.

2.2 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: 1x8 Rough Sawn Lumber or another approved material. Provide lumber dressed on at least two edges and one side for tight fit.


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.

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.

2.3 STEEL REINFORCEMENT

A. Recycled Content of Steel Products: Provide products with an average recycled content of steel products so postconsumer recycled content plus one-half of pre-consumer recycled content is not less than 25 percent.

B. Reinforcing Bars: ASTM A 615/A 615M, Grade 60, deformed.

C. Plain-Steel Welded Wire Reinforcement: ASTM A 185, plain, fabricated from as-drawn steel wire into flat sheets.

D. Deformed Bar Anchors shall be manufactured from cold-rolled, deformed reinforcing bars conforming to the requirements of AWS D1.1 and ASTM A496 with a minimum yield strength of 70 ksi (485 MPa) and tensile strength of 80 ksi (550 MPa). Anchors shall be attached to the structural steel using automatic end-welding equipment in strict accordance with the manufacturer’s written instructions, Anchor diameter and length shall be as indicated on the Structural Drawings.
2.4 REINFORCEMENT ACCESSORIES

A. Joint Dowel Bars: ASTM A 615/A 615M, Grade 60, plain-steel bars, cut bars true to length with ends square and free of burrs.

B. Bar Supports: Bolsters, chairs, spacers, and other devices for spacing, supporting, and fastening reinforcing bars and welded wire reinforcement in place. Manufacture bar supports from steel wire, plastic, or precast concrete according to CRSI's "Manual of Standard Practice," of greater compressive strength than concrete and as follows:

1. For concrete surfaces exposed to view where legs of wire bar supports contact forms, use CRSI Class 1 plastic-protected steel wire or CRSI Class 2 stainless-steel bar supports.

2.5 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 C or F.
   b. Ground Granulated Blast-Furnace Slag: ASTM C 989, Grade 100 or 120.

B. Normal-Weight Aggregates: ASTM C 33, coarse aggregate or better, graded. Provide aggregates from a single source.

1. Maximum Coarse-Aggregate Size: 1 inch nominal.
2. Fine Aggregate: Free of materials with deleterious reactivity to alkali in cement.

C. Lightweight Aggregate: ASTM C 330, Type II

D. Water: ASTM C 94 and potable.

2.6 ADMIXTURES


B. Chemical Admixtures: Provide admixtures certified by manufacturer to be compatible with other admixtures and that will not contribute water-soluble chloride ions exceeding those permitted in hardened concrete. Do not use calcium chloride or admixtures containing calcium chloride.

1. Water-Reducing Admixture: ASTM C 494/C 494M, Type A.
2. Retarding Admixture: ASTM C 494/C 494M, Type B.
3. Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type D.
4. High-Range, Water-Reducing Admixture: ASTM C 494/C 494M, Type F.
5. High-Range, Water-Reducing and Retarding Admixture: ASTM C 494/C 494M, Type G.
6. Plasticizing and Retarding Admixture: ASTM C 1017/C 1017M, Type II.

C. Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete and complying with ASTM C 494/C 494M, Type C.
1. Available Products:

   a. Euclid Chemical Company (The); Eucon CIA.
   b. Grace Construction Products, W. R. Grace & Co.; DCI.
   c. Master Builders, Inc.; Rheocrete CNI.

D. Non-Set-Accelerating Corrosion-Inhibiting Admixture: Commercially formulated, non-set-accelerating, anodic inhibitor or mixed cathodic and anodic inhibitor; capable of forming a protective barrier and minimizing chloride reactions with steel reinforcement in concrete.

   1. Available Products:

      b. Master Builders, Inc.; Rheocrete 222+.
      c. Sika Corporation; FerroGard-901.

2.7 FIBER REINFORCEMENT

A. Carbon-Steel Fiber: ASTM A 820, deformed, minimum of 2 inches long, and aspect ratio of [35 to 40] 60 to 65.

   1. Available Products:

      a. Bekaert Corporation; Dramix.
      c. SI Concrete Systems; Zorex.

B. Synthetic Fiber: Monofilament or fibrillated polypropylene fibers engineered and designed for use in concrete pavement, complying with ASTM C 1116, Type III.

   1. Available Products:

      a. Monofilament Fibers:

         1) FORTA Corporation; Forta Mono.
         3) SI Concrete Systems; Fibermix Stealth.

      b. Fibrillated Fibers:

         1) FORTA Corporation; Forta.
         3) SI Concrete Systems; Fibermesh.
2.8 WATERSTOPS

2.9 VAPOR RETARDERS

A. Plastic Vapor Retarder: ASTM E 1745, Class B. Include manufacturer's recommended adhesive or pressure-sensitive tape.

1. Available Products:
   a. Fortifiber Corporation; Moistop Ultra 10.
   b. Raven Industries Inc.; Vapor Block 10.
   c. Stego Industries, LLC; StegoWrap, 10 mils.

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.

2.10 CURING MATERIALS

A. Evaporation Retarder: Waterborne, monomolecular film forming, manufactured for application to fresh concrete.

1. Available Products:
   a. Euclid Chemical Company (The); Eucobar.
   b. L&M Construction Chemicals, Inc.; E-Con.

B. Absorptive Cover: AASHTO M 182, Class 2, burlap cloth made from jute or kenaf, weighing approximately 9 oz./sq. yd. when dry.

C. Moisture-Retaining Cover: ASTM C 171, polyethylene film or white burlap-polyethylene sheet.

D. Water: Potable.

E. Clear, Waterborne, Membrane-Forming Curing Compound: ASTM C 309, Type 1, Class B, non-dissipating, certified by curing compound manufacturer to not interfere with bonding of floor covering.

1. Available Products:
   a. Euclid Chemical Company (The); Aqua Cure VOX.
   b. L&M Construction Chemicals, Inc.; Dress & Seal WB.
2.11 RELATED MATERIALS


B. Bonding Agent: ASTM C 1059, Type II, non-redispersible, acrylic emulsion or styrene butadiene.

C. Reglets: Fabricate reglets of not less than 0.0217-inch-thick, galvanized steel sheet. Temporarily fill or cover face opening of reglet to prevent intrusion of concrete or debris.

D. Dovetail Anchor Slots: Hot-dip galvanized steel sheet, not less than 0.0336 inch thick, with bent tab anchors. Temporarily fill or cover face opening of slots to prevent intrusion of concrete or debris.

2.12 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 [4100 psi] <Insert strength> at 28 days when tested according to ASTM C 109/C 109M.

B. Repair Overlayment: 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 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] <Insert strength> at 28 days when tested according to ASTM C 109/C 109M.

2.13 CONCRETE MIXTURES, GENERAL

A. Prepare design mixtures for each type and strength of concrete, proportioned on the basis of laboratory trial mixture or field test data, or both, according to ACI 301.
   1. Use a qualified independent testing agency for preparing and reporting proposed mixture designs based on laboratory trial mixtures.

B. Cementitious Materials: Provide percentage, by weight, of cementitious materials other than portland cement in concrete as follows:
1. Fly Ash: 25-35 percent.

C. Admixtures: Use admixtures according to manufacturer's written instructions.
   1. Use water-reducing or plasticizing admixture in concrete, as required, for placement and workability.
   2. Use water-reducing and retarding admixture when required by high temperatures, low humidity, or other adverse placement conditions.
   3. Use water-reducing admixture in pumped concrete, concrete for 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.

2.14 CONCRETE MIXTURES FOR BUILDING ELEMENTS

A. Footings: As Indicated on Drawings.

B. Foundation Walls: As Indicated on Drawings.

C. Slabs-on-Grade: As Indicated on Drawings.

2.15 FABRICATING REINFORCEMENT

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

2.16 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.

B. Project-Site Mixing: Measure, batch, and mix concrete materials and concrete according to ASTM C 94/C 94M. Mix concrete materials in appropriate drum-type batch machine mixer.

   1. For mixer capacity of 1 cu. yd. or smaller, continue mixing at least 1-1/2 minutes, but not more than 5 minutes after ingredients are in mixer, before any part of batch is released.
   2. For mixer capacity larger than 1 cu. yd., increase mixing time by 15 seconds for each additional 1 cu. yd.
3. Provide batch ticket for each batch discharged and used in the Work, indicating Project identification name and number, date, mixture type, mixture time, quantity, and amount of water added. Record approximate location of final deposit in structure.

PART 3 - EXECUTION

3.1 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 347R as abrupt or gradual, as follows:
   2. Class B, 1/4 inch or 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 reglets to receive waterproofing and to receive through-wall flashings in outer face of concrete frame at exterior walls, where flashing is shown at lintels, shelf angles, and other conditions.
3. 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, if concrete is hard enough to not be damaged by form-removal operations and curing and protection operations are maintained.

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 VAPOR RETARDERS

A. Plastic Vapor Retarders: Place, protect, and repair vapor retarders according to ASTM E 1643 and manufacturer's written instructions.

1. Lap joints 6 inches and seal with manufacturer's recommended tape.

B. Bituminous Vapor Retarders: Place, protect, and repair vapor retarders according to manufacturer's written instructions.

C. Granular Course: Cover vapor retarder with [granular fill] [fine-graded granular material], moisten, and compact with mechanical equipment to elevation tolerances of plus 0 inch or minus 3/4 inch.

1. Place and compact a 1/2-inch- thick layer of fine-graded granular material over granular fill.

3.5 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, where indicated.

D. Set wire ties with ends directed into concrete, not toward exposed concrete surfaces.

E. Install welded wire reinforcement in longest practicable lengths on bar supports spaced to minimize sagging. Lap edges and ends of adjoining sheets at least one mesh spacing. Offset laps of adjoining sheet widths to prevent continuous laps in either direction. Lace overlaps with wire.

3.6 JOINTS

A. General: Construct joints true to line with faces perpendicular to surface plane of concrete.

B. Construction Joints: Install so strength and appearance of concrete are not impaired, at locations indicated or as approved by Architect.

1. Place joints perpendicular to main reinforcement. Continue reinforcement across construction joints, unless otherwise indicated. Do not continue reinforcement through sides of strip placements of floors and slabs.

2. Form keyed joints as indicated. Embed keys at least 1-1/2 inches into concrete.

3. Locate joints for beams, slabs, joists, and girders in the middle third of spans. Offset joints in girders a minimum distance of twice the beam width from a beam-girder intersection.

4. Locate horizontal joints in walls and columns at underside of floors, slabs, beams, and girders and at the top of footings or floor slabs.

5. Space vertical joints in walls as indicated. Locate joints beside piers integral with walls, near corners, and in concealed locations where possible.

6. Use a bonding agent at locations where fresh concrete is placed against hardened or partially hardened concrete surfaces.

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. Grooved Joints: Form contraction joints after initial floating by grooving and finishing each edge of joint to a radius of 1/8 inch. Repeat grooving of contraction joints after applying surface finishes. Eliminate groover tool marks on concrete surfaces.

2. 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.

E. Doweled Joints: Install dowel bars and support assemblies at joints where indicated. Lubricate or asphalt coat one-half of dowel length to prevent concrete bonding to one side of joint.

3.7 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 or testing agency.

C. Before test sampling and placing concrete, water may be added at Project site, subject to limitations of ACI 301.
   1. Do not add water to concrete after adding high-range water-reducing admixtures to mixture.

D. Deposit concrete continuously in one layer or in horizontal layers of such thickness that no new concrete will be placed on concrete that has hardened enough to cause seams or planes of weakness. If a section cannot be placed continuously, provide construction joints as indicated. Deposit concrete to avoid segregation.
   1. Deposit concrete in horizontal layers of depth to not exceed formwork design pressures and in a manner to avoid inclined construction joints.
   2. Consolidate placed concrete with mechanical vibrating equipment according to ACI 301.
   3. Do not use vibrators to transport concrete inside forms. Insert and withdraw vibrators vertically at uniformly spaced locations to rapidly penetrate placed layer and at least 6 inches into preceding layer. Do not insert vibrators into lower layers of concrete that have begun to lose plasticity. At each insertion, limit duration of vibration to time necessary to consolidate concrete and complete embedment of reinforcement and other embedded items without causing mixture constituents to segregate.

E. Deposit and consolidate concrete for floors and slabs in a continuous operation, within limits of construction joints, until placement of a panel or section is complete.
   1. Consolidate concrete during placement operations so concrete is thoroughly worked around reinforcement and other embedded items and into corners.
   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.

3.8 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 to receive a rubbed finish.

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.

3.9 FINISHING FLOORS AND SLABS

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

B. Scratch Finish: While still plastic, texture concrete surface that has been screeded and bull-floated or darbied. Use stiff brushes, brooms, or rakes to produce a profile amplitude of 1/4 inch in 1 direction.
1. Apply scratch finish to surfaces to receive mortar setting beds for bonded cementitious floor finishes.
C. **Float Finish:** Consolidate surface with power-driven floats or by hand floating if area is small or inaccessible to power driven floats. Re-straighten, cut down high spots, and fill low spots. Repeat float passes and re-straightening until surface is left with a uniform, smooth, granular texture.

1. Apply float finish to surfaces to receive trowel finish and other finishes as indicated.

D. **Trowel Finish:** After applying float finish, apply first troweling and consolidate concrete by hand or power-driven trowel. Continue troweling passes and re-straighten until surface is free of trowel marks and uniform in texture and appearance. Grind smooth any surface defects that would telegraph through applied coatings or floor coverings.

1. Apply a trowel finish to surfaces indicated.

2. Finish and measure surface so gap at any point between concrete surface and an unleveled, freestanding, 10-foot long straightedge resting on 2 high spots and placed anywhere on the surface does not exceed 3/16 inch, typical unless otherwise noted.

E. **Trowel and Fine-Broom Finish:** Apply a first trowel finish to surfaces indicated. While concrete is still plastic, slightly scarify surface with a fine broom.

1. Comply with flatness tolerances for trowel finished floor surfaces.

F. **Broom Finish:** Apply a broom finish to exterior concrete platforms, steps, and 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.

3.10 **MISCELLANEOUS CONCRETE ITEMS**

A. **SCHEDULE OF CONCRETE FINISHES**
- Interior slab on grade – Trowel Finish
- Exterior steps and sidewalks – Broom Finish
- Elevated slabs – Trowel Finish
- All unexposed concrete surfaces, U.O.N. Rough Form Finish
- All exposed concrete surfaces, U.O.N. – Smooth Rubbed Finish
- Slabs to receive setting beds – Scratch Finish

B. **Filling In:** Fill in holes and openings left in concrete structures, unless otherwise indicated, after work of other trades is in place. 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.

C. **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.

D. **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.
E. 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.

3.11 CONCRETE PROTECTING AND CURING

A. General: Protect freshly placed concrete from premature drying and excessive cold or hot temperatures. Comply with ACI 306.1 for cold-weather protection and ACI 301 for hot-weather protection during curing.

B. Evaporation Retarder: Apply evaporation retarder to unformed concrete surfaces if hot, dry, or windy conditions cause moisture loss approaching 0.2 lb/sq. ft. x h before and during finishing operations. Apply according to manufacturer's written instructions after placing, screeding, and bull floating or darbying concrete, but before float finishing.

C. Formed Surfaces: Cure formed concrete surfaces, including underside of beams, supported slabs, and other similar surfaces. If forms remain during curing period, moist cure after loosening forms. If removing forms before end of curing period, continue curing for the remainder of the curing period.

D. Unformed Surfaces: Begin curing immediately after finishing concrete. Cure unformed surfaces, including floors and slabs, concrete floor toppings, and other surfaces.

E. Cure concrete according to ACI 308.1, by one or a combination of the following methods:

1. Moisture Curing: Keep surfaces continuously moist for not less than seven days with the following materials:
   a. Water.
   b. Continuous water-fog spray.
   c. Absorptive cover, water saturated, and kept continuously wet. Cover concrete surfaces and edges with 12-inch lap over adjacent absorptive covers.

2. Moisture-Retaining-Cover Curing: Cover concrete surfaces with moisture-retaining cover for curing concrete, placed in widest practicable width, with sides and ends lapped at least 12 inches, and sealed by waterproof tape or adhesive. Cure for not less than seven days. Immediately repair any holes or tears during curing period using cover material and waterproof tape. UTILIZE THIS CURING METHOD IN AREAS TO RECEIVED POLISHED CONCRETE.
   a. Moisture cure or use moisture-retaining covers to cure concrete surfaces to receive floor coverings.
   b. 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. 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.

4. Curing and Sealing Compound: Apply uniformly to floors and slabs indicated in a 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. Repeat process 24 hours
later and apply a second coat. Maintain continuity of coating and repair damage during curing period.

3.12 LIQUID FLOOR TREATMENTS

A. Sealing Coat: Uniformly apply a continuous sealing coat of curing and sealing compound to hardened concrete by power spray or roller according to manufacturer's written instructions.

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. 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.

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 in solid concrete, but not less than 1 inch in depth. 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 special inspector and qualified testing and inspecting agency to perform field tests and inspections and prepare test reports.

B. Inspections:
1. Steel reinforcement placement.
2. Headed bolts and studs.
3. Verification of use of required design mixture.
4. Concrete placement, including conveying and depositing.
5. Curing procedures and maintenance of curing temperature.

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; 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.

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. Test one set of two field-cured specimens at 7 days and one set of two specimens at 28 days.
   b. A compressive-strength test shall be the average compressive strength from a set of two specimens obtained from same composite sample and tested at age indicated.

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. Nondestructive Testing: Impact hammer, sonoscope, or other nondestructive device may be permitted by Architect but will not be used as sole basis for approval or rejection of concrete.

11. 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.

12. Additional testing and inspecting, at Contractor's expense, will be performed to determine compliance of replaced or additional work with specified requirements.

13. Correct deficiencies in the Work that test reports and inspections indicate do not comply with the Contract Documents.

END OF SECTION 033000
SECTION 061000 - ROUGH CARPENTRY

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. Framing with dimension lumber.
   2. Framing with engineered wood products.
   3. Wood blocking, cants, and nailers.
   4. Wood furring and grounds.
   5. Wood sleepers.
   6. Plywood backing panels.

B. Related Requirements:
   1. Division 06 Section "Sheathing."
   2. Division 06 Section "Shop-Fabricated Wood Trusses" for wood trusses made from dimension lumber.
   3. Division 31 Section "Termite Control" for site application of borate treatment to wood framing.

1.3 DEFINITIONS

A. Exposed Framing: Framing not concealed by other construction.

B. Dimension Lumber: Lumber of 2 inches nominal or greater but less than 5 inches nominal in least dimension.

C. Lumber grading agencies, and the abbreviations used to reference them, include the following:
   2. NLGA: National Lumber Grades Authority.
   4. WCLIB: West Coast Lumber Inspection Bureau.
   5. WWPA: Western Wood Products Association.

1.4 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions and include construction and application details.
1. Include data for wood-preservative treatment from chemical treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained.
2. For products receiving a waterborne treatment, include statement that moisture content of treated materials was reduced to levels specified before shipment to Project site.
3. Include copies of warranties from chemical treatment manufacturers for each type of treatment.

1.5 QUALITY ASSURANCE

A. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber flat with spacers beneath and between each bundle to provide air circulation. Protect lumber from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

2.1 WOOD PRODUCTS, GENERAL

A. Certified Wood: Materials shall be produced from wood obtained from forests certified by an FSC-accredited certification body to comply with FSC STD-01-001, "FSC Principles and Criteria for Forest Stewardship"

B. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules-writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Where nominal sizes are indicated, provide actual sizes required by DOC PS 20 for moisture content specified. Where actual sizes are indicated, they are minimum dressed sizes for dry lumber.
4. Provide dressed lumber, S4S, unless otherwise indicated.

C. Maximum Moisture Content of Lumber: 15 percent unless otherwise indicated.

D. Engineered Wood Products: Provide engineered wood products acceptable to authorities having jurisdiction and for which current model code research or evaluation reports exist that show compliance with building code in effect for Project.
1. Allowable Design Stresses: Provide engineered wood products with allowable design stresses, as published by manufacturer, that meet or exceed those indicated. Manufacturer’s published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

2.2 WOOD-PRESERVATIVE-TREATED LUMBER

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC2 for interior construction not in contact with the ground, Use Category UC3b for exterior construction not in contact with the ground, and Use Category UC4a for items in contact with the ground.

1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
2. For exposed items indicated to receive a stained or natural finish, use chemical formulations that do not require incising, contain colorants, bleed through, or otherwise adversely affect finishes.

B. Kiln-dry lumber after treatment to a maximum moisture content of 19 percent. Do not use material that is warped or that does not comply with requirements for untreated material.

C. Mark lumber with treatment quality mark of an inspection agency approved by the ALSC Board of Review.

1. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece or omit marking and provide certificates of treatment compliance issued by inspection agency.

D. Application: Treat items indicated on Drawings, and the following:

1. Wood cants, nailers, curbs, equipment support bases, blocking, stripping, and similar members in connection with roofing, flashing, vapor barriers, and waterproofing.
2. Wood sills, sleepers, blocking, furring, and similar concealed members in contact with masonry or concrete.
3. Wood framing and furring attached directly to the interior of below-grade exterior masonry or concrete walls.
4. Wood floor plates that are installed over concrete slabs-on-grade.

2.3 DIMENSION LUMBER FRAMING

A. Non-Load-Bearing Interior Partitions: No. 2 grade.

1. Application: All interior partitions.
2. Species:
   a. Mixed southern pine; SPIB.
   b. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

B. Load-Bearing Partitions: No. 2 grade.
2. Species:
   a. Southern pine; SPIB.
   b. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. Ceiling Joists: Construction or No. 2 grade.
1. Species:
   a. Mixed southern pine; SPIB.
   b. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

D. Joists, Rafters, and Other Framing Not Listed Above: No. 2 grade.
1. Species:
   a. Spruce-pine-fir; NLGA.
   b. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

E. Exposed Framing: Provide material hand-selected for uniformity of appearance and freedom from characteristics, on exposed surfaces and edges, that would impair finish appearance, including decay, honeycomb, knot-holes, shake, splits, torn grain, and wane.
1. Application: Exposed exterior and interior framing indicated to receive a stained or natural finish.
2. Species and Grade: As indicated above for load-bearing construction of same type.
3. Species and Grade: Spruce-pine-fir; No. 1 grade; NLGA.
4. Species and Grade: Spruce-pine-fir (south); No. 1 grade; NeLMA, WCLIB, or WWPA.

2.4 ENGINEERED WOOD PRODUCTS

A. Engineered Wood Products, General: Products shall contain no urea formaldehyde. 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."

B. Source Limitations: Obtain each type of engineered wood product from single source from a single manufacturer.

C. Laminated-Veneer Lumber: Structural composite lumber made from wood veneers with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   b. Georgia-Pacific.
   c. Louisiana-Pacific Corporation.
   d. Weyerhaeuser Company.
2. Extreme Fiber Stress in Bending, Edgewise: as indicated on the drawings.
3. Modulus of Elasticity, Edgewise: as indicated on the drawings.

D. Parallel-Strand Lumber: Structural composite lumber made from wood strand elements with grain primarily parallel to member lengths, evaluated and monitored according to ASTM D 5456 and manufactured with an exterior-type adhesive complying with ASTM D 2559.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Louisiana-Pacific Corporation.
   b. Weyerhaeuser Company.

2. Extreme Fiber Stress in Bending, Edgewise: as indicated on the drawings.
3. Modulus of Elasticity, Edgewise: as indicated on the drawing.

2.5 MISCELLANEOUS LUMBER

A. General: Provide miscellaneous lumber indicated and lumber for support or attachment of other construction, including the following:

1. Blocking.
2. Nailers.
3. Cants.
4. Furring.
5. Grounds.

B. For items of dimension lumber size, provide No. 2 grade lumber and any of the following species:

1. Mixed southern pine; SPIB.
2. Spruce-pine-fir (south); NeLMA, WCLIB, or WWPA.

C. For concealed boards, provide lumber with 15 percent maximum moisture content and any of the following species and grades:

1. Mixed southern pine; No. 2 grade; SPIB.
2. Spruce-pine-fir (south) or spruce-pine-fir; Construction or No. 2 Common grade; NeLMA, NLGA, WCLIB, or WWPA.

D. For blocking and nailers used for attachment of other construction, select and cut lumber to eliminate knots and other defects that will interfere with attachment of other work.

E. For furring strips for installing plywood or hardboard paneling, select boards with no knots capable of producing bent-over nails and damage to paneling.

2.6 PLYWOOD BACKING PANELS

A. Equipment Backing Panels: DOC PS 1, fire-retardant treated, in thickness indicated or, if not indicated, not less than 3/4-inch nominal thickness.
1. Plywood 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."

2.7 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Where rough carpentry is exposed to weather, in ground contact, pressure-preservative treated, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.


D. Wood Screws: ASME B18.6.1.

E. Lag Bolts: ASME B18.2.1.

F. Expansion Anchors: Anchor bolt and sleeve assembly of material indicated below with capability to sustain, without failure, a load equal to six times the load imposed when installed in unit masonry assemblies and equal to four times the load imposed when installed in concrete as determined by testing per ASTM E 488 conducted by a qualified independent testing and inspecting agency.


2.8 METAL FRAMING ANCHORS

A. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Cleveland Steel Specialty Co.
2. Simpson Strong-Tie Co., Inc.
3. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those indicated. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.

C. Hot-Dip, Heavy-Galvanized Steel Sheet: ASTM A 653/A 653M; structural steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G185 coating designation; and not less than 0.036 inch thick.

1. Use for wood-preservative-treated lumber and where indicated.
D. Joist Hangers: U-shaped joist hangers with 2-inch-long seat and 1-1/4-inch-wide nailing flanges at least 85 percent of joist depth.

E. Rafter Tie-Downs (Hurricane or Seismic Ties): Bent strap tie for fastening rafters or roof trusses to wall studs below, 2-1/4 inches wide by 0.062 inch thick. Tie fits over top of rafter or truss and fastens to both sides of rafter or truss, face of top plates, and side of stud below.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Set rough carpentry to required levels and lines, with members plumb, true to line, cut, and fitted. Fit rough carpentry to other construction; scribe and cope as needed for accurate fit. Locate furring, nailers, blocking, and similar supports to comply with requirements for attaching other construction.

B. Framing Standard: Comply with AF&PA's WCD 1, "Details for Conventional Wood Frame Construction," unless otherwise indicated.

C. Framing with Engineered Wood Products: Install engineered wood products to comply with manufacturer's written instructions.

D. Install plywood backing panels by fastening to studs; coordinate locations with utilities requiring backing panels. Install fire-retardant treated plywood backing panels with classification marking of testing agency exposed to view.

E. Shear Wall Panels: Install shear wall panels to comply with manufacturer's written instructions.

F. Metal Framing Anchors: Install metal framing anchors to comply with manufacturer's written instructions. Install fasteners through each fastener hole.

G. Do not splice structural members between supports unless otherwise indicated.

H. Provide blocking and framing as indicated and as required to support facing materials, fixtures, specialty items, and trim.

I. Provide fire blocking in furred spaces, stud spaces, and other concealed cavities as indicated and as follows:

1. Fire block furred spaces of walls, at each floor level, at ceiling, and at not more than 96 inches o.c. with solid wood blocking or noncombustible materials accurately fitted to close furred spaces.

2. Fire block concealed spaces of wood-framed walls and partitions at each floor level, at ceiling line of top story, and at not more than 96 inches o.c. Where fire blocking is not inherent in framing system used, provide closely fitted solid wood blocks of same width as framing members and 2-inch nominal-thickness.

3. Fire block concealed spaces between floor sleepers with same material as sleepers to limit concealed spaces to not more than 100 sq. ft. and to solidly fill space below.
partitions.

4. Fire block concealed spaces behind combustible cornices and exterior trim at not more than 20 feet o.c.

J. Sort and select lumber so that natural characteristics will not interfere with installation or with fastening other materials to lumber. Do not use materials with defects that interfere with function of member or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

K. Comply with AWPA M4 for applying field treatment to cut surfaces of preservative-treated lumber.

1. Use inorganic boron for items that are continuously protected from liquid water.
2. Use copper naphthenate for items not continuously protected from liquid water.

L. Securely attach rough carpentry work to substrate by anchoring and fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.

M. Use steel common nails unless otherwise indicated. Select fasteners of size that will not fully penetrate members where opposite side will be exposed to view or will receive finish materials. Make tight connections between members. Install fasteners without splitting wood. Drive nails snug but do not countersink nail heads unless otherwise indicated.

N. For exposed work, arrange fasteners in straight rows parallel with edges of members, with fasteners evenly spaced, and with adjacent rows staggered.

1. Use finishing nails unless otherwise indicated. Countersink nail heads and fill holes with wood filler.

3.2 SLEEPER, BLOCKING, AND NAILER INSTALLATION

A. Install where indicated and where required for screeding or attaching other work. Form to shapes indicated and cut as required for true line and level of attached work. Coordinate locations with other work involved.

B. Attach items to substrates to support applied loading. Recess bolts and nuts flush with surfaces unless otherwise indicated.

3.3 WOOD FURRING INSTALLATION

A. Install level and plumb with closure strips at edges and openings. Shim with wood as required for tolerance of finish work.

B. Furring to Receive Plywood or Hardboard Paneling: Install 1-by-3-inch nominal-size furring horizontally at 24 inches o.c.
3.4 CEILING JOIST AND RAFTER FRAMING INSTALLATION

A. Ceiling Joists: Install ceiling joists with crown edge up and complying with requirements specified above for floor joists.

B. Provide special framing as indicated for eaves, overhangs, dormers, and similar conditions if any.

3.5 PROTECTION

A. Protect wood that has been treated with inorganic boron (SBX) from weather. If, despite protection, inorganic boron-treated wood becomes wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Protect rough carpentry from weather. If, despite protection, rough carpentry becomes sufficiently wet that moisture content exceeds that specified, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

END OF SECTION 061000
SECTION 061600 - SHEATHING

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. Wall sheathing.
3. Roof sheathing.
4. Underlayment.
5. Building wrap.

1.3 SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials and dimensions include construction and application details, and field quality control test reports.

B. For building wrap, include data on air-/moisture-infiltration protection based on testing according to referenced standards.

1.4 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: For assemblies with fire-resistance ratings, provide materials and construction identical to those of assemblies tested for fire resistance per ASTM E 119 by a testing and inspecting agency acceptable to authorities having jurisdiction.


1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack panels flat with spacers between each bundle to provide air circulation. Provide for air circulation around stacks and under coverings.

PART 2 - PRODUCTS

WOOD PANEL PRODUCTS, GENERAL: Plywood: Either DOC PS 1 or DOC PS 2, unless otherwise indicated.

??. PRESERVATIVE-TREATED PLYWOOD
Preservative Treatment by Pressure Process: AWPA C9.

Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.

Mark plywood with appropriate classification marking of an inspection agency acceptable to authorities having jurisdiction.

Application: Treat items indicated on Drawings and plywood in contact with masonry or concrete or used with roofing, flashing, vapor barriers, and waterproofing.

2.1 WALL SHEATHING

Plywood Wall Sheathing: Exterior, Structural I sheathing.

- Span Rating: Not less than 24/0.
- Nominal Thickness: Not less than 1/2 inch (13 mm).

2.2 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this Article for material and manufacture.

- Power Driven Fasteners: NES NER 272.

2.3 WEATHER-RESISTANT SHEATHING PAPER

Building Wrap: ASTM E 1677, Type I air retarder; with flame-spread and smoke-developed indexes of less than 25 and 450, respectively, when tested according to ASTM E 84; UV stabilized; and acceptable to authorities having jurisdiction.

- Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:
  - Dow Chemical Company (The); Styrofoam Weathermate Plus Brand Housewrap.
  - DuPont (E. I. du Pont de Nemours and Company); Tyvek CommercialWrap.
  - Pactiv, Inc.; GreenGuard Classic Wrap.
- Allowable UV Exposure Time: Not less than three months.

Building-Wrap Tape: Pressure-sensitive plastic tape recommended by building-wrap manufacturer for sealing joints and penetrations in building wrap.

Flexible Flashing: Composite, self-adhesive, flashing product consisting of a pliable, rubberized-asphalt
compound, bonded to a high-density, cross-laminated polyethylene film to produce an overall thickness of not less than 0.040 inch (1.0 mm).

?. Available Products: Subject to compliance with requirements, products that may be incorporated into the Work include, but are not limited to, the following:

?. Carlisle Coatings & Waterproofing; CCW-705-TWF Thru-Wall Flashing.
?. MFM Building Products Corp.; Window Wrap.
?. Polyguard Products, Inc.; Polyguard 300.

?. Primer for Flexible Flashing: Product recommended by manufacturer of flexible flashing for substrate.

PART 3 - EXECUTION

3.1 INSTALLATION, GENERAL

A. Do not use materials with defects that impair quality of sheathing or pieces that are too small to use with minimum number of joints or optimum joint arrangement.

B. Cut panels at penetrations, edges, and other obstructions of work; fit tightly against abutting construction, unless otherwise indicated.

C. Securely attach to substrate by fastening as indicated, complying with the following:

1. NES NER-272 for power-driven fasteners.
2. Table 2304.9.1, "Fastening Schedule," in ICC's "International Building Code."

D. Coordinate wall and roof sheathing installation with flashing and joint-sealant installation so these materials are installed in sequence and manner that prevent exterior moisture from passing through completed assembly.

E. Do not bridge building expansion joints; cut and space edges of panels to match spacing of structural support elements.

F. Coordinate sheathing installation with installation of materials installed over sheathing so sheathing is not exposed to precipitation or left exposed at end of the workday when rain is forecast.

?? WEATHER-RESISTANT SHEATHING-PAPER INSTALLATION

?. General: Cover sheathing with weather-resistant sheathing paper as follows:

?. Cut back barrier 1/2 inch (13 mm) on each side of the break in supporting members at expansion- or control-joint locations.

?. Apply barrier to cover vertical flashing with a minimum 4-inch (100-mm) overlap, unless otherwise indicated.

?. Building Wrap: Comply with manufacturer's written instructions.

?. Seal seams, edges, fasteners, and penetrations with tape.

?. Extend into jambs of openings and seal corners with tape.
3.2 SHEATHING JOINT-AND-PENETRATION TREATMENT

A. Seal sheathing joints according to sheathing manufacturer's written instructions.

FLEXIBLE FLASHING INSTALLATION

Apply flexible flashing where indicated to comply with manufacturer's written instructions.

- Prime substrates as recommended by flashing manufacturer.
- Lap seams and junctures with other materials at least 4 inches (100 mm), except that at flashing flanges of other construction, laps need not exceed flange width.
- Lap flashing over weather-resistant building paper at bottom and sides of openings.
- Lap weather-resistant building paper over flashing at heads of openings.
- After flashing has been applied, roll surfaces with a hard rubber or metal roller to ensure that flashing is completely adhered to substrates.

END OF SECTION 061600
SECTION 061753 - SHOP-FABRICATED WOOD TRUSSES

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. Wood roof trusses.
2. Wood truss bracing.
3. Metal truss accessories.

1.3 DEFINITIONS

A. Metal-Plate-Connected Wood Trusses: Planar structural units consisting of metal-plate-connected members fabricated from dimension lumber and cut and assembled before delivery to Project site.

1.4 ACTION SUBMITTALS

A. Product Data: For metal-plate connectors, metal truss accessories, and fasteners.

B. Shop Drawings: Show fabrication and installation details for trusses. Sealed by a NC licensed Engineer.

1.  Show location, pitch, span, camber, configuration, and spacing for each type of truss required.
2.  Indicate sizes, stress grades, and species of lumber.
3.  Indicate locations of permanent bracing required to prevent buckling of individual truss members due to design loads.
4.  Indicate locations, sizes, and materials for permanent bracing required to prevent buckling of individual truss members due to design loads.
5.  Indicate type, size, material, finish, design values, orientation, and location of metal connector plates.
6.  Show splice details and bearing details.

1.5 INFORMATIONAL SUBMITTALS

A. Material Certificates: For dimension lumber specified to comply with minimum specific gravity. Indicate species and grade selected for each use and specific gravity.

1.6 QUALITY ASSURANCE

A. Metal Connector-Plate Manufacturer Qualifications: A manufacturer that is a member of TPI and that complies with quality-control procedures in TPI 1 for manufacture of connector plates.
1. Manufacturer's responsibilities include providing professional engineering services needed to assume engineering responsibility.

2. Engineering Responsibility: Preparation of Shop Drawings and comprehensive engineering analysis by a qualified professional engineer.

B. Fabricator Qualifications: Shop that participates in a recognized quality-assurance program that complies with quality-control procedures in TPI 1 and that involves third-party inspection by an independent testing and inspecting agency acceptable to Architect and authorities having jurisdiction.

C. Testing Agency Qualifications: For testing agency providing classification marking for fire-retardant treated material, an inspection agency acceptable to authorities having jurisdiction that periodically performs inspections to verify that the material bearing the classification marking is representative of the material tested.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Handle and store trusses to comply with recommendations in TPI BCSI, "Building Component Safety Information: Guide to Good Practice for Handling, Installing, Restraining, & Bracing Metal Plate Connected Wood Trusses."

1. Store trusses flat, off of ground, and adequately supported to prevent lateral bending.
2. Protect trusses from weather by covering with waterproof sheeting, securely anchored.
3. Provide for air circulation around stacks and under coverings.

B. Inspect trusses showing discoloration, corrosion, or other evidence of deterioration. Discard and replace trusses that are damaged or defective.

PART 2 - PRODUCTS

2.1 DIMENSION LUMBER

A. Lumber: DOC PS 20 and applicable rules of grading agencies indicated. If no grading agency is indicated, provide lumber that complies with the applicable rules of any rules writing agency certified by the ALSC Board of Review. Provide lumber graded by an agency certified by the ALSC Board of Review to inspect and grade lumber under the rules indicated.

1. Factory mark each piece of lumber with grade stamp of grading agency.
2. For exposed lumber indicated to receive a stained or natural finish, omit grade stamp and provide certificates of grade compliance issued by grading agency.
3. Provide dressed lumber, S4S.
4. Provide dry lumber with 15 percent maximum moisture content at time of dressing.

B. Permanent Bracing: Provide wood bracing that complies with requirements for miscellaneous lumber in Division 06 Section "Rough Carpentry."

2.2 METAL CONNECTOR PLATES

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

1. Alpine Engineered Products, Inc.; an ITW company.
2. Cherokee Metal Products, Inc.; Masengill Machinery Company.
B. Source Limitations: Obtain metal connector plates from single manufacturer.

C. General: Fabricate connector plates to comply with TPI 1.

D. Hot-Dip Galvanized-Steel Sheet: ASTM A 653/A 653M; Structural Steel (SS), high-strength low-alloy steel Type A (HSLAS Type A), or high-strength low-alloy steel Type B (HSLAS Type B); G60 coating designation; and not less than 0.036 inch thick.

2.3 FASTENERS

A. General: Provide fasteners of size and type indicated that comply with requirements specified in this article for material and manufacture.

1. Provide fasteners for use with metal framing anchors that comply with written recommendations of metal framing manufacturer.

2. Where trusses are exposed to weather, in ground contact, made from pressure-preservative treated wood, or in area of high relative humidity, provide fasteners with hot-dip zinc coating complying with ASTM A 153/A 153M.

B. Nails, Brads, and Staples: ASTM F 1667.

2.4 METAL FRAMING ANCHORS AND ACCESSORIES

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

1. Cleveland Steel Specialty Co.

2. Simpson Strong-Tie Co., Inc.

3. USP Structural Connectors.

B. Allowable Design Loads: Provide products with allowable design loads, as published by manufacturer, that meet or exceed those of basis-of-design products. Manufacturer's published values shall be determined from empirical data or by rational engineering analysis and demonstrated by comprehensive testing performed by a qualified independent testing agency.


2.5 MISCELLANEOUS MATERIALS

A. Galvanizing Repair Paint: SSPC-Paint 20, with dry film containing a minimum of 94 percent zinc dust by weight.
2.6 FABRICATION

A. Cut truss members to accurate lengths, angles, and sizes to produce close-fitting joints.

B. Fabricate metal connector plates to sizes, configurations, thicknesses, and anchorage details required to withstand design loads for types of joint designs indicated.

C. Assemble truss members in design configuration indicated; use jigs or other means to ensure uniformity and accuracy of assembly with joints closely fitted to comply with tolerances in TPI 1. Position members to produce design camber indicated.

1. Fabricate wood trusses within manufacturing tolerances in TPI 1.

D. Connect truss members by metal connector plates located and securely embedded simultaneously in both sides of wood members by air or hydraulic press.

2.7 SOURCE QUALITY CONTROL

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install wood trusses only after supporting construction is in place and is braced and secured.

B. If trusses are delivered to Project site in more than one piece, assemble trusses before installing.

C. Hoist trusses in place by lifting equipment suited to sizes and types of trusses required, exercising care not to damage truss members or joints by out-of-plane bending or other causes.

D. Install and brace trusses according to TPI recommendations and as indicated.

E. Install trusses plumb, square, and true to line and securely fasten to supporting construction.

F. Space trusses as indicated; adjust and align trusses in location before permanently fastening.

G. Anchor trusses securely at bearing points; use metal truss tie-downs or floor truss hangers as applicable. Install fasteners through each fastener hole in metal framing anchors according to manufacturer's fastening schedules and written instructions.

H. Install and fasten permanent bracing during truss erection and before construction loads are applied. Anchor ends of permanent bracing where terminating at walls or beams.

1. Install bracing to comply with Division 06 Section "Rough Carpentry."

I. Install wood trusses within installation tolerances in TPI 1.

J. Do not alter trusses in field. Do not cut, drill, notch, or remove truss members.

K. Replace wood trusses that are damaged or do not meet requirements.

1. Damaged trusses may be repaired according to truss repair details signed and sealed by the qualified professional engineer responsible for truss design, when approved by Architect.
3.2 REPAIRS AND PROTECTION

A. Protect wood trusses from weather. If, despite protection, wood trusses become wet, apply EPA-registered borate treatment. Apply borate solution by spraying to comply with EPA-registered label.

B. Repair damaged galvanized coatings on exposed surfaces with galvanized repair paint according to ASTM A 780 and manufacturer's written instructions.

END OF SECTION 061753
SECTION 062013 - EXTERIOR FINISH CARPENTRY

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. Exterior wood trim.

B. Related Requirements:
   1. Division 06 Section "Rough Carpentry" for furring, blocking, and other carpentry work not exposed to view and for framing exposed to view.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of process and factory-fabricated product. Indicate component materials, dimensions, profiles, textures, and colors and include construction and application details.
   1. Include data for wood-preservative treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements. Indicate type of preservative used and net amount of preservative retained. Include chemical-treatment manufacturer's written instructions for finishing treated material.
   2. Include data for fire-retardant treatment from chemical-treatment manufacturer and certification by treating plant that treated materials comply with requirements.

1.4 INFORMATIONAL SUBMITTALS

A. Compliance Certificates:
   1. For preservative-treated wood that is not marked with treatment-quality mark.
   2. For fire-retardant-treated wood that is not marked with classification marking of testing and inspecting agency.

B. Evaluation Reports: For the following, from ICC-ES:
   1. Wood-preservative-treated wood.
   2. Fire-retardant-treated wood.
3. Foam plastic moldings.

C. Sample Warranties: For manufacturer's warranties.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Stack lumber, plywood, and other panels flat with spacers between each bundle to provide air circulation. Protect materials from weather by covering with waterproof sheeting, securely anchored. Provide for air circulation around stacks and under coverings.

1.6 FIELD CONDITIONS

A. Weather Limitations: Proceed with installation only when existing and forecast weather conditions permit work to be performed and at least one coat of specified finish can be applied without exposure to rain, snow, or dampness.

B. Do not install finish carpentry materials that are wet, moisture damaged, or mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.

2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

1.7 WARRANTY

A. Manufacturer's Warranty for Hardboard Siding and Trim: Manufacturer agrees to repair or replace siding that fails in materials or workmanship within specified warranty period. Failures include, but are not limited to, deformation or deterioration beyond normal weathering.

1. Warranty Period for Factory-Applied Finish: Five years from date of Substantial Completion.

2. Warranty Period for Siding and Trim (Excluding Finish): 25 years from date of Substantial Completion.

B. Manufacturer's Warranty for Columns: Manufacturer agrees to repair or replace columns that fail in materials or workmanship within specified warranty period.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Factory mark each piece of lumber with grade stamp of inspection agency indicating grade, species, moisture content at time of surfacing, and mill.

1. For exposed lumber, mark grade stamp on end or back of each piece.

B. Softwood Plywood: DOC PS 1.
2.2 WOOD-PRESERVATIVE-TREATED MATERIALS

A. Preservative Treatment by Pressure Process: AWPA U1; Use Category UC3b.
   1. Preservative Chemicals: Acceptable to authorities having jurisdiction and containing no arsenic or chromium.
   2. For exposed items indicated to receive transparent finish, do not use chemical formulations that contain colorants or that bleed through or otherwise adversely affect finishes.
   3. Mark lumber with treatment-quality mark of an inspection agency approved by the American Lumber Standard Committee's Board of Review.
      a. For exposed lumber indicated to receive a stained or natural finish, mark end or back of each piece.

2.3 FIRE-RETARDANT-TREATED MATERIALS

A. General: For applications indicated, use materials complying with requirements in this article that are acceptable to authorities having jurisdiction, and comply with testing requirements; testing by a qualified testing agency.

B. Fire-Retardant-Treated Lumber and Plywood by Pressure Process: Products with a flame spread index of 25 or less when tested according to ASTM E 84, with no evidence of significant progressive combustion when the test is extended an additional 20 minutes, and with the flame front not extending more than 10.5 feet beyond the centerline of the burners at any time during the test.
   1. Kiln dry lumber and plywood after treatment to a maximum moisture content of 19 and 15 percent respectively.

C. Do not use material that does not comply with requirements for untreated material or is warped or discolored.

D. Identify fire-retardant-treated wood with appropriate classification marking of testing and inspecting agency acceptable to authorities having jurisdiction.

2.4 CEMENTIOUS SIDING

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   1. Collins Products LLC; Collins Companies, Inc. (The).
   2. Georgia-Pacific Corp.
   3. Louisiana-Pacific Corporation.

B. Colors, Textures, and Patterns: As selected by Architect from manufacturer's full range.
2.5 MISCELLANEOUS MATERIALS

A. Fasteners for Exterior Finish Carpentry: Provide nails or screws, in sufficient length to penetrate not less than 1-1/2 inches into wood substrate.

1. For face-fastening siding (cementious fiber board only), provide ringed-shank siding nails or hot-dip galvanized-steel siding nails.
2. For cedar or redwood, provide stainless-steel fasteners.
3. For prefinished items, provide matching prefinished aluminum fasteners where face fastening is required.
4. For pressure-preservative-treated wood, provide hot-dip galvanized-steel fasteners.
5. For applications not otherwise indicated, provide stainless-steel fasteners.

B. Wood Glue: Waterproof resorcinol glue recommended by manufacturer for exterior carpentry use.

C. Flashing: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim" for flashing materials installed in exterior finish carpentry.


D. Continuous Soffit Vents: Aluminum hat channel shape with stamped louvers, 2 inches wide and in lengths not less than 96 inches.

1. Net Free Area: 6 sq. in./linear ft.
2. Finish: Mill finish.

E. Sealants: Latex, complying with ASTM C 834 Type OP, Grade NF and with applicable requirements in Division 07 Section "Joint Sealants," recommended by sealant manufacturer and manufacturer of substrates for intended application.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; Sonolac.
   d. Pecora Corporation; AC-20+.
   e. Schnee-Morehead, Inc., an ITW company; SM 8200.
   f. Tremco Incorporated; Tremflex 834.

2.6 FABRICATION

A. Back out or kerf backs of standing and running trim wider than 5 inches, except members with ends exposed in finished work.

B. Ease edges of lumber less than 1 inch in nominal thickness to 1/16-inch radius and edges of lumber 1 inch or more in nominal thickness to 1/8-inch radius.
PART 3 - EXECUTION

3.1 EXAMINATION
A. Examine substrates, with Installer present, 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 PREPARATION
A. Clean substrates of projections and substances detrimental to application.
B. Prime lumber and moldings to be painted, including both faces and edges, unless factory primed. Cut to required lengths and prime ends. Comply with requirements in Division 09 Section "Exterior Painting."

3.3 INSTALLATION, GENERAL
A. Do not use materials that are unsound, warped, improperly treated or finished, inadequately seasoned, or too small to fabricate with proper jointing arrangements.
   1. Do not use manufactured units with defective surfaces, sizes, or patterns.
B. Install exterior finish carpentry level, plumb, true, and aligned with adjacent materials. Use concealed shims where necessary for alignment.
   1. Scribe and cut exterior finish carpentry to fit adjoining work. Refinish and seal cuts as recommended by manufacturer.
   2. Install to tolerance of 1/8 inch in 96 inches for level and plumb. Install adjoining exterior finish carpentry with 1/32-inch maximum offset for flush installation and 1/16-inch maximum offset for reveal installation.
   3. Install stairs with no more than 3/16-inch variation between adjacent treads and risers and with no more than 3/8-inch variation between largest and smallest treads and risers within each flight.
   4. Coordinate exterior finish carpentry with materials and systems in or adjacent to it. Provide cutouts for mechanical and electrical items that penetrate exterior finish carpentry.

3.4 STANDING AND RUNNING TRIM INSTALLATION
A. Install flat-grain lumber with bark side exposed to weather.
B. Install trim with minimum number of joints practical, using full-length pieces from maximum lengths of lumber available. Do not use pieces less than 24 inches long except where necessary.
   1. Use scarf joints for end-to-end joints.
2. Stagger end joints in adjacent and related members.

C. Fit exterior joints to exclude water. Cope at returns and miter at corners to produce tight-fitting joints with full-surface contact throughout length of joint. Plane backs of casings to provide uniform thickness across joints, where necessary for alignment.

D. Where face fastening is unavoidable, countersink fasteners, fill surface flush, and sand unless otherwise indicated.

3.5 SIDING INSTALLATION

A. Install siding to comply with manufacturer's written instructions and warranty requirements.

B. Cementious board Siding: Install hardboard siding to comply with manufacturer's recommendations. Install panels with edges over framing or blocking. Leave 1/8-inch gap at perimeter, openings, and horizontal panel joints unless otherwise recommended by panel manufacturer.

1. Seal butt joints at inside and outside corners and at trim locations.
2. Install continuous metal flashing at horizontal panel joints.
3. Apply battens and corner trim as indicated.
4. Conceal fasteners to greatest practical extent by placing in grooves of siding pattern or by concealing with applied trim or battens as detailed.

C. Flashing: Install metal flashing as indicated on Drawings and as recommended by siding manufacturer.

D. Finish: Apply finish within two weeks of installation.

3.6 ADJUSTING

A. Replace exterior finish carpentry that is damaged or does not comply with requirements. Exterior finish carpentry may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing. Adjust joinery for uniform appearance.

3.7 CLEANING

A. Clean exterior finish carpentry on exposed and semiexposed surfaces. Touch up factory-applied finishes to restore damaged or soiled areas.

3.8 PROTECTION

A. Protect installed products from damage from weather and other causes during construction.

B. Remove and replace finish carpentry materials that are wet, moisture damaged, and mold damaged.

1. Indications that materials are wet or moisture damaged include, but are not limited to,
discoloration, sagging, or irregular shape.

2. Indications that materials are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 062013
SECTION 064023 - INTERIOR ARCHITECTURAL WOODWORK

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Interior standing and running trim.

1.3 DEFINITIONS

A. Interior architectural woodwork includes wood furring, blocking, shims, and hanging strips for installing woodwork items unless concealed within other construction before woodwork installation.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated cabinet hardware and accessories.

B. Product Data: For panel products high-pressure decorative laminate adhesive for bonding plastic laminate cabinet hardware and accessories and finishing materials and processes.

C. Shop Drawings: Show location of each item, dimensioned plans and elevations, large-scale details, attachment devices, and other components.
   1. Show details full size.
   2. Show locations and sizes of furring, blocking, and hanging strips, including concealed blocking and reinforcement specified in other Sections.
   3. Show locations and sizes of cutouts and holes for plumbing fixtures faucets and other items installed in architectural woodwork.

D. Samples for Initial Selection:
   1. Plastic laminates.
   2. Thermoset decorative panels.

E. Samples for Verification:
   1. Plastic laminates, 8 by 10 inches, for each type, color, pattern, and surface finish.

1.5 QUALITY ASSURANCE
A. Fabricator Qualifications: Shop that employs skilled workers who custom-fabricate products similar to those required for this Project and whose products have a record of successful in-service performance.

B. Source Limitations: Engage a qualified woodworking firm to assume undivided responsibility for production of interior architectural woodwork with sequence-matched wood veneers.

C. Quality Standard: Unless otherwise indicated, comply with AWI's "Architectural Woodwork Quality Standards" for grades of interior architectural woodwork indicated for construction, finishes, installation, and other requirements.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not deliver woodwork until painting and similar operations that could damage woodwork have been completed in installation areas. If woodwork must be stored in other than installation areas, store only in areas where environmental conditions comply with requirements specified in "Project Conditions" Article.

1.7 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install woodwork until building is enclosed, wet work is complete, and HVAC system is operating and maintaining temperature and relative humidity at occupancy levels during the remainder of the construction period.

B. Field Measurements: Where woodwork is indicated to fit to other construction, verify dimensions of other construction by field measurements before fabrication, and indicate measurements on Shop Drawings. Coordinate fabrication schedule with construction progress to avoid delaying the Work.

1. Locate concealed framing, blocking, and reinforcements that support woodwork by field measurements before being enclosed, and indicate measurements on Shop Drawings.

1.8 COORDINATION

A. Coordinate sizes and locations of framing, blocking, furring, reinforcements, and other related units of Work specified in other Sections to ensure that interior architectural woodwork can be supported and installed as indicated.

PART 2 - PRODUCTS

2.1 WOODWORK FABRICATORS

A. Available Fabricators: Subject to compliance with requirements, fabricators offering interior architectural woodwork that may be incorporated into the Work.

2.2 MATERIALS

A. General: Provide materials that comply with requirements of quality standard for each type of woodwork and quality grade specified, unless otherwise indicated.
B. Wood Products: Comply with the following:

1. Recycled Content of Medium-Density Fiberboard and Particleboard: Provide products with an average recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25% percent.
3. Particleboard: Straw-based particleboard complying with requirements in ANSI A208.1, Grade M-2, except for density.

C. Thermoset Decorative Panels: Particleboard or medium-density fiberboard finished with thermally fused, melamine-impregnated decorative paper complying with LMA SAT-1.

D. High-Pressure Decorative Laminate: NEMA LD 3, grades as indicated or, if not indicated, as required by woodwork quality standard.

1. Manufacturer: Subject to compliance with requirements, provide high-pressure decorative laminates by one of the following:
   a. Abet Laminati, Inc.
   b. Arborite; Division of ITW Canada, Inc.
   c. Formica Corporation.
   d. Lamin-Art, Inc.
   e. Nevamar Company, LLC; Decorative Products Div.
   f. Panolam Industries International Incorporated.
   g. Westinghouse Electric Corp.; Specialty Products Div.
   h. Wilsonart International; Div. of Premark International, Inc.

2.3 CABINET HARDWARE AND ACCESSORIES

A. General: Provide cabinet hardware and accessory materials associated with architectural cabinets, except for items specified in Division 08 Section "Door Hardware (Scheduled by Describing Products)."

B. Frameless Concealed Hinges (European Type): BHMA A156.9, B01602, 100 degrees of opening.

C. Wire Pulls: Back mounted, solid metal, 4 inches long, 5/16 inch in diameter.

D. Shelf Rests: BHMA A156.9, B04013; metal.

E. Drawer Slides: BHMA A156.9, B05091.

1. Heavy Duty (Grade 1HD-100 and Grade 1HD-200): Side mounted; full-extension type; zinc-plated steel ball-bearing slides.
2. Box Drawer Slides: Grade 1; for drawers not more than 6 inches high and 24 inches wide.
3. Keyboard Slides: Grade 1; for computer keyboard shelves.

F. Door Locks: BHMA A156.11, E07121.

G. Drawer Locks: BHMA A156.11, E07041.

H. Grommets for Cable Passage through Countertops: 2-inch OD, black, molded-plastic grommets and matching plastic caps with slot for wire passage.

I. Exposed Hardware Finishes: For exposed hardware, provide finish that complies with BHMA A156.18
for BHMA finish number indicated.

1. Satin Stainless Steel: BHMA 630.

J. For concealed hardware, provide manufacturer's standard finish that complies with product class requirements in BHMA A156.9.

2.4 MISCELLANEOUS MATERIALS

A. Furring, Blocking, Shims, and Hanging Strips: Softwood or hardwood lumber, kiln dried to less than 15 percent moisture content.

B. Anchors: Select material, type, size, and finish required for each substrate for secure anchorage. Provide nonferrous-metal or hot-dip galvanized anchors and inserts on inside face of exterior walls and elsewhere as required for corrosion resistance. Provide toothed-steel or lead expansion sleeves for drilled-in-place anchors.

C. Adhesives, General: Do not use adhesives that contain urea formaldehyde.

D. VOC Limits for Installation Adhesives and Glues: Use installation adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   1. Wood Glues: 30 g/L.
   2. Contact Adhesive: 250 g/L.

E. Adhesive for Bonding Plastic Laminate: Unpigmented contact cement.

2.5 FABRICATION, GENERAL

A. Interior Woodwork Grade: Unless otherwise indicated, provide -grade interior woodwork complying with referenced quality standard.

B. Wood Moisture Content: Comply with requirements of referenced quality standard for wood moisture content in relation to ambient relative humidity during fabrication and in installation areas.

C. Fabricate woodwork to dimensions, profiles, and details indicated. Ease edges to radius indicated for the following:


D. Complete fabrication, including assembly, finishing, and hardware application, to maximum extent possible before shipment to Project site. Disassemble components only as necessary for shipment and installation. Where necessary for fitting at site, provide ample allowance for scribing, trimming, and fitting.

   1. Trial fit assemblies at fabrication shop that cannot be shipped completely assembled. Install dowels, screws, bolted connectors, and other fastening devices that can be removed after trial fitting. Verify that various parts fit as intended and check measurements of assemblies against field measurements indicated on Shop Drawings before disassembling for shipment.
E. Shop-cut openings to maximum extent possible to receive hardware, appliances, plumbing fixtures, electrical work, and similar items. Locate openings accurately and use templates or roughing-in diagrams to produce accurately sized and shaped openings. Sand edges of cutouts to remove splinters and burrs.

1. Seal edges of openings in countertops with a coat of varnish.

2.6 PLASTIC-LAMINATE CABINETS

A. Grade: Custom.

B. Laminate Cladding for Exposed Surfaces: High-pressure decorative laminate complying with the following requirements:

1. Horizontal Surfaces Other Than Tops: Grade HGS.
2. Postformed Surfaces: Grade HGP.
3. Vertical Surfaces: Grade HGS.
4. Edges: Grade HGS.

C. Materials for Semiexposed Surfaces:

1. Surfaces Other Than Drawer Bodies: High-pressure decorative laminate, Grade VGS.
2. Drawer Sides and Backs: Thermoset decorative panels.
3. Drawer Bottoms: Thermoset decorative panels.

D. Concealed Backs of Panels with Exposed Plastic Laminate Surfaces: High-pressure decorative laminate, Grade BKL.

E. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from laminate manufacturer's full range in the following categories:
   a. Solid colors, matte finish.
   b. Solid colors with core same color as surface, matte finish.
   c. Wood grains, matte finish.
   d. Patterns, matte finish.

F. Provide dust panels of 1/4-inch plywood or tempered hardboard above compartments and drawers, unless located directly under tops.

2.7 PLASTIC-LAMINATE COUNTERTOPS

A. Grade: Custom.

B. High-Pressure Decorative Laminate Grade: HGS.

C. Colors, Patterns, and Finishes: Provide materials and products that result in colors and textures of exposed laminate surfaces complying with the following requirements:

1. As selected by Architect from manufacturer's full range in the following categories:
a. Solid colors, matte finish.
b. Solid colors with core same color as surface, matte finish.
c. Wood grains, matte finish.
d. Patterns, matte finish.

D. Grain Direction: Parallel to cabinet fronts.

E. Edge Treatment: Same as laminate cladding on horizontal surfaces and Lumber edge for transparent finish matching wood species and cut on cabinet surfaces see drawings for specific locations.

F. Core Material: Particleboard.

G. Core Material at Sinks: Particleboard made with exterior glue.

H. Backer Sheet: Provide plastic-laminate backer sheet, Grade BKL, on underside of countertop substrate.

1. Retain one of three options in subparagraph below. If retaining first, indicate colors, patterns, and finishes in a separate schedule.

2.8 SHOP FINISHING

A. Grade: Provide finishes of same grades as items to be finished.

B. General: Finish architectural woodwork at fabrication shop as specified in this Section. Defer only final touchup, cleaning, and polishing until after installation.

C. Preparation for Finishing: Comply with referenced quality standard for sanding, filling countersunk fasteners, sealing concealed surfaces, and similar preparations for finishing architectural woodwork, as applicable to each unit of work.

D. Transparent Finish:

1. AWI Finish System: Catalyzed polyurethane.
2. Staining: Match approved sample for color.
3. Filled Finish for Open-Grain Woods: After staining (if any), apply paste wood filler to open-grain woods and wipe off excess. Tint filler to match stained wood.
4. Sheen: Satin, 31-45 gloss units measured on 60-degree gloss meter per ASTM D 523.

PART 3 - EXECUTION

3.1 PREPARATION

A. Before installation, condition woodwork to average prevailing humidity conditions in installation areas.

B. Before installing architectural woodwork, examine shop-fabricated work for completion and complete work as required, including removal of packing and backpriming.

3.2 INSTALLATION

A. Grade: Install woodwork to comply with requirements for the same grade specified in Part 2 for INTERIOR ARCHITECTURAL WOODWORK
fabrication of type of woodwork involved.

B. Assemble woodwork and complete fabrication at Project site to comply with requirements for fabrication in Part 2, to extent that it was not completed in the shop.

C. Install woodwork level, plumb, true, and straight. Shim as required with concealed shims. Install level and plumb (including tops) to a tolerance of 1/8 inch in 96 inches.

D. Scribe and cut woodwork to fit adjoining work, refinish cut surfaces, and repair damaged finish at cuts.

E. Anchor woodwork to anchors or blocking built in or directly attached to substrates. Secure with countersunk, concealed fasteners and blind nailing as required for complete installation. Use fine finishing nails or finishing screws for exposed fastening, countersunk and filled flush with woodwork and matching final finish if transparent finish is indicated.

F. Standing and Running Trim: Install with minimum number of joints possible, using full-length pieces (from maximum length of lumber available) to greatest extent possible. Do not use pieces less than 60 inches long, except where shorter single-length pieces are necessary. Scarf running joints and stagger in adjacent and related members.

   1. Fill gaps, if any, between top of base and wall with plastic wood filler, sand smooth, and finish same as wood base if finished.
   2. Install wall railings on indicated metal brackets securely fastened to wall framing.
   3. Install standing and running trim with no more variation from a straight line than 1/8 inch in 96 inches.

G. Paneling: Anchor paneling to supporting substrate with concealed panel-hanger clips. Do not use face fastening, unless covered by trim.

   1. Install flush paneling with no more than 1/16 inch in 96-inch vertical cup or bow and 1/8 inch in 96-inch horizontal variation from a true plane.

H. Cabinets: Install without distortion so doors and drawers fit openings properly and are accurately aligned. Adjust hardware to center doors and drawers in openings and to provide unencumbered operation. Complete installation of hardware and accessory items as indicated.

   1. Install cabinets with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   2. Fasten wall cabinets through back, near top and bottom, at ends and not more than 16 inches o.c. with No. 10 wafer-head screws sized for 1-inch penetration into wood framing, blocking, or hanging strips.

I. Countertops: Anchor securely by screwing through corner blocks of base cabinets or other supports into underside of countertop.

   1. Align adjacent solid-surfacing-material countertops and form seams to comply with manufacturer's written recommendations using adhesive in color to match countertop. Carefully dress joints smooth, remove surface scratches, and clean entire surface.
   2. Install countertops with no more than 1/8 inch in 96-inch sag, bow, or other variation from a straight line.
   3. Securebacksplashes to walls with adhesive.
   4. Calk space between backsplash and wall with sealant specified in Division 07 Section “Joint Sealants.”

J. Touch up finishing work specified in this Section after installation of woodwork. Fill nail holes with
matching filler where exposed.

K. Refer to Division 09 Sections for final finishing of installed architectural woodwork not indicated to be shop finished.

3.3 ADJUSTING AND CLEANING

A. Repair damaged and defective woodwork, where possible, to eliminate functional and visual defects; where not possible to repair, replace woodwork. Adjust joinery for uniform appearance.

B. Clean, lubricate, and adjust hardware.

C. Clean woodwork on exposed and semiexposed surfaces. Touch up shop-applied finishes to restore damaged or soiled areas.

END OF SECTION 064023
SECTION 071113 - BITUMINOUS DAMPPROOFING

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. Cold-applied, emulsified-asphalt dampproofing.

1.3 SUBMITTALS
   A. Product Data: For each type of product indicated. Include recommendations for method of application, primer, number of coats, coverage or thickness, and protection course.
   B. Material Certificates: For each product, signed by manufacturers.

1.4 QUALITY ASSURANCE
   A. Source Limitations: Obtain primary dampproofing materials and primers through one source from a single manufacturer. Provide secondary materials recommended by manufacturer of primary materials.

1.5 PROJECT CONDITIONS
   A. Weather Limitations: Proceed with installation only when existing and forecasted weather conditions permit dampproofing to be performed according to manufacturers' written instructions.
   B. Ventilation: Provide adequate ventilation during application of dampproofing in enclosed spaces. Maintain ventilation until dampproofing has cured.

PART 2 - PRODUCTS

2.1 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING
   A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
      1. ChemMasters Corp.
      2. Degussa Building Systems; Sonneborn Brand Products.
      3. Gardner Gibson, Inc.
6. Koppers Inc.
7. Malarkey Roofing Products.

B. Trowel Coats: ASTM D 1227, Type II, Class 1.
C. Fibered Brush and Spray Coats: ASTM D 1227, Type II, Class 1.
D. Brush and Spray Coats: ASTM D 1227, Type III, Class 1.
E. VOC Content: 0.25 lb/gal. or less.

2.2 MISCELLANEOUS MATERIALS
A. Asphalt-Coated Glass Fabric: ASTM D 1668, Type I.
B. Patching Compound: Manufacturer's fibered mastic of type recommended by dampproofing manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for surface smoothness and other conditions affecting performance of work.

1. Proceed with dampproofing application only after substrate construction and penetrating work have been completed and unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Protection of Other Work: Mask or otherwise protect adjoining exposed surfaces from being stained, spotted, or coated with dampproofing. Prevent dampproofing materials from entering and clogging weep holes and drains.

B. Clean substrates of projections and substances detrimental to work; fill voids, seal joints, and apply bond breakers if any, as recommended by prime material manufacturer.

C. Apply patching compound for filling and patching tie holes, honeycombs, reveals, and other imperfections.

3.3 APPLICATION, GENERAL

A. Comply with manufacturer's written recommendations unless more stringent requirements are indicated or required by Project conditions to ensure satisfactory performance of dampproofing.

1. Apply additional coats if recommended by manufacturer or if required to achieve coverages
indicated.
2. Allow each coat of dampproofing to cure 12 hours before applying subsequent coats. 
3. Allow 36 hours drying time prior to backfilling. 

B. Apply dampproofing to footings and foundation walls where opposite side of wall faces building interior.
   1. Apply from finished-grade line to top of footing, extend over top of footing, and down a minimum of 6 inches over outside face of footing. 
   2. Extend 12 inches onto intersecting walls and footings, but do not extend onto surfaces exposed to view when Project is completed. 
   3. Install flashings and corner protection stripping at internal and external corners, changes in plane, construction joints, cracks, and where shown as "reinforced," by embedding an 8-inch- wide strip of asphalt-coated glass fabric in a heavy coat of dampproofing. Dampproofing coat for embedding fabric is in addition to other coats required. 

C. Apply dampproofing to provide continuous plane of protection on exterior face of inner wythe of exterior masonry cavity walls. 
   1. Lap dampproofing at least 1/4 inch onto flashing, masonry reinforcement, veneer ties, and other items that penetrate inner wythe. 
   2. Extend dampproofing over outer face of structural members and concrete slabs that interrupt inner wythe, and lap dampproofing at least 1/4 inch onto shelf angles supporting veneer. 

D. Apply dampproofing to provide continuous plane of protection on interior face of above-grade, exterior concrete and masonry walls unless walls are indicated to receive direct application of paint. 
   1. Continue dampproofing through intersecting walls by keeping vertical mortar joints at intersection temporarily open or by delaying construction of intersecting walls until dampproofing is applied. 

3.4 COLD-APPLIED, EMULSIFIED-ASPHALT DAMPPROOFING 

A. On Concrete Foundations and Parged Masonry Foundation Walls: Apply 2 brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, 1 fibered brush or spray coat at not less than 3 gal./100 sq. ft. , or 1 trowel coat at not less than 4 gal./100 sq. ft. . 

B. On Unparged Masonry Foundation Walls: Apply primer and 2 brush or spray coats at not less than 1.5 gal./100 sq. ft. for first coat and 1 gal./100 sq. ft. for second coat, primer and 1 fibered brush or spray coat at not less than 3 gal./100 sq. ft. , or primer and 1 trowel coat at not less than 5 gal./100 sq. ft. . 

C. On Unexposed Face of Concrete Retaining Walls: Apply 1 brush or spray coat at not less than 1.25 gal./100 sq. ft. . 

D. On Unexposed Face of Masonry Retaining Walls: Apply primer and 1 brush or spray coat at not less than 1.25 gal./100 sq. ft. . 

E. On Masonry Backup for architectural precast concrete panels and masonry veneers : Apply primer and 1 brush or spray coat at not less than 1 gal./100 sq. ft. . 

F. On Exterior Face of Inner Wythe of Cavity Walls: Apply primer and 1 brush or spray coat at not less than 1 gal./100 sq. ft. . 

3.5 CLEANING 

BITUMINOUS DAMPPROOFING 071113 - 3
A. Remove dampproofing materials from surfaces not intended to receive dampproofing.

END OF SECTION 071113
SECTION 072100 - THERMAL INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Perimeter insulation under slabs-on-grade.
   2. Concealed building insulation.
   3. Exposed building insulation.

B. Related Sections include the following:
   Division 22 Section "Plumbing Insulation."
   Division 23 Section "HVAC Insulation."

1.3 DEFINITIONS

A. Mineral-Fiber Insulation: Insulation composed of rock-wool fibers, slag-wool fibers, or glass fibers; produced in boards and blanket with latter formed into batts (flat-cut lengths) or rolls.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency for insulation products.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain each type of building insulation through one source from a single manufacturer.

   Fire-Test-Response Characteristics: Provide insulation and related materials with the fire-test-response characteristics indicated, as determined by testing identical products per test method indicated below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify materials with appropriate markings of applicable testing and inspecting agency.


B. Recycled Content: Provide glass-fiber insulation with recycled content so postconsumer recycled content plus one-half of preconsumer recycled content is not less than 25 percent.

1.6 DELIVERY, STORAGE, AND HANDLING

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

Protect plastic insulation as follows:

1. Do not expose to sunlight, except to extent necessary for period of installation and concealment. Protect against ignition at all times. Do not deliver plastic insulating materials to Project site before installation time. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:

1. Products: Subject to compliance with requirements, provide one of the products specified. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 FOAM-PLASTIC BOARD INSULATION

A. Extruded-Polystyrene Board Insulation: ASTM C 578, of type and density indicated below, with maximum flame-spread and smoke-developed indexes of 75 and 450, respectively:

1. Manufacturers:

   a. DiversiFoam Products.
   Dow Chemical Company.
   Owens Corning.
   Pactiv Building Products Division.

2. Type VI, 1.80 lb/cu. ft.

2.3 GLASS-FIBER BOARD INSULATION

A. Manufacturers:

1. CertainTeed Corporation.
   Johns Manville.
Knauf Fiber Glass.
Owens Corning.

B. Glass-Mat-Faced, Glass-Fiber Board Insulation: ASTM C 612, Type IA or Types IA and IB; faced on 1 side with black glass-fiber mat or black polymer finish; maximum flame-spread and smoke-developed indexes of 25 and 50, respectively; and of the following nominal density and thermal resistivity:

1. Nominal density of 2.25 lb/cu. ft., thermal resistivity of 4.3 deg F x h x sq. ft./Btu x in. at 75 deg F.

2.4 GLASS-FIBER BLANKET INSULATION

A. Manufacturers:

1. CertainTeed Corporation.
Guardian Fiberglass, Inc.
Johns Manville.
Knauf Fiber Glass.
Owens Corning.

Faced, Glass-Fiber Blanket Insulation: ASTM C 665, Type III (blankets with reflective membrane facing), Class A (membrane-faced surface with a flame-spread index of 25 or less); Category 1 (membrane is a vapor barrier), faced with foil-scrim-kraft, foil-scrim, or foil-scrim-polyethylene vapor-retarder membrane on 1 face.

Where glass-fiber blanket insulation is indicated by the following thicknesses, provide blankets in batt or roll form with thermal resistances indicated:

2. 3-5/8 inches thick with a thermal resistance of 11 deg F x h x sq. ft./Btu at 75 deg F.
5-1/2 inches thick with a thermal resistance of 19 deg F x h x sq. ft./Btu at 75 deg F.

2.5 AUXILIARY INSULATING MATERIALS

A. Vapor-Retarder Tape: Pressure-sensitive tape of type recommended by insulation manufacturers for sealing joints and penetrations in vapor-retarder facings.

Adhesive for Bonding Insulation: Product with demonstrated capability to bond insulation securely to substrates indicated without damaging insulation and substrates.

2.6 INSULATION FASTENERS

A. Adhesively Attached, Spindle-Type Anchors: Plate welded to projecting spindle; capable of holding insulation of thickness indicated securely in position indicated with self-locking washer in place; and
complying with the following requirements:

1. Products:
   a. AGM Industries, Inc.; Series T TACTOO Insul-Hangers.
      Eckel Industries of Canada; Stic-Klip Type N Fasteners.
      Gemco; Spindle Type.

2. Plate: Perforated galvanized carbon-steel sheet, 0.030 inch thick by 2 inches square.
   Spindle: Copper-coated, low carbon steel; fully annealed; 0.105 inch in diameter; length to suit depth of insulation indicated.

B. Anchor Adhesive: Product with demonstrated capability to bond insulation anchors securely to substrates indicated without damaging insulation, fasteners, and substrates.

1. Products:
   a. AGM Industries, Inc.; TACTOO Adhesive.
      Eckel Industries of Canada; Stic-Klip Type S Adhesive.
      Gemco; Tuff Bond Hanger Adhesive.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Installer present, for compliance with requirements of Sections in which substrates and related work are specified and for other conditions affecting performance.

1. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Clean substrates of substances harmful to insulation or vapor retarders, including removing projections capable of puncturing vapor retarders or of interfering with insulation attachment.

3.3 INSTALLATION, GENERAL

A. Comply with insulation manufacturer's written instructions applicable to products and application indicated. INCLUDING BUT NOT LIMITED TO ALLOWABLE EXPOSURE TO SUN OR UV.

Install insulation that is undamaged, dry, and unsoiled and that has not been left exposed at any time to ice, rain, and snow.

Extend insulation in thickness indicated to envelop entire area to be insulated. Cut and fit tightly around obstructions and fill voids with insulation. Remove projections that interfere with placement.

Water-Piping Coordination: If water piping is located within insulated exterior walls, coordinate location of piping to ensure that it is placed on warm side of insulation and insulation encapsulates piping.

For preformed insulating units, provide sizes to fit applications indicated and selected from manufacturer's standard thicknesses, widths, and lengths. Apply single layer of insulation units to produce thickness
indicated unless multiple layers are otherwise shown or required to make up total thickness.

3.4 INSTALLATION OF PERIMETER AND UNDER-SLAB INSULATION

A. On vertical surfaces, set insulation units in adhesive applied according to manufacturer's written instructions. Use adhesive recommended by insulation manufacturer.

   1. If not otherwise indicated, extend insulation a minimum of 24 inches below exterior grade line.

B. On horizontal surfaces, loosely lay insulation units according to manufacturer's written instructions. Stagger end joints and tightly abut insulation units.

3.5 INSTALLATION OF GENERAL BUILDING INSULATION

A. Apply insulation units to substrates by method indicated, complying with manufacturer's written instructions. If no specific method is indicated, bond units to substrate with adhesive or use mechanical anchorage to provide permanent placement and support of units.

Seal joints between foam-plastic insulation units by applying adhesive, mastic, or sealant to edges of each unit to form a tight seal as units are shoved into place. Fill voids in completed installation with adhesive, mastic, or sealant as recommended by insulation manufacturer.

Set vapor-retarder-faced units with vapor retarder to warm-in-winter side of construction, unless otherwise indicated.

   1. Tape joints and ruptures in vapor retarder, and seal each continuous area of insulation to surrounding construction to ensure airtight installation.

B. Install mineral-fiber insulation in cavities formed by framing members according to the following requirements:

   1. Use insulation widths and lengths that fill the cavities formed by framing members. If more than one length is required to fill cavity, provide lengths that will produce a snug fit between ends. Place insulation in cavities formed by framing members to produce a friction fit between edges of insulation and adjoining framing members.

   For metal-framed wall cavities where cavity heights exceed 96 inches, support unfaced blankets mechanically and support faced blankets by taping flanges of insulation to flanges of metal studs.

C. Install board insulation on concrete or metal deck substrates by adhesively attached, spindle-type insulation anchors as follows:

   1. Fasten insulation anchors to concrete substrates with insulation anchor adhesive according to anchor manufacturer's written instructions. Space anchors according to insulation manufacturer's written instructions for insulation type, thickness, and application indicated.

   After adhesive has dried, install board insulation by pressing insulation into position over spindles and securing it tightly in place with insulation-retaining washers, taking care not to compress insulation below indicated thickness.

   Where insulation will not be covered by other building materials, apply capped washers to tips of spindles.

D. Install board insulation in curtain-wall construction where indicated on Drawings according to curtain-wall manufacturer's written instructions.
1. Retain insulation in place by metal clips and straps or integral pockets within window frames, spaced at intervals recommended in writing by insulation manufacturer to hold insulation securely in place without touching spandrel glass. Maintain cavity width of dimension indicated between insulation and glass. Install insulation where it contacts perimeter fire-containment system to prevent insulation from bowing under pressure from perimeter fire-containment system.

2. Place loose-fill insulation into spaces indicated, [either] [by pouring] [or] [by machine blowing], to comply with ASTM C 1015. Level horizontal applications to uniform thickness as indicated, lightly settle to uniform density, but do not compact excessively.

3. For cellulosic-fiber loose-fill insulation, comply with the Cellulose Insulation Manufacturers Association's Special Report #3, "Standard Practice for Installing Cellulose Insulation."

3.6 INSTALLATION OF INSULATION WITH VAPOR RETARDERS

A. General: Extend vapor retarder to extremities of areas to be protected from vapor transmission. Secure in place with adhesives or other anchorage system as indicated. Extend vapor retarder to cover miscellaneous voids in insulated substrates.

Seal joints caused by pipes, conduits, electrical boxes, and similar items penetrating vapor retarders with vapor-retarder tape to create an airtight seal between penetrating objects and vapor retarder.

Repair tears or punctures in vapor retarders immediately before concealment by other work. Cover with vapor-retarder tape or another layer of vapor retarder.

3.7 PROTECTION

A. Protect installed insulation and vapor retarders from damage due to harmful weather exposures, physical abuse, and other causes. Provide temporary coverings or enclosures where insulation is subject to abuse and cannot be concealed and protected by permanent construction immediately after installation.

3.8 INSULATION SCHEDULE

A. Insulation Type: Type IV extruded-polystyrene board insulation. Utilize on top of glass fiber reinforced exterior sheathing products with woodstud back up, below grade as perimeter insulation and as protection board where not specified in Division 07, "Bituminous damproofing" or "Self adhered sheet waterproofing".

Insulation Type: Faced, glass-fiber blanket insulation. Utilize at all locations where batt insulation is indicated.

END OF SECTION 072100
SECTION 073113 - ASPHALT SHINGLES

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. Asphalt shingles.
   2. Underlayment.

B. Related Sections:
   1. Division 06 Section "Rough Carpentry " for wood framing.
   2. Division 06 Section "Sheathing" for roof sheathing.

1.3 DEFINITION

A. Roofing Terminology:  See ASTM D 1079 and glossary of NRCA's "The NRCA Roofing and Waterproofing Manual" for definitions of terms related to roofing work in this Section.

1.4 ACTION SUBMITTALS

A. Product Data:  For each type of product indicated.

B. Samples for Initial Selection:  For each type of asphalt shingle ridge and hip cap shingles ridge vent indicated.
   1. Include similar Samples of trim and accessories involving color selection.

1.5 INFORMATIONAL SUBMITTALS

A. Qualification Data:  For qualified Installer.

B. Product Test Reports:  Based on evaluation of comprehensive tests performed by manufacturer and witnessed by a qualified testing agency, for asphalt shingles.

C. Research/Evaluation Reports:  For each type of asphalt shingle required, from the ICC.

D. Warranties:  Sample of special warranties.
1.6 CLOSEOUT SUBMITTALS

A. Maintenance Data: For each type of asphalt shingle to include in maintenance manuals.

1.7 QUALITY ASSURANCE

A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for installation of units required for this Project.

B. Source Limitations: Obtain ridge and hip cap shingles from single source from single manufacturer.

C. Fire-Resistance Characteristics: Where indicated, provide asphalt shingles and related roofing materials identical to those of assemblies tested for fire resistance per test method below by UL or another testing and inspecting agency acceptable to authorities having jurisdiction. Identify products with appropriate markings of applicable testing agency.

1. Exterior Fire-Test Exposure: Class A; ASTM E 108 or UL 790, for application and roof slopes indicated.

D. Preinstallation Conference: Conduct conference at Project site.

1.8 DELIVERY, STORAGE, AND HANDLING

A. Store roofing materials in a dry, well-ventilated, weathertight location according to asphalt shingle manufacturer's written instructions. Store underlayment rolls on end on pallets or other raised surfaces. Do not double stack rolls.

1. Handle, store, and place roofing materials in a manner to avoid significant or permanent damage to roof deck or structural supporting members.

B. Protect unused underlayment from weather, sunlight, and moisture when left overnight or when roofing work is not in progress.

1.9 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install asphalt shingles until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and temporary HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

1. Install self-adhering sheet underlayment within the range of ambient and substrate temperatures recommended by manufacturer.

1.10 WARRANTY

A. Special Warranty: Standard form in which manufacturer agrees to repair or replace asphalt shingles that fail in materials or workmanship within specified warranty period.
1. Failures include, but are not limited to, the following:
   a. Manufacturing defects.
   b. Structural failures including failure of asphalt shingles to self-seal after a reasonable time.

2. Material Warranty Period: 25 years from date of project acceptance, prorated, with first 12 years nonprorated.

3. Wind-Speed Warranty Period: Asphalt shingles will resist blow-off or damage caused by wind speeds up to 100 mph for 10 years from date of Project Acceptance.

4. .

5. Algae-Discoloration Warranty Period: Asphalt shingles will not discolor 10 years from date of Project Acceptance.

B. Special Project Warranty: Roofing Installer's Warranty, or warranty form at end of this Section, signed by roofing Installer, covering the Work of this Section, in which roofing Installer agrees to repair or replace components of asphalt shingle roofing that fail in materials or workmanship within specified warranty period.

1. Warranty Period: Two years from date of Project Acceptance.

PART 2 - PRODUCTS

2.1 GLASS-FIBER-REINFORCED ASPHALT SHINGLES


1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

2. 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:

   a. CertainTeed Corporation.
   b. GAF Materials Corporation.
   c. IKO.
   d. Owens Corning.
   e. TAMKO Roofing Products, Inc.

3. Tab Arrangement: Three tabs, regularly spaced.
4. Cutout Shape: Square.
7. Algae Resistance: Granules treated to resist algae discoloration.
8. Color and Blends: As selected by Architect from manufacturer's full range.

B. Hip and Ridge Shingles: Manufacturer's standard units to match asphalt shingles.
2.2 UNDERLAYMENT MATERIALS

A. Felt: ASTM D 226, Type I, asphalt-saturated organic felts, nonperforated.


2.3 RIDGE VENTS

A. Flexible Ridge Vent: Manufacturer's standard, compression-resisting, three-dimensional, open-nylon or polyester-mat filter bonded to a nonwoven, nonwicking, geotextile fabric cover.

1. Manufacturers: Subject to compliance with requirements, [provide products by one of the following] [available manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following]:

2. 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:

   a. GAF Materials Corporation.
   b. Obdyke, Benjamin Incorporated.
   c. TAMKO Roofing Products, Inc.

2.4 ACCESSORIES

A. Asphalt Roofing Cement: ASTM D 4586, Type II, asbestos free.

B. Roofing Nails: ASTM F 1667; aluminum, stainless-steel, copper, or hot-dip galvanized-steel wire shingle nails, minimum 0.120-inch diameter, smooth shank, sharp-pointed, with a minimum 3/8-inch diameter flat head and of sufficient length to penetrate 3/4 inch into solid wood decking or extend at least 1/8 inch through OSB or plywood sheathing.

1. Where nails are in contact with metal flashing, use nails made from same metal as flashing.

C. Felt Underlayment Nails: Aluminum, stainless-steel, or hot-dip galvanized-steel wire with low-profile capped heads or disc caps, 1-inch minimum diameter.

2.5 METAL FLASHING AND TRIM

A. General: Comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."

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 the Work.
   
   1. Examine roof sheathing to verify that sheathing joints are supported by framing and blocking or metal clips and that installation is within flatness tolerances.
   2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and completely anchored; and that provision has been made for flashings and penetrations through asphalt shingles.

B. Prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 UNDERLAYMENT INSTALLATION

A. General: Comply with underlayment manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply.

B. Single-Layer Felt Underlayment: Install on roof deck parallel with and starting at the eaves. Lap sides a minimum of 2 inches over underlying course. Lap ends a minimum of 4 inches. Stagger end laps between succeeding courses at least 72 inches. Fasten with felt underlayment nails.

   1. Install felt underlayment on roof deck not covered by self-adhering sheet underlayment. Lap sides of felt over self-adhering sheet underlayment not less than 3 inches in direction to shed water. Lap ends of felt not less than 6 inches over self-adhering sheet underlayment.
   2. Install fasteners at no more than 36 inch o.c.

C. Concealed, Woven Valley Lining: Comply with NRCA's recommendations. Install a 36-inch-wide felt underlayment centered in valley. Fasten to roof deck with felt underlayment nails.

   1. Lap roof-deck felt underlayment over valley felt underlayment at least 6 inches.
   2. Install a 36-inch-wide strip of granular-surfaced valley lining centered in valley, with granular-surface face up. Lap ends of strips at least 12 inches in direction to shed water, and seal with asphalt roofing cement. Fasten to roof deck with roofing nails.

3.3 METAL FLASHING INSTALLATION

A. General: Install metal flashings and other sheet metal to comply with requirements in Division 07 Section "Sheet Metal Flashing and Trim."

   1. Install metal flashings according to recommendations in ARMA's "Residential Asphalt Roofing Manual" and asphalt shingle recommendations in NRCA's "The NRCA Roofing
and Waterproofing Manual."

B. Open-Valley Flashings: Install centered in valleys, lapping ends at least 8 inches in direction to shed water. Fasten upper end of each length to roof deck beneath overlap.

3.4 ASPHALT SHINGLE INSTALLATION


B. Install starter strip along lowest roof edge, consisting of an asphalt shingle strip with tabs removed with self-sealing strip face up at roof edge.

1. Extend asphalt shingles 3/4 inch over fasciae at eaves and rakes.
2. Install starter strip along rake edge.

C. Install first and remaining courses of asphalt shingles stair-stepping diagonally across roof deck with manufacturer's recommended offset pattern at succeeding courses, maintaining uniform exposure.

D. Install asphalt shingles by single-strip column or racking method, maintaining uniform exposure. Install full-length first course followed by cut second course, repeating alternating pattern in succeeding courses.

E. Fasten asphalt shingle strips with a minimum of five roofing nails located according to manufacturer's written instructions.

1. When ambient temperature during installation is below 50 deg F, seal asphalt shingles with asphalt roofing cement spots.

F. Woven Valleys: Extend succeeding asphalt shingle courses from both sides of valley 12 inches beyond center of valley, weaving intersecting shingle-strip courses over each other. Use one-piece shingle strips without joints in valley.

1. Do not nail asphalt shingles within 6 inches of valley center.

G. Ridge Vents: Install continuous ridge vents over asphalt shingles according to manufacturer's written instructions. Fasten with roofing nails of sufficient length to penetrate sheathing.

H. Ridge Cap Shingles: Maintain same exposure of cap shingles as roofing shingle exposure. Lap cap shingles at ridges to shed water away from direction of prevailing winds. Fasten with roofing nails of sufficient length to penetrate sheathing.

1. Fasten ridge cap asphalt shingles to cover ridge vent without obstructing airflow.

3.5 ROOFING INSTALLER'S WARRANTY

A. WHEREAS <Insert name> of <Insert address>, herein called the "Roofing Installer," has performed roofing and associated work ("work") on the following project:
1. Owner: <Insert name of Owner>.
2. Address: <Insert address>.
3. Building Name/Type: <Insert information>.
4. Address: <Insert address>.
5. Area of Work: <Insert information>.
6. Acceptance Date: <Insert date>.
7. Warranty Period: <Insert time>.
8. Expiration Date: <Insert date>.

B. AND WHEREAS Roofing Installer has contracted (either directly with Owner or indirectly as a subcontractor) to warrant said work against leaks and faulty or defective materials and workmanship for designated Warranty Period,

C. NOW THEREFORE Roofing Installer hereby warrants, subject to terms and conditions herein set forth, that during Warranty Period he will, at his own cost and expense, make or cause to be made such repairs to or replacements of said work as are necessary to correct faulty and defective work and as are necessary to maintain said work in a watertight condition.

D. This Warranty is made subject to the following terms and conditions:

1. Specifically excluded from this Warranty are damages to work and other parts of the building, and to building contents, caused by:
   a. Lightning;
   b. Peak gust wind speed exceeding 100 mph;
   c. Fire;
   d. Failure of roofing system substrate, including cracking, settlement, excessive deflection, deterioration, and decomposition;
   e. Faulty construction of parapet walls, copings, chimneys, skylights, vents, equipment supports, and other edge conditions and penetrations of the work;
   f. Vapor condensation on bottom of roofing; and
   g. Activity on roofing by others, including construction contractors, maintenance personnel, other persons, and animals, whether authorized or unauthorized by Owner.

2. When work has been damaged by any of foregoing causes, Warranty shall be null and void until such damage has been repaired by Roofing Installer and until cost and expense thereof have been paid by Owner or by another responsible party so designated.

3. Roofing Installer is responsible for damage to work covered by this Warranty but is not liable for consequential damages to building or building contents resulting from leaks or faulty or defects of work.

4. During Warranty Period, if Owner allows alteration of work by anyone other than Roofing Installer, including cutting, patching, and maintenance in connection with penetrations, attachment of other work, and positioning of anything on roof, this Warranty shall become null and void on date of said alterations, but only to the extent said alterations affect work covered by this Warranty. If Owner engages Roofing Installer to perform said alterations, Warranty shall not become null and void unless Roofing Installer, before starting said work, shall have notified Owner in writing, showing reasonable cause for claim, that said alterations would likely damage or deteriorate work, thereby reasonably justifying a limitation or termination of this Warranty.
5. During Warranty Period, if original use of roof is changed and it becomes used for, but was not originally specified for, a promenade, work deck, spray-cooled surface, flooded basin, or other use or service more severe than originally specified, this Warranty shall become null and void on date of said change, but only to the extent said change affects work covered by this Warranty.

6. Owner shall promptly notify Roofing Installer of observed, known, or suspected leaks, defects, or deterioration and shall afford reasonable opportunity for Roofing Installer to inspect work and to examine evidence of such leaks, defects, or deterioration.

7. This Warranty is recognized to be the only warranty of Roofing Installer on said work and shall not operate to restrict or cut off Owner from other remedies and resources lawfully available to Owner in cases of roofing failure. Specifically, this Warranty shall not operate to relieve Roofing Installer of responsibility for performance of original work according to requirements of the Contract Documents, regardless of whether Contract was a contract directly with Owner or a subcontract with Owner's General Contractor.

E. IN WITNESS THEREOF, this instrument has been duly executed this <Insert day> day of <Insert month>, <Insert year>.

1. Authorized Signature: <Insert signature>.
2. Name: <Insert name>.
3. Title: <Insert title>.

END OF SECTION 073113
SECTION 074633 – PLASTIC SIDING

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Vinyl siding.
   2. Vinyl soffit.
   3. Vinyl decorative accessories.

B. Related Sections include the following:
   1. Division 6 Section "Rough Carpentry" for building wrap.
   2. Division 6 Section "Finish Carpentry" for wood and wood-based sidings and for exterior trim.
   3. Division 7 Section "Sheet Metal Flashing and Trim" for flashing, gutters, and other sheet metal work.
   4. Division 7 Section "Joint Sealants."

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.
   1. For vinyl siding, include VSI's official certification logo printed on Product Data.

B. Samples for Verification: For each type, color, texture, and pattern required.
   1. 12-inch- (300-mm-) long-by-actual-width Sample of siding.
   2. 12-inch- (300-mm-) long-by-actual-width Sample of soffit.
   3. 12-inch- (300-mm-) long-by-actual-width Sample of trim.

C. Product Certificates: For each type of siding and soffit, signed by product manufacturer.

D. Research/Evaluation Reports: For each type of siding required.

1.4 QUALITY ASSURANCE

A. Source Limitations for Siding and Soffit: Obtain each type, color, texture, and pattern of siding and soffit, including related accessories, through one source from a single manufacturer.
B. Vinyl Siding Certification Program: Provide vinyl siding products that are listed in VSI's list of certified products.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Store materials in a dry, well-ventilated, weathertight place.

1.6 PROJECT CONDITIONS
A. Weather Limitations: Proceed with siding installation only if substrate is completely dry and if existing and forecasted weather conditions permit siding to be installed according to manufacturer's written instructions.

1.7 SEQUENCING
A. Coordinate installation with flashings and other adjoining construction to ensure proper sequencing.

1.8 WARRANTY
A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace siding that does not comply with requirements or that fails within specified warranty period. Failures include, but are not limited to, cracking, deforming, fading, or otherwise deteriorating beyond normal weathering.

1. Fading is defined as loss of color, after cleaning with product recommended by manufacturer, of more than 4 Hunter color-difference units as measured according to ASTM D 2244.

2. Warranty Period: 25 years from date of Substantial Completion.

1.9 EXTRA MATERIALS
A. Furnish extra materials described below that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish full lengths of siding and trim in a quantity equal to 2 percent of amount installed.

PART 2 - PRODUCTS

2.1 MANUFACTURERS
A. In other Part 2 articles where titles below introduce lists, the following requirements apply to product selection:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.
2. Basis-of-Design Product: The design for each siding and soffit is based on the product named. Subject to compliance with requirements, provide either the named product or a comparable product by one of the other manufacturers specified.

2.2 SIDING

A. Vinyl Siding: Integrally colored, vinyl siding complying with ASTM D 3679.

1. Basis-of-Design Product: CertainTeed Corp; Double 4” Clapboard – Select Cedar or a comparable product by one of the following:
   a. Alcoa Building Products, Inc.
   b. Alside, Inc.
   c. CertainTeed Corp.
   d. Crane Plastics Holding Company.
   e. Gentek Building Products, Inc.
   f. Heartland Building Products.
   g. Louisiana-Pacific Corporation.
   h. Mitten Vinyl Inc.
   i. Owens Corning.
   k. Rollex Corporation.
   l. Royal Group Technologies Limited.
   m. Variform, Inc.
2. Horizontal Pattern: 8-inch (203-mm) exposure in plain, double 4-inch (102-mm) board style.
3. Texture: Wood grain.
4. Minimum Nominal Thickness: 0.044 inch (1.1 mm).
6. Finish: Wood-grain print with clear protective coating containing not less than 70 percent PVDF.
7. Colors for Vinyl Siding: As selected by Architect from manufacturer's full range.

2.3 SOFFIT

A. Vinyl Soffit: Integrally colored, vinyl soffit complying with ASTM D 4477.

1. Basis-of-Design Product: CertainTeed Corp, Universal Triple 4” or a comparable product by one of the following:
   a. Same manufacturers listed for vinyl siding.
2. Pattern: 12-inch (305-mm) exposure in V-grooved, triple 4-inch (102-mm) board style.
3. Texture: Wood grain.
4. Ventilation: Provide perforated soffit, unless otherwise indicated.
5. Minimum Nominal Thickness: 0.044 inch (1.1 mm).
6. Colors for Vinyl Soffit: As selected by Architect from manufacturer's full range.
2.4 ACCESSORIES

A. Siding Accessories: Provide starter strips, edge trim, corner cap, and other items as recommended by siding manufacturer for building configuration.

1. Provide accessories made from same material as adjacent siding, unless otherwise indicated.
2. Provide accessories matching color and texture of adjacent siding, unless otherwise indicated.

B. Vinyl Accessories: Where vinyl accessories are indicated, provide integrally colored vinyl accessories complying with ASTM D 3679 except for wind-load resistance.

1. Texture: Wood grain.

C. Decorative Accessories: Provide the following types of decorative accessories as indicated:

1. Corner posts.
2. Door and window casings.
3. Fasciae.
4. Moldings and trim.

D. Colors for Decorative Accessories: selected by Architect from manufacturer's full range.

E. Flashing: Provide aluminum flashing complying with Division 7 Section "Sheet Metal Flashing and Trim" at window and door heads and where indicated.

1. Finish for Aluminum Flashing: Siliconized polyester coating, same color as siding.

F. Elastomeric Joint Sealant: Single-component urethane joint sealant complying with requirements in Division 7 Section "Joint Sealants" for Use NT (nontraffic) and for Uses M, G, A, and, as applicable to joint substrates indicated, O joint substrates.

G. Fasteners:

1. For fastening to wood, use ribbed bugle-head screws of sufficient length to penetrate a minimum of 1 inch (25 mm) into substrate.
2. For fastening vinyl, use hot-dip galvanized fasteners. Where fasteners will be exposed to view, use prefinished aluminum fasteners in color to match item being fastened.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates for compliance with requirements for installation tolerances and other conditions affecting performance of siding. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 PREPARATION
   A. Clean substrates of projections and substances detrimental to application.

3.3 INSTALLATION
   A. General: Comply with siding manufacturer's written installation instructions applicable to products and applications indicated unless more stringent requirements apply. Center nails in elongated nailing slots without binding siding to allow for thermal movement. Overlap joints to shed water away from direction of prevailing wind.
   B. Install vinyl siding, soffit and accessories according to ASTM D 4756.
      1. Install siding in continuous lengths without seams.
   C. Isolate dissimilar metals by separating with rubber gaskets or elastomeric sealant. Use rubber washers where fasteners made from dissimilar metal penetrate siding. Isolate dissimilar metals behind siding by covering with polyethylene film.

3.4 ADJUSTING AND CLEANING
   A. Remove damaged, improperly installed, or otherwise defective siding materials and replace with new materials complying with specified requirements.
   B. Clean finished surfaces according to siding manufacturer's written instructions and maintain in a clean condition during construction.

END OF SECTION 074633
SECTION 076200 - SHEET METAL FLASHING AND TRIM

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. Formed Products:
   a. Formed roof drainage sheet metal fabrications.

B. Related Sections:

1. Division 06 Section "Rough Carpentry " for wood nailers, curbs, and blocking.

1.3 PERFORMANCE REQUIREMENTS

A. General: Sheet metal flashing and trim assemblies as indicated shall withstand wind loads, structural movement, thermally induced movement, and exposure to weather without failure due to defective manufacture, fabrication, installation, or other defects in construction. Completed sheet metal flashing and trim shall not rattle, leak, or loosen, and shall remain watertight.

B. Fabricate and install roof edge flashing and copings capable of resisting the following forces according to recommendations in FMG Loss Prevention Data Sheet 1-49:

1. Wind Zone 2: For velocity pressures of 31 to 45 lbf/sq. ft.: 90-lbf/sq. ft. perimeter uplift force, 120-lbf/sq. ft. corner uplift force, and 45-lbf/sq. ft. outward force.

C. Thermal Movements: Provide sheet metal flashing and trim that allows for thermal movements from ambient and surface temperature changes.

1. Temperature Change (Range): 120 deg F, ambient; 180 deg F, material surfaces.

1.4 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, dimensions of individual components and profiles, and finishes for each manufactured product and accessory.

B. Shop Drawings: Show fabrication and installation layouts of sheet metal flashing and trim, including plans, elevations, expansion-joint locations, and keyed details. Distinguish between shop- and field-assembled work. Include the following:
1. Identification of material, thickness, weight, and finish for each item and location in Project.
2. Details for forming sheet metal flashing and trim, including profiles, shapes, seams, and dimensions.
3. Details for joining, supporting, and securing sheet metal flashing and trim, including layout of fasteners, cleats, clips, and other attachments. Include pattern of seams.
4. Details of termination points and assemblies, including fixed points.
5. Details of expansion joints and expansion-joint covers, including showing direction of expansion and contraction.
6. Details of edge conditions, including eaves, ridges, valleys, rakes, crickets, and counterflashings as applicable.
7. Details of special conditions.
8. Details of connections to adjoining work.
9. Detail formed flashing and trim at a scale of not less than 1-1/2 inches per 12 inches.

C. Samples for Verification: For each type of exposed finish required, prepared on Samples of size indicated below:

1. Sheet Metal Flashing: 12 inches long by actual width of unit, including finished seam and in required profile. Include fasteners, cleats, clips, closures, and other attachments.
2. Trim, Metal Closures, Expansion Joints, Joint Intersections, and Miscellaneous Fabrications: 12 inches long and in required profile. Include fasteners and other exposed accessories.
3. Accessories and Miscellaneous Materials: Full-size Sample.

D. Warranty: Sample of special warranty.

1.5 QUALITY ASSURANCE

A. Fabricator Qualifications: Shop that employs skilled workers who custom fabricate sheet metal flashing and trim similar to that required for this Project and whose products have a record of successful in-service performance.

B. Sheet Metal Flashing and Trim Standard: Comply with SMACNA's "Architectural Sheet Metal Manual" unless more stringent requirements are specified or shown on Drawings.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Do not store sheet metal flashing and trim materials in contact with other materials that might cause staining, denting, or other surface damage. Store sheet metal flashing and trim materials away from uncured concrete and masonry.

B. Protect strippable protective covering on sheet metal flashing and trim from exposure to sunlight and high humidity, except to the extent necessary for the period of sheet metal flashing and trim installation.

1.7 WARRANTY

A. Special Warranty on Finishes: Manufacturer's standard form in which manufacturer agrees to repair finish or replace sheet metal flashing and trim that shows evidence of deterioration of factory-applied finishes within specified warranty period.

1. Exposed Panel Finish: Deterioration includes, but is not limited to, the following:
2. Color fading more than 5 Hunter units when tested according to ASTM D 2244.

b. Chalking in excess of a No. 8 rating when tested according to ASTM D 4214.

c. Cracking, checking, peeling, or failure of paint to adhere to bare metal.

2. Finish Warranty Period: 10 years from date of Project acceptance.

PART 2 - PRODUCTS

2.1 SHEET METALS

A. General: Protect mechanical and other finishes on exposed surfaces from damage by applying a strippable, temporary protective film before shipping.

B. Aluminum Sheet: ASTM B 209, alloy as standard with manufacturer for finish required, with temper as required to suit forming operations and performance required.

  1. Surface: Smooth, flat.
  2. Clear Anodic Finish, Coil Coated: AAMA 611, AA-M12C22A41, Class I, 0.018 mm or thicker.
  3. Color: Match metal panels and curtainwall and storefront systems.
  4. Concealed Finish: Pretreat with manufacturer's standard white or light-colored acrylic or polyester backer finish, consisting of prime coat and wash coat with a minimum total dry film thickness of 0.5 mil.

C. Stainless-Steel Sheet: ASTM A 240/A 240M or ASTM A 666, Type 304, dead soft, fully annealed.

  1. Finish: 2D (dull, cold rolled).
  2. Surface: Smooth, flat.

2.2 MISCELLANEOUS MATERIALS

A. General: Provide materials and types of fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required for complete sheet metal flashing and trim installation and recommended by manufacturer of primary sheet metal unless otherwise indicated.

B. Fasteners: Wood screws, annular threaded nails, self-tapping screws, self-locking rivets and bolts, and other suitable fasteners designed to withstand design loads and recommended by manufacturer of primary sheet metal or manufactured item.

  1. General: Blind fasteners or self-drilling screws, gasketed, with hex-washer head.

    a. Exposed Fasteners: Heads matching color of sheet metal using plastic caps or factory-applied coating.
    b. Blind Fasteners: High-strength aluminum or stainless-steel rivets suitable for metal being fastened.
    c. Spikes and Ferrules: Same material as gutter; with spike with ferrule matching internal gutter width.

  2. Fasteners for Aluminum Sheet: Aluminum or Series 300 stainless steel.
  3. Fasteners for Stainless-Steel Sheet: Series 300 stainless steel.
  4. Fasteners for Zinc-Coated (Galvanized) Steel Sheet: Hot-dip galvanized steel according to ASTM A 153/A 153M or ASTM F 2329 or Series 300 stainless steel.
C. **Solder:**

1. For Stainless Steel: ASTM B 32, Grade Sn60, with an acid flux of type recommended by stainless-steel sheet manufacturer.
2. For Zinc-Coated (Galvanized) Steel: ASTM B 32, Grade Sn50, 50 percent tin and 50 percent lead or Grade Sn60, 60 percent tin and 40 percent lead.

D. **Sealant Tape:** Pressure-sensitive, 100 percent solids, gray polyisobutylene compound sealant tape with release-paper backing. Provide permanently elastic, nonsag, nontoxic, nonstaining tape 1/2 inch wide and 1/8 inch thick.

E. **Elastomeric Sealant:** ASTM C 920, elastomeric polyurethane polymer sealant; low modulus; of type, grade, class, and use classifications required to seal joints in sheet metal flashing and trim and remain watertight.

F. **Epoxy Seam Sealer:** Two-part, noncorrosive, aluminum seam-cementing compound, recommended by aluminum manufacturer for exterior nonmoving joints, including riveted joints.

G. **Bituminous Coating:** Cold-applied asphalt emulsion complying with ASTM D 1187.

H. **Asphalt Roofing Cement:** ASTM D 4586, asbestos free, of consistency required for application.

2.3 **FABRICATION, GENERAL**

A. **General:** Custom fabricate sheet metal flashing and trim to comply with recommendations in SMACNA's "Architectural Sheet Metal Manual" that apply to design, dimensions, geometry, metal thickness, and other characteristics of item indicated. Fabricate items at the shop to greatest extent possible.

1. Fabricate sheet metal flashing and trim in thickness or weight needed to comply with performance requirements, but not less than that specified for each application and metal.
2. Obtain field measurements for accurate fit before shop fabrication.
3. Form sheet metal flashing and trim without excessive oil canning, buckling, and tool marks and true to line and levels indicated, with exposed edges folded back to form hems.
4. Conceal fasteners and expansion provisions where possible. Exposed fasteners are not allowed on faces exposed to view.

B. **Fabrication Tolerances:** Fabricate sheet metal flashing and trim that is capable of installation to a tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

C. **Fabrication Tolerances:** Fabricate sheet metal flashing and trim that is capable of installation to tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

D. **Sealed Joints:** Form nonexpansion but movable joints in metal to accommodate elastomeric sealant.

E. **Expansion Provisions:** Where lapped expansion provisions cannot be used, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with butyl sealant concealed within joints.

F. Fabricate cleats and attachment devices from same material as accessory being anchored or from compatible, noncorrosive metal.

G. Fabricate cleats and attachment devices of sizes as recommended by SMACNA's "Architectural Sheet Metal Manual."
Metal Manual® and by FMG Loss Prevention Data Sheet 1-49 for application, but not less than thickness of metal being secured.

H. Seams: Fabricate nonmoving seams with flat-lock seams. Tin edges to be seamed, form seams, and solder.

I. Seams: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with elastomeric sealant unless otherwise recommended by sealant manufacturer for intended use. Rivet joints where necessary for strength.

J. Seams for Aluminum: Fabricate nonmoving seams with flat-lock seams. Form seams and seal with epoxy seam sealer. Rivet joints where necessary for strength.

K. Do not use graphite pencils to mark metal surfaces.

2.4 ROOF DRAINAGE SHEET METAL FABRICATIONS

A. Hanging Gutters: Fabricate to cross section indicated, complete with end pieces, outlet tubes, and other accessories as required. Fabricate in minimum 96-inch-long sections. Furnish flat-stock gutter spacers and gutter brackets fabricated from same metal as gutters, of size recommended by SMACNA but not less than twice the gutter thickness. Fabricate expansion joints, expansion-joint covers, gutter bead reinforcing bars, and gutter accessories from same metal as gutters.

1. Gutter Style: F.
2. Expansion Joints: Lap type.
3. Accessories: Continuous removable leaf screen with sheet metal frame and hardware cloth screen.
4. Gutters with Girth up to 15 Inches: Fabricate from the following material:
   a. Prepainted, Metallic-Coated Steel: 0.0217 inch thick.

B. Downspouts: Fabricate rectangular downspouts complete with mitered elbows. Furnish with metal hangers, from same material as downspouts, and anchors.

1. Manufactured Hanger Style: Bracket support.
2. Fabricate downspouts from the following material:
   a. Prepainted, Metallic-Coated Steel: 0.0217 inch thick.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions, with Installer present, to verify actual locations, dimensions and other conditions affecting performance of the Work.

1. Verify compliance with requirements for installation tolerances of substrates.
2. Verify that substrate is sound, dry, smooth, clean, sloped for drainage, and securely anchored.

B. For the record, prepare written report, endorsed by Installer, listing conditions detrimental to performance of the Work.
C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION, GENERAL

A. General: Anchor sheet metal flashing and trim and other components of the Work securely in place, with provisions for thermal and structural movement. Use fasteners, solder, welding rods, protective coatings, separators, sealants, and other miscellaneous items as required to complete sheet metal flashing and trim system.

1. Install sheet metal flashing and trim true to line and levels indicated. Provide uniform, neat seams with minimum exposure of solder, welds, and sealant.
2. Install sheet metal flashing and trim to fit substrates and to result in watertight performance. Verify shapes and dimensions of surfaces to be covered before fabricating sheet metal.
3. Space cleats not more than 12 inches apart. Anchor each cleat with two fasteners. Bend tabs over fasteners.
4. Install exposed sheet metal flashing and trim without excessive oil canning, buckling, and tool marks.
5. Install sealant tape where indicated.
6. Torch cutting of sheet metal flashing and trim is not permitted.
7. Do not use graphite pencils to mark metal surfaces.

B. Metal Protection: Where dissimilar metals will contact each other or corrosive substrates, protect against galvanic action by painting contact surfaces with bituminous coating or by other permanent separation as recommended by SMACNA.

1. Coat back side of uncoated aluminum sheet metal flashing and trim with bituminous coating where flashing and trim will contact wood, ferrous metal, or cementitious construction.
2. Underlayment: Where installing metal flashing directly on cementitious or wood substrates, install a course of felt underlayment and cover with a slip sheet or install a course of polyethylene sheet.

C. Expansion Provisions: Provide for thermal expansion of exposed flashing and trim. Space movement joints at a maximum of 10 feet with no joints allowed within 24 inches of corner or intersection. Where lapped expansion provisions cannot be used or would not be sufficiently watertight, form expansion joints of intermeshing hooked flanges, not less than 1 inch deep, filled with sealant concealed within joints.

D. Fastener Sizes: Use fasteners of sizes that will penetrate metal decking not less than recommended by fastener manufacturer to achieve maximum pull-out resistance.

E. Seal joints as shown and as required for watertight construction.

1. Where sealant-filled joints are used, embed hooked flanges of joint members not less than 1 inch into sealant. Form joints to completely conceal sealant. When ambient temperature at time of installation is moderate, between 40 and 70 deg F, set joint members for 50 percent movement each way. Adjust setting proportionately for installation at higher ambient temperatures. Do not install sealant-type joints at temperatures below 40 deg F.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

F. Soldered Joints: Clean surfaces to be soldered, removing oils and foreign matter. Pre-tin edges of sheets to be soldered to a width of 1-1/2 inches, except reduce pre-tinning where pre-tinned surface would show in completed Work.
1. Do not solder metallic-coated steel sheet.
2. Do not use torches for soldering. Heat surfaces to receive solder and flow solder into joint. Fill joint completely. Completely remove flux and spatter from exposed surfaces.

G. Rivets: Rivet joints in zinc where indicated and where necessary for strength.

3.3 ROOF DRAINAGE SYSTEM INSTALLATION

A. General: Install sheet metal roof drainage items to produce complete roof drainage system according to SMACNA recommendations and as indicated. Coordinate installation of roof perimeter flashing with installation of roof drainage system.

B. Hanging Gutters: Join sections with riveted and soldered joints or with lapped joints sealed with elastomeric sealant. Provide for thermal expansion. Attach gutters at eave or fascia to firmly anchored gutter brackets spaced not more than 36 inches apart. Provide end closures and seal watertight with sealant. Slope to downspouts.

1. Fasten gutter spacers to front and back of gutter.
2. Loosely lock straps to front gutter bead and anchor to roof deck.
3. Anchor and loosely lock back edge of gutter to continuous cleat.
4. Anchor back of gutter that extends onto roof deck with cleats spaced not more than 24 inches apart.
5. Anchor gutter with spikes and ferrules spaced not more than 24 inches apart.
6. Install gutter with expansion joints at locations indicated but not exceeding 50 feet apart. Install expansion joint caps.
7. Install continuous gutter screens on gutters with noncorrosive fasteners, hinged to swing open for cleaning gutters.

C. Downspouts: Join sections with 1-1/2-inch telescoping joints. Provide fasteners designed to hold downspouts securely 1 inch away from walls; locate fasteners at top and bottom and at approximately 60 inches o.c. in between.

1. Provide elbows at base of downspout to direct water away from building.
2. Connect downspouts to underground drainage system indicated.

3.4 ROOF FLASHING INSTALLATION

A. General: Install sheet metal flashing and trim to comply with performance requirements, sheet metal manufacturer's written installation instructions, and SMACNA's "Architectural Sheet Metal Manual." Provide concealed fasteners where possible, set units true to line, and level as indicated. Install work with laps, joints, and seams that will be permanently watertight and weather resistant.

B. Roof Edge Flashing: Anchor to resist uplift and outward forces according to recommendations in FMG Loss Prevention Data Sheet 1-49 for specified wind zone and as indicated. Interlock bottom edge of roof edge flashing with continuous cleat anchored to substrate at 24-inch centers.

C. Pipe or Post Counterflashing: Install counterflashing umbrella with close-fitting collar with top edge flared for elastomeric sealant, extending a minimum of 4 inches over base flashing. Install stainless-steel draw band and tighten.
D. Counterflashing: Coordinate installation of counterflashing with installation of base flashing. Insert counterflashing in reglets or receivers and fit tightly to base flashing. Extend counterflashing 4 inches over base flashing. Lap counterflashing joints a minimum of 4 inches and bed with sealant. Secure in a waterproof manner by means of anchor and washer at 36-inch centers.

3.5 WALL FLASHING INSTALLATION

A. General: Install sheet metal wall flashing to intercept and exclude penetrating moisture according to SMACNA recommendations and as indicated. Coordinate installation of wall flashing with installation of wall-opening components such as windows, doors, and louvers.

3.6 ERECTION TOLERANCES

A. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerance of 1/4 inch in 20 feet on slope and location lines as indicated and within 1/8-inch offset of adjoining faces and of alignment of matching profiles.

B. Installation Tolerances: Shim and align sheet metal flashing and trim within installed tolerances specified in MCA's "Guide Specification for Residential Metal Roofing."

3.7 CLEANING AND PROTECTION

A. Clean exposed metal surfaces of substances that interfere with uniform oxidation and weathering.

B. Clean and neutralize flux materials. Clean off excess solder.

C. Clean off excess sealants.

D. Remove temporary protective coverings and strippable films as sheet metal flashing and trim are installed unless otherwise indicated in manufacturer's written installation instructions. On completion of installation, remove unused materials and clean finished surfaces. Maintain in a clean condition during construction.

E. Replace sheet metal flashing and trim that have been damaged or that have deteriorated beyond successful repair by finish touchup or similar minor repair procedures.

END OF SECTION 076200
SECTION 079200 - JOINT SEALANTS

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. Silicone joint sealants.
   2. Urethane joint sealants.
   3. Latex joint sealants.

B. Related Sections:
   1. Division 08 Section "Glazing" for glazing sealants.
   2. Division 09 Section "Gypsum Board" for sealing perimeter joints.
   3. Division 09 Section "Tiling" for sealing tile joints.

1.3 PRECONSTRUCTION TESTING

A. Preconstruction Compatibility and Adhesion Testing: Submit to joint-sealant manufacturers, for testing indicated below, samples of materials that will contact or affect joint sealants.
   1. Use manufacturer's standard test method to determine whether priming and other specific joint preparation techniques are required to obtain rapid, optimum adhesion of joint sealants to joint substrates.

B. Preconstruction Field-Adhesion Testing: Before installing sealants, field test their adhesion to Project joint substrates as follows:
   1. Locate test joints where indicated on Project or, if not indicated, as directed by Architect.
   2. Conduct field tests for each application indicated below:
      a. Each kind of sealant and joint substrate indicated.
   3. Notify Architect seven days in advance of dates and times when test joints will be erected.

1.4 SUBMITTALS

A. Product Data: For each joint-sealant product indicated.

B. Samples for Initial Selection: Manufacturer's color charts consisting of strips of cured sealants showing the full range of colors available for each product exposed to view.
Joint-Sealant Schedule: Include the following information:

1. Joint-sealant application, joint location, and designation.
2. Joint-sealant manufacturer and product name.

Product Certificates: For each kind of joint sealant and accessory, from manufacturer.

Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, indicating that sealants comply with requirements.

Preconstruction Compatibility and Adhesion Test Reports: From sealant manufacturer, indicating the following:

1. Materials forming joint substrates and joint-sealant backings have been tested for compatibility and adhesion with joint sealants.
2. Interpretation of test results and written recommendations for primers and substrate preparation needed for adhesion.

Preconstruction Field-Adhesion Test Reports: Indicate which sealants and joint preparation methods resulted in optimum adhesion to joint substrates based on testing specified in "Preconstruction Testing" Article.

Field-Adhesion Test Reports: For each sealant application tested.

QUALITY ASSURANCE

Source Limitations: Obtain each kind of joint sealant from single source from single manufacturer.

PROJECT CONDITIONS

Do not proceed with installation of joint sealants under the following conditions:

1. When ambient and substrate temperature conditions are outside limits permitted by joint-sealant manufacturer or are below 40 deg F.
2. When joint substrates are wet.
3. Where joint widths are less than those allowed by joint-sealant manufacturer for applications indicated.
4. Where contaminants capable of interfering with adhesion have not yet been removed from joint substrates.

WARRANTY

Special Manufacturer's Warranty: Manufacturer's standard form in which joint-sealant manufacturer agrees to furnish joint sealants to repair or replace those that do not comply with performance and other requirements specified in this Section within specified warranty period.

Warranty Period: 5 years from date of Final Project Acceptance.

Special warranties specified in this article exclude deterioration or failure of joint sealants from the following:
1. Movement of the structure caused by structural settlement or errors attributable to design or construction resulting in stresses on the sealant exceeding sealant manufacturer's written specifications for sealant elongation and compression.
2. Disintegration of joint substrates from natural causes exceeding design specifications.
3. Mechanical damage caused by individuals, tools, or other outside agents.
4. Changes in sealant appearance caused by accumulation of dirt or other atmospheric contaminants.

PART 2 - PRODUCTS

2.1 MATERIALS, GENERAL

A. Compatibility: Provide joint sealants, backings, and other related materials that are compatible with one another and with joint substrates under conditions of service and application, as demonstrated by joint-sealant manufacturer, based on testing and field experience.

B. VOC Content of Interior Sealants: Provide sealants and sealant primers for use inside the weatherproofing system that comply with the following limits for VOC content when calculated according to 40 CFR 59, Part 59, Subpart D (EPA Method 24):

1. Architectural Sealants: 250 g/L.
2. Sealant Primers for Nonporous Substrates: 250 g/L.
3. Sealant Primers for Porous Substrates: 775 g/L.

C. Liquid-Applied Joint Sealants: Comply with ASTM C 920 and other requirements indicated for each liquid-applied joint sealant specified, including those referencing ASTM C 920 classifications for type, grade, class, and uses related to exposure and joint substrates.

D. Stain-Test-Response Characteristics: Where sealants are specified to be nonstaining to porous substrates, provide products that have undergone testing according to ASTM C 1248 and have not stained porous joint substrates indicated for Project.

E. Colors of Exposed Joint Sealants: As selected by Architect from manufacturer's full range.

2.2 SILICONE JOINT SEALANTS

A. Single-Component, Nonsag, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 790.
   b. GE Advanced Materials - Silicones; SilPruf LM SCS2700.
   c. May National Associates, Inc.; Bondaflex Sil 728 NS.
   d. Pecora Corporation; 301 NS.
   e. Sika Corporation, Construction Products Division; SikaSil-C990.

B. Single-Component, Nonsag, Traffic-Grade, Neutral-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 100/50, for Use T.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Dow Corning Corporation; 790.
b. May National Associates, Inc.; Bondaflex Sil 728 NS.
c. Pecora Corporation; 301 NS.
d. Tremco Incorporated; Spectrem 800.

C. Mildew-Resistant, Single-Component, Acid-Curing Silicone Joint Sealant: ASTM C 920, Type S, Grade NS, Class 25, for Use NT.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; Omniplus.
   b. Dow Corning Corporation; 786 Mildew Resistant.
   c. GE Advanced Materials - Silicones; Sanitary SCS1700.
   d. May National Associates, Inc.; Bondaflex Sil 100 WF.
   e. Tremco Incorporated; Tremsil 200 Sanitary.

2.3 URETHANE JOINT SEALANTS

A. Single-Component, Nonsag, Traffic-Grade, Urethane Joint Sealant: ASTM C 920. Type S, Grade NS, Class 25, for Use T.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; Sonolastic NP1.
   b. May National Associates, Inc.; Bondaflex PUR 40 FC.
   c. Pacific Polymers International, Inc.; Elasto-Thane 230 Type II.
   d. Sika Corporation, Construction Products Division; Sikaflex - 1a.
   e. Tremco Incorporated; Vulkem 116.

2.4 LATEX JOINT SEALANTS

A. Latex Joint Sealant: Acrylic latex or siliconized acrylic latex, ASTM C 834, Type OP, Grade NF.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. BASF Building Systems; Sonolac.
   d. Pecora Corporation; AC-20+.
   e. Schnee-Morehead, Inc.; SM 8200.
   f. Tremco Incorporated; Tremflex 834.

2.5 ACOUSTICAL JOINT SEALANTS

A. Acoustical Joint Sealant: Manufacturer's standard nonsag, paintable, nonstaining latex sealant complying with ASTM C 834. Product effectively reduces airborne sound transmission through perimeter joints and openings in building construction as demonstrated by testing representative assemblies according to ASTM E 90.

2.6 JOINT SEALANT BACKING

A. General: Provide sealant backings of material that are nonstaining; are compatible with joint substrates,
sealants, primers, and other joint fillers; and are approved for applications indicated by sealant manufacturer based on field experience and laboratory testing.

B. Cylindrical Sealant Backings: ASTM C 1330, Type C (closed-cell material with a surface skin) Type O (open-cell material) Type B (bicellular material with a surface skin) or any of the preceding types, as approved in writing by joint-sealant manufacturer for joint application indicated, and of size and density to control sealant depth and otherwise contribute to producing optimum sealant performance.

C. Bond-Breaker Tape: Polyethylene tape or other plastic tape recommended by sealant manufacturer for preventing sealant from adhering to rigid, inflexible joint-filler materials or joint surfaces at back of joint. Provide self-adhesive tape where applicable.

2.7 MISCELLANEOUS MATERIALS

A. Primer: Material recommended by joint-sealant manufacturer where required for adhesion of sealant to joint substrates indicated, as determined from preconstruction joint-sealant-substrate tests and field tests.

B. Cleaners for Nonporous Surfaces: Chemical cleaners acceptable to manufacturers of sealants and sealant backing materials, free of oily residues or other substances capable of staining or harming joint substrates and adjacent nonporous surfaces in any way, and formulated to promote optimum adhesion of sealants to joint substrates.

C. Masking Tape: Nonstaining, nonabsorbent material compatible with joint sealants and surfaces adjacent to joints.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine joints indicated to receive joint sealants, with Installer present, for compliance with requirements for joint configuration, installation tolerances, and other conditions affecting joint-sealant performance.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Cleaning of Joints: Clean out joints immediately before installing joint sealants to comply with joint-sealant manufacturer's written instructions and the following requirements:

1. Remove all foreign material from joint substrates that could interfere with adhesion of joint sealant, including dust, paints (except for permanent, protective coatings tested and approved for sealant adhesion and compatibility by sealant manufacturer), old joint sealants, oil, grease, waterproofing, water repellents, water, surface dirt, and frost.

2. Clean porous joint substrate surfaces by brushing, grinding, mechanical abrading, or a combination of these methods to produce a clean, sound substrate capable of developing optimum bond with joint sealants. Remove loose particles remaining after cleaning operations above by vacuuming or blowing out joints with oil-free compressed air. Porous joint substrates include the following:

   a. Concrete.
b. Masonry.
c. Unglazed surfaces of ceramic tile.
d. Direct applied finish systems.
e. 

3. Remove laitance and form-release agents from concrete.
4. Clean nonporous joint substrate surfaces with chemical cleaners or other means that do not stain, harm substrates, or leave residues capable of interfering with adhesion of joint sealants.
   Nonporous joint substrates include the following:
   a. Metal.
   b. Glass.
   c. Porcelain enamel.
   d. Glazed surfaces of ceramic tile.
   e. 

B. Joint Priming: Prime joint substrates where recommended by joint-sealant manufacturer or as indicated by preconstruction joint-sealant-substrate tests or prior experience. Apply primer to comply with joint-sealant manufacturer's written instructions. Confine primers to areas of joint-sealant bond; do not allow spillage or migration onto adjoining surfaces.

C. Masking Tape: Use masking tape where required to prevent contact of sealant or primer with adjoining surfaces that otherwise would be permanently stained or damaged by such contact or by cleaning methods required to remove sealant smears. Remove tape immediately after tooling without disturbing joint seal.

3.3 INSTALLATION OF JOINT SEALANTS

A. General: Comply with joint-sealant manufacturer's written installation instructions for products and applications indicated, unless more stringent requirements apply.

B. Sealant Installation Standard: Comply with recommendations in ASTM C 1193 for use of joint sealants as applicable to materials, applications, and conditions indicated.

C. Install sealant backings of kind indicated to support sealants during application and at position required to produce cross-sectional shapes and depths of installed sealants relative to joint widths that allow optimum sealant movement capability.
   1. Do not leave gaps between ends of sealant backings.
   2. Do not stretch, twist, puncture, or tear sealant backings.
   3. Remove absorbent sealant backings that have become wet before sealant application and replace them with dry materials.

D. Install bond-breaker tape behind sealants where sealant backings are not used between sealants and backs of joints.

E. Install sealants using proven techniques that comply with the following and at the same time backings are installed:
   1. Place sealants so they directly contact and fully wet joint substrates.
   2. Completely fill recesses in each joint configuration.
   3. Produce uniform, cross-sectional shapes and depths relative to joint widths that allow optimum sealant movement capability.
F. Tooling of Nonsag Sealants: Immediately after sealant application and before skinning or curing begins, tool sealants according to requirements specified in subparagraphs below to form smooth, uniform beads of configuration indicated; to eliminate air pockets; and to ensure contact and adhesion of sealant with sides of joint.

1. Remove excess sealant from surfaces adjacent to joints.
2. Use tooling agents that are approved in writing by sealant manufacturer and that do not discolor sealants or adjacent surfaces.
3. Provide concave joint profile per Figure 8A in ASTM C 1193, unless otherwise indicated.

G. Acoustical Sealant Installation: At perimeter of acoustical ceilings, sound-rated assemblies and elsewhere as indicated, seal construction at perimeters, behind control joints, and at openings and penetrations with a continuous bead of acoustical sealant. Install acoustical sealant at both faces of partitions at perimeters and through penetrations. Comply with ASTM C 919 and with manufacturer's written recommendations.

3.4 FIELD QUALITY CONTROL

A. Field-Adhesion Testing: Field test joint-sealant adhesion to joint substrates as follows:

1.Extent of Testing: Test completed and cured sealant joints as follows:

3.5 CLEANING

A. Clean off excess sealant or sealant smears adjacent to joints as the Work progresses by methods and with cleaning materials approved in writing by manufacturers of joint sealants and of products in which joints occur.

3.6 PROTECTION

A. Protect joint sealants during and after curing period from contact with contaminating substances and from damage resulting from construction operations or other causes so sealants 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 sealants immediately so installations with repaired areas are indistinguishable from original work.

3.7 JOINT-SEALANT SCHEDULE

A. Joint-Sealant Application: Exterior joints in horizontal traffic surfaces JS-#1.

1. Joint Locations:
   a. Isolation and contraction joints in cast-in-place concrete slabs.
   b. .

3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

1. Joint Locations:
   b. Joints between plant-precast architectural concrete units.
   c. Control and expansion joints in unit masonry.
   d. Joints between metal panels.
   e. Joints between different materials listed above.
   f. Perimeter joints between materials listed above and frames of doors windows and louvers.
   g. Control and expansion joints in ceilings and other overhead surfaces.

2. Silicone Joint Sealant: Single component, nonsag, neutral curing, Class 100/50.
3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

C. Joint-Sealant Application: Interior joints in horizontal traffic surfaces JS-#3.
   1. Joint Locations:
      b. Control and expansion joints in tile flooring.

   2. Urethane Joint Sealant: Single component, nonsag, traffic grade.
   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

   1. Joint Locations:
      a. Control and expansion joints on exposed interior surfaces of exterior walls.
      b. Perimeter joints of exterior openings where indicated.
      c. Tile control and expansion joints.
      d. Vertical joints on exposed surfaces of interior unit masonry concrete walls and partitions.
      e. Perimeter joints between interior wall surfaces and frames of interior doors windows and elevator entrances.

   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

E. Joint-Sealant Application: Mildew-resistant interior joints in vertical surfaces and horizontal nontraffic surfaces JS-#5.
   1. Joint Sealant Location:
      a. Joints between plumbing fixtures and adjoining walls, floors, and counters.
      b. Tile control and expansion joints where indicated.

   3. Joint-Sealant Color: As selected by Architect from manufacturer's full range of colors.

   1. Joint Location:
      a. Acoustical joints where indicated.
2. Joint-Sealant Color: As selected by Architect from manufacturer's full range.

END OF SECTION 079200
SECTION 081113 - HOLLOW METAL DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section Includes:
   1. Standard hollow metal frames.

1.3 DEFINITIONS

A. Minimum Thickness: Minimum thickness of base metal without coatings.
B. Standard Hollow Metal Work: Hollow metal work fabricated according to ANSI/SDI A250.8.

1.4 SUBMITTALS

A. Shop Drawings: Include the following:
   1. Elevations of each door design.
   2. Details of doors, including vertical and horizontal edge details and metal thicknesses.
   3. Frame details for each frame type, including dimensioned profiles and metal thicknesses.
   4. Locations of reinforcement and preparations for hardware.
   5. Details of each different wall opening condition.
   6. Details of anchorages, joints, field splices, and connections.
   7. Details of accessories.
   8. Details of moldings, removable stops, and glazing.
   9. Details of conduit and preparations for power, signal, and control systems.

B. Other Action Submittals:
   1. Schedule: Provide a schedule of hollow metal work prepared by or under the supervision of supplier, using same reference numbers for details and openings as those on Drawings. Coordinate with door hardware schedule.

C. Product Test Reports: Based on evaluation of comprehensive tests performed by a qualified testing agency, for each type of hollow metal door and frame assembly.

1.5 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal work from single source from single manufacturer.
1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

1.6 DELIVERY, STORAGE, AND HANDLING

A. Deliver hollow metal work palletized, wrapped, or crated to provide protection during transit and Project-site storage. Do not use nonvented plastic.

1. Provide additional protection to prevent damage to finish of factory-finished units.

B. Deliver welded frames with two removable spreader bars across bottom of frames, tack welded to jambs and mullions.

C. Store hollow metal work under cover at Project site. Place in stacks of five units maximum in a vertical position with heads up, spaced by blocking, on minimum 4-inch-high wood blocking. Do not store in a manner that traps excess humidity.

1. Provide minimum 1/4-inch space between each stacked door to permit air circulation.

1.7 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings by field measurements before fabrication.

1.8 COORDINATION

A. Coordinate installation of anchorages for hollow metal frames. Furnish setting drawings, templates, and directions for installing anchorages, including sleeves, concrete inserts, anchor bolts, and items with integral anchors. Deliver such items to Project site in time for installation.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

1. Amweld Building Products, LLC.
2. Benchmark; a division of Therma-Tru Corporation.
3. Ceco Door Products; an Assa Abloy Group company.
4. Curries Company; an Assa Abloy Group company.
5. Deansteel Manufacturing Company, Inc.
7. Fleming Door Products Ltd.; an Assa Abloy Group company.
10. Kewanee Corporation (The).
11. Mesker Door Inc.
14. Steelcraft; an Ingersoll-Rand company.
15. Windsor Republic Doors.
2.2 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Hot-Rolled Steel Sheet: ASTM A 1011/A 1011M, Commercial Steel (CS), Type B; free of scale, pitting, or surface defects; pickled and oiled.

C. Frame Anchors: ASTM A 591/A 591M, Commercial Steel (CS), 40Z coating designation; mill phosphatized.
   1. For anchors built into exterior walls, steel sheet complying with ASTM A 1008/A 1008M or ASTM A 1011/A 1011M, hot-dip galvanized according to ASTM A 153/A 153M, Class B.

D. Inserts, Bolts, and Fasteners: Hot-dip galvanized according to ASTM A 153/A 153M.

E. Powder-Actuated Fasteners in Concrete: Fastener system of type suitable for application indicated, fabricated from corrosion-resistant materials, with clips or other accessory devices for attaching hollow metal frames of type indicated.

F. Grout: ASTM C 476, except with a maximum slump of 4 inches, as measured according to ASTM C 143/C 143M.

G. Glazing: Comply with requirements in Division 08 Section "Glazing."

H. Bituminous Coating: Cold-applied asphalt mastic, SSPC-Paint 12, compounded for 15-mil dry film thickness per coat. Provide inert-type noncorrosive compound free of asbestos fibers, sulfur components, and other deleterious impurities.

2.3 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

   1. Fabricate frames with mitered or coped corners.
   2. Fabricate frames as Frames for Level 3 Steel Doors: 0.053-inch-thick steel sheet.
   3. Interior Frames: Fabricated from cold-rolled steel sheet. Fabricate frames with mitered or coped corners.
   4. Frames for Level 3 Steel Doors: 0.053-inch-thick steel sheet.

C. Frames for Wood Doors: Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 with reinforcement plates from same material as frames.

2.4 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, not less than 0.042 inch thick, with corrugated or perforated straps not less than 2 inches wide by 10 inches long; or wire anchors not less than 0.177 inch thick.
   2. Stud-Wall Type: Designed to engage stud, welded to back of frames; not less than 0.042 inch thick.
HOLLOW METAL DOORS AND FRAMES

2.5 HOLLOW METAL PANELS

A. Provide hollow metal panels of same materials, construction, and finish as specified for adjoining hollow metal work.

2.6 STOPS AND MOLDINGS

A. Moldings for Glazed Lites in Doors: Minimum 0.032 inch thick, fabricated from same material as door face sheet in which they are installed.

B. Fixed Frame Moldings: Formed integral with hollow metal frames, a minimum of 5/8 inch high unless otherwise indicated.

C. Loose Stops for Glazed Lites in Frames: Minimum 0.032 inch thick, fabricated from same material as frames in which they are installed.

2.7 ACCESSORIES

A. Mullions and Transom Bars: Join to adjacent members by welding or rigid mechanical anchors.

B. Ceiling Struts: Minimum 1/4-inch-thick by 1-inch-wide steel.

C. Grout Guards: Formed from same material as frames, not less than 0.016 inch thick.

2.8 FABRICATION

A. Fabricate hollow metal work to be rigid and free of defects, warp, or buckle. Accurately form metal to required sizes and profiles, with minimum radius for thickness of metal. Where practical, fit and assemble units in manufacturer's plant. To ensure proper assembly at Project site, clearly identify work that cannot be permanently factory assembled before shipment.

1. Tolerances: Fabricate hollow metal work to tolerances indicated in Exterior Doors. Provide weep-hole openings in bottom of exterior doors to permit moisture to escape. Seal joints in top edges of doors against water penetration.

B. Hollow Metal Frames: Where frames are fabricated in sections due to shipping or handling limitations, provide alignment plates or angles at each joint, fabricated of same thickness metal as frames.

1. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
a. Masonry Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Two anchors per jamb up to 60 inches high.
2) Three anchors per jamb from 60 to 90 inches high.
3) Four anchors per jamb from 90 to 120 inches high.
4) Four anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 120 inches high.

b. Stud-Wall Type: Locate anchors not more than 18 inches from top and bottom of frame. Space anchors not more than 32 inches o.c. and as follows:

1) Three anchors per jamb up to 60 inches high.
2) Four anchors per jamb from 60 to 90 inches high.
3) Five anchors per jamb from 90 to 96 inches high.
4) Five anchors per jamb plus 1 additional anchor per jamb for each 24 inches or fraction thereof above 96 inches high.
5) Two anchors per head for frames above 42 inches wide and mounted in metal-stud partitions.

2. Door Silencers: Except on weather-stripped doors, drill stops to receive door silencers as follows. Keep holes clear during construction.

a. Single-Door Frames: Drill stop in strike jamb to receive three door silencers.

b. Double-Door Frames: Drill stop in head jamb to receive two door silencers.

C. Fabricate concealed stiffeners, edge channels, and hardware reinforcement from either cold- or hot-rolled steel sheet.

D. Hardware Preparation: Factory prepare hollow metal work to receive templated mortised hardware; include cutouts, reinforcement, mortising, drilling, and tapping according to the Door Hardware Schedule and templates furnished as specified in Division 08 Section "Door Hardware."

1. Locate hardware as indicated, or if not indicated, according to Reinforce doors and frames to receive nontemplated, mortised and surface-mounted door hardware.

2. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.

3. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

E. Stops and Moldings: Provide stops and moldings around glazed lites where indicated. Form corners of stops and moldings with butted or mitered hairline joints.

1. Single Glazed Lites: Provide fixed stops and moldings welded on secure side of hollow metal work.

2. Multiple Glazed Lites: Provide fixed and removable stops and moldings so that each glazed lile is capable of being removed independently.

3. Provide fixed frame moldings on outside of exterior and on secure side of interior doors and frames.

4. Provide loose stops and moldings on inside of hollow metal work.

5. Coordinate rabbet width between fixed and removable stops with type of glazing and type of installation indicated.

2.9 STEEL FINISHES
A. Prime Finish: Apply manufacturer's standard primer immediately after cleaning and pretreating.

1. Shop Primer: Manufacturer's standard, fast-curing, lead- and chromate-free primer complying with ANSI/SDI A250.10 acceptance criteria; recommended by primer manufacturer for substrate; compatible with substrate and field-applied coatings despite prolonged exposure.

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 the Work.

B. Examine roughing-in for embedded and built-in anchors to verify actual locations before frame installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Remove welded-in shipping spreaders installed at factory. Restore exposed finish by grinding, filling, and dressing, as required to make repaired area smooth, flush, and invisible on exposed faces.

B. Prior to installation, adjust and securely brace welded hollow metal frames for squareness, alignment, twist, and plumbness to the following tolerances:

1. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.

2. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.

3. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.

4. Plumbness: Plus or minus 1/16 inch, measured at jambs on a perpendicular line from head to floor.

C. Drill and tap doors and frames to receive nontemplated, mortised, and surface-mounted door hardware.

3.3 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

1. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with

   a. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete, remove temporary braces, leaving surfaces smooth and undamaged.

   b. At fire-protection-rated openings, install frames according to NFPA 80.

   c. Where frames are fabricated in sections because of shipping or handling limitations, field splice at approved locations by welding face joint continuously; grind, fill, dress, and make
splice smooth, flush, and invisible on exposed faces.

c. Install frames with removable glazing stops located on secure side of opening.
d. Install door silencers in frames before grouting.
e. Remove temporary braces necessary for installation only after frames have been properly set and secured.
f. Check plumbness, squareness, and twist of frames as walls are constructed. Shim as necessary to comply with installation tolerances.
g. Field apply bituminous coating to backs of frames that are filled with grout containing antifreezing agents.

2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with postinstalled expansion anchors.
   a. Floor anchors may be set with powder-actuated fasteners instead of postinstalled expansion anchors if so indicated and approved on Shop Drawings.

3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with grout.

4. Concrete Walls: Solidly fill space between frames and concrete with grout. Take precautions, including bracing frames, to ensure that frames are not deformed or damaged by grout forces.

5. Ceiling Struts: Extend struts vertically from top of frame at each jamb to overhead structural supports or substrates above frame unless frame is anchored to masonry or to other structural support at each jamb. Bend top of struts to provide flush contact for securing to supporting construction. Provide adjustable wedged or bolted anchorage to frame jamb members.

6. Installation Tolerances: Adjust hollow metal door frames for squareness, alignment, twist, and plumb to the following tolerances:
   a. Squareness: Plus or minus 1/16 inch, measured at door rabbet on a line 90 degrees from jamb perpendicular to frame head.
   b. Alignment: Plus or minus 1/16 inch, measured at jambs on a horizontal line parallel to plane of wall.
   c. Twist: Plus or minus 1/16 inch, measured at opposite face corners of jambs on parallel lines, and perpendicular to plane of wall.
   d. Plumbness: Plus or minus 1/16 inch, measured at jambs at floor.

B. Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.
   1. Secure stops with countersunk flat- or oval-head machine screws spaced uniformly not more than 9 inches o.c. and not more than 2 inches o.c. from each corner.

3.4 ADJUSTING AND CLEANING

A. Final Adjustments: Check and readjust operating hardware items immediately before final inspection. Leave work in complete and proper operating condition. Remove and replace defective work, including hollow metal work that is warped, bowed, or otherwise unacceptable.

B. Remove grout and other bonding material from hollow metal work immediately after installation.

C. Prime-Coat Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat and apply touchup of compatible air-drying, rust-inhibitive primer.

D. Metallic-Coated Surfaces: Clean abraded areas and repair with galvanizing repair paint according to manufacturer's written instructions.
END OF SECTION 081113
SECTION 081416 - FLUSH WOOD DOORS

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. Solid-core doors with wood-veneer faces.
2. Factory finishing flush wood doors.
3. Factory fitting flush wood doors to frames and factory machining for hardware.

B. Related Sections:

1. Division 08 Section "Glazing" for glass view panels in flush wood doors.

1.3 SUBMITTALS

A. Product Data: For each type of door indicated. Include details of core and edge construction, louvers, and trim for openings. Include factory-finishing specifications.

B. Shop Drawings: Indicate location, size, and hand of each door; elevation of each kind of door; construction details not covered in Product Data; location and extent of hardware blocking; and other pertinent data.

1. Indicate dimensions and locations of mortises and holes for hardware.
2. Indicate dimensions and locations of cutouts.
3. Indicate requirements for veneer matching.
4. Indicate doors to be factory finished and finish requirements.
5. Indicate fire-protection ratings for fire-rated doors.

C. Samples for Initial Selection: For factory-finished doors.

D. Warranty: Sample of special warranty.

1.4 QUALITY ASSURANCE

A. Manufacturer Qualifications: A qualified manufacturer that is certified for chain of custody by an FSC-accredited certification body.

B. Source Limitations: Obtain flush wood doors from single manufacturer.

C. Quality Standard: In addition to requirements specified, comply with AWI's "Architectural Woodwork
1. Provide AWI Quality Certification Labels or an AWI letter of licensing for Project indicating that doors comply with requirements of grades specified.

D. Fire-Rated Wood Doors: Doors complying with NFPA 80 that are listed and labeled by a qualified testing agency, for fire-protection ratings indicated, based on testing at as close to neutral pressure as possible according to NFPA 252 or UL 10C.

1. Oversize Fire-Rated Door Assemblies: For units exceeding sizes of tested assemblies, provide certification by a qualified testing agency that doors comply with standard construction requirements for tested and labeled fire-rated door assemblies except for size.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Comply with requirements of referenced standard and manufacturer's written instructions.

B. Package doors individually in cardboard cartons and wrap bundles of doors in plastic sheeting.

C. Mark each door on top and bottom rail with opening number used on Shop Drawings.

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining ambient temperature and humidity conditions at occupancy levels during the remainder of the construction period.

B. Environmental Limitations: Do not deliver or install doors until spaces are enclosed and weathertight, wet work in spaces is complete and dry, and HVAC system is operating and maintaining temperature between 60 and 90 deg F and relative humidity between 43 and 70 percent during the remainder of the construction period.

1.7 WARRANTY

A. Special Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace doors that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:

   a. Warping (bow, cup, or twist) more than 1/4 inch in a 42-by-84-inch section.
   b. Telegraphing of core construction in face veneers exceeding 0.01 inch in a 3-inch span.


PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Algoma Hardwoods, Inc.
2. Ampco, Inc.
3. Buell Door Company Inc.
4. Chappell Door Co.
5. Eagle Plywood & Door Manufacturing, Inc.
7. Graham; an Assa Abloy Group company.
8. Ideal Architectural Doors & Plywood.
10. Lambton Doors.
11. Marlite.
12. Marshfield Door Systems, Inc.
15. Poncraft Door Company.
17. VT Industries Inc.-BASIS OF DESIGN
18. Southwood.

2.2 DOOR CONSTRUCTION, GENERAL

A. Low-Emitting Materials: Provide doors made with adhesives and composite wood products that do not contain urea formaldehyde.

B. Particleboard-Core Doors:
   1. Particleboard: ANSI A208.1., made with binder containing no urea-formaldehyde resin.
   2. Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.

C. Structural-Composite-Lumber-Core Doors:
      a. Screw Withdrawal, Face: 700 lbf.
      b. Screw Withdrawal, Edge: 400 lbf.

D. Fire-Protection-Rated Doors: Provide core specified or mineral core as needed to provide fire-protection rating indicated.
   1. Edge Construction: Provide edge construction with intumescent seals concealed by outer stile. Comply with specified requirements for exposed edges.
   2. Pairs: Provide fire-retardant stiles that are listed and labeled for applications indicated without formed-steel edges and astragals. Comply with specified requirements for exposed edges.

E. Mineral-Core Doors:
   1. Core: Noncombustible mineral product complying with requirements of referenced quality standard and testing and inspecting agency for fire-protection rating indicated.
   2. Blocking: Provide composite blocking with improved screw-holding capability approved for use in doors of fire-protection ratings indicated as needed to eliminate through-bolting hardware.
      a. , in doors indicated to have exit devices.
3. Edge Construction: At hinge stiles, provide laminated-edge construction with improved screw-holding capability and split resistance. Comply with specified requirements for exposed edges.

2.3 VENEERED-FACED DOORS FOR TRANSPARENT FINISH

A. Interior Solid-Core Doors:

1. Grade: Premium, with Grade A faces.
2. Species: Cherry.
5. Assembly of Veneer Leaves on Door Faces: Balance match.
6. Pair and Set Match: Provide for doors hung in same opening or separated only by mullions.
7. Core: Particleboard Either glued wood stave or structural composite lumber. Coordinate cores with openings in doors.
8. Construction: Five or seven plies. Stiles and rails are bonded to core, then entire unit abrasive planed before veneering.

2.4 LOUVERS AND LIGHT FRAMES

A. Wood Louvers: Door manufacturer's standard solid-wood louvers unless otherwise indicated.

1. Wood Species: Species compatible with door faces.

B. Wood Beads for Light Openings in Wood Doors: Provide manufacturer's standard wood beads as follows unless otherwise indicated.

1. Wood Species: Species to match with door faces.
2. Profile: Flush rectangular beads.
3. At wood-core doors with 20-minute fire-protection ratings, provide wood beads and metal glazing clips approved for such use.

C. Wood-Veneered Beads for Light Openings in Fire-Rated Doors: Manufacturer's standard wood-veneered noncombustible beads matching veneer species of door faces and approved for use in doors of fire-protection rating indicated. Include concealed metal glazing clips where required for opening size and fire-protection rating indicated.

2.5 FABRICATION

A. Factory fit doors to suit frame-opening sizes indicated. Comply with clearance requirements of referenced quality standard for fitting unless otherwise indicated.

1. Comply with requirements in NFPA 80 for fire-rated doors.

B. Factory machine doors for hardware that is not surface applied. Locate hardware to comply with DHI-WDHS-3. Comply with final hardware schedules, door frame Shop Drawings, DHI A115-W series standards, and hardware templates.

1. Coordinate with hardware mortises in metal frames to verify dimensions and alignment before factory machining.
2. Metal Astragals: Factory machine astragals and formed-steel edges for hardware for pairs of fire-
rated doors.

C. Transom and Side Panels: Fabricate matching panels with same construction, exposed surfaces, and finish as specified for associated doors. Finish bottom edges of transoms and top edges of rabbeted doors same as door stiles.

D. Openings: Cut and trim openings through doors in factory.

1. Light Openings: Trim openings with moldings of material and profile indicated.
2. Glazing: Factory install glazing in doors indicated to be factory finished. Comply with applicable requirements in Division 08 Section "Glazing."

2.6 FACTORY FINISHING

A. General: Comply with referenced quality standard for factory finishing. Complete fabrication, including fitting doors for openings and machining for hardware that is not surface applied, before finishing.

1. Finish faces, all four edges, edges of cutouts, and mortises. Stains and fillers may be omitted on top and bottom edges, edges of cutouts, and mortises.

B. Finish doors at factory.

C. Transparent Finish:

1. Grade: Premium.
2. Finish: WDMA TR-6 catalyzed polyurethane.
3. Staining – Clear CL07:

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine doors and installed door frames before hanging doors.

1. Verify that frames comply with indicated requirements for type, size, location, and swing characteristics and have been installed with level heads and plumb jambs.
2. Reject doors with defects.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Hardware: For installation, see Division 08 Section "Door Hardware."

B. Installation Instructions: Install doors to comply with manufacturer's written instructions and the referenced quality standard, and as indicated.

1. Install fire-rated doors in corresponding fire-rated frames according to NFPA 80.
C. Factory-Fitted Doors: Align in frames for uniform clearance at each edge.

D. Factory-Finished Doors: Restore finish before installation if fitting or machining is required at Project site.

3.3 ADJUSTING

A. Operation: Rehang or replace doors that do not swing or operate freely.

B. Finished Doors: Replace doors that are damaged or that do not comply with requirements. Doors may be repaired or refinished if work complies with requirements and shows no evidence of repair or refinishing.

END OF SECTION 081416
SECTION 081436 - HINGED WOOD-FRAMED GLASS DOORS

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. Aluminum-clad hinged wood-framed glass doors.

B. Related Requirements:

1. Section 087100 "Door Hardware" for hardware not specified in Section 081436.
2. Section 099113 "Exterior Painting" and Section 099123 "Interior Painting" for on-site finishing of unfinished and factory-primed hinged wood-framed glass doors.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of hinged wood-framed glass door.

1. Include construction details, material descriptions, fabrication methods, dimensions of individual components and profiles, hardware, finishes, and operating instructions.

B. Shop Drawings: For hinged wood-framed glass doors.

1. Include plans, elevations, sections, and details.
2. Detail attachments to other work, and between units, if any.
3. Include hardware and required clearances.

C. Samples for Initial Selection: For doors with factory-applied color finishes.

1. Include Samples of hardware and accessories involving color selection.

D. Samples for Verification: For hinged wood-framed glass doors and components required, prepared on Samples of size indicated below:

1. Main Framing Member: 12-inch-long section with weather stripping, glazing bead, and factory-applied color finish.
2. Hardware: Full-size units with factory-applied finish.

E. Product Schedule: For hinged wood-framed glass doors.
1.4 INFORMATIONAL SUBMITTALS
   A. Qualification Data: For Installer.
   B. Product Test Reports: For each hinged wood-framed glass door, for tests performed by manufacturer and witnessed by a qualified testing agency; and for each class and performance grade indicated, tested at AAMA gateway size.
   C. Field quality-control reports.
   D. Sample Warranty: For special warranty.

1.5 CLOSEOUT SUBMITTALS
   A. Maintenance Data: For finishes, weather stripping, operable panels, and operating hardware to include in maintenance manuals.

1.6 QUALITY ASSURANCE
   A. Installer Qualifications: An installer acceptable to hinged wood-framed glass door manufacturer for installation of units required for this Project.

1.7 WARRANTY
   A. Manufacturer's Special Warranty: Manufacturer agrees to repair or replace hinged wood-framed glass doors that fail in materials or workmanship within specified warranty period.

   1. Failures include, but are not limited to, the following:

      a. Failure to meet performance requirements.
      b. Structural failures including excessive deflection.
      c. Excessive water leakage or air infiltration.
      d. Faulty operation of movable panels and hardware.
      e. Deterioration of wood, metals, vinyl, and other materials and finishes beyond normal weathering.
      f. Failure of insulating glass.

   2. Warranty Period:

      a. Hinged Door: 10 years from date of Substantial Completion.
      b. Insulating Glass: 20 years from date of Substantial Completion.
      c. Metal Finish: 20 years from date of Substantial Completion.
PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain hinged wood-framed glass doors from single source from single manufacturer.

2.2 PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

1. Product Certification: AMMA certified with label attached to each door.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:

1. Minimum Performance Class: Class CW.
2. Minimum Performance Grade: Grade 30.

C. Thermal Transmittance: NFRC 100 maximum total fenestration product U-factor of 0.32 Btu/sq. ft. x h x deg F.

D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum total fenestration product SHGC of 0.30.

2.3 ALUMINUM-CLAD HINGED WOOD-FRAMED GLASS DOORS

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

B. Basis-of-Design: Subject to compliance with requirements, provide PELLA; Encompass Series ½ light entry door with glass or comparable product by one of the following:

1. [Crestline Windows and Doors](#).
2. [EAGLE Window & Door, Inc.: a subsidiary of Andersen Corporation](#).
3. [Hurd Windows and Doors](#).
4. [Jeld-Wen, Inc.](#).
5. [Kolbe & Kolbe Millwork Co., Inc.](#).
6. [Marvin Windows and Doors](#).
7. [Pella Corporation](#).
8. [Semling-Menke Company](#).
9. [Sierra Pacific Windows; Sierra Pacific Industries](#).
10. [Weather Shield Mfg., Inc.](#).

C. Exterior Surfaces: Aluminum cladding with manufacturer's standard baked-on enamel finish.

1. Color: As selected by Architect from manufacturer's full range.
D. Interior Surfaces: Manufacturer's standard factory-applied color finish.
   1. Color: As selected by Architect from manufacturer's full range.

E. Frames and Door Panels: Fabricate from wood components complying with indicated requirements. Provide factory-assembled door panels with standard-profile stiles and factory-assembled or field-assembled frames.

F. Wood Components: Manufacturer's standard LVL or fine-grained wood lumber complying with AAMA/WDMA/CSA 101/IS.2/A440; kiln dried to a moisture content of not more than 12 percent at time of fabrication; free of visible finger joints, blue stain, knots, pitch pockets, and surface checks larger than 1/32 inch deep by 2 inches wide; water-repellent preservative treated.

G. Trim and Glazing Stops: Material and finish to match cladding.

H. Integral Nailing Fin: Aluminum nailing fins for securing frame to structure; provide sufficient strength to withstand design pressure indicated.

I. Drip Caps: Extruded aluminum, factory fabricated and finished to match door frame; designed to direct water away from building when installed horizontally at head of hinged wood-framed glass doors.

J. Threshold: Provide manufacturer's standard thermally broken threshold of thickness, dimensions, and profile indicated; designed to comply with performance requirements indicated and to drain to exterior.
   2. Low-Profile Threshold: ADA-ABA compliant.

2.4 GLAZING

A. Glass and Glazing: Manufacturer's standard glazing system that produces weathertight seal.
   1. Glass: ASTM C 1036, Type 1, q3, Category II safety glass complying with testing requirements in 16 CFR 1201.
   2. Safety Glazing Labeling: Permanently mark safety glazing with certification label of the SGCC or another certification agency acceptable to authorities having jurisdiction or the manufacturer. Label shall indicate manufacturer's name, type of glass, thickness, and safety glazing standard with which glass complies.
   3. Tint: Clear.
   4. Insulating-Glass Units: ASTM E 2190, certified through IgCC as complying with requirements of IgCC.
      a. Filling: Fill space between glass lites with argon.
      b. Lites: Two.
      c. Low-E Coating: Manufacturer's standard.
      d. Integral Louver Blinds: Glass manufacturer's standard horizontal louver blinds with aluminum slats and polyester fiber cords, located in space between glass lites, and operated by hardware located on inside face of door panel.
1) Operation: Tilt, raising, and lowering.
2) Color: As selected by Architect from manufacturer's full range.

Dual Glazing:

a. Interior Lite: Glass.
b. Exterior Lite: Insulating-glass unit.

2.5 HARDWARE

A. General: Provide manufacturer's standard hardware, fabricated from a corrosion-resistant material compatible with wood and aluminum cladding complying with AAMA 907; designed to smoothly operate, tightly close, and securely lock hinged wood-framed glass doors and sized to accommodate panel weight and dimensions.

B. Lock: Install manufacturer's standard keyed multipoint locking device on each operable panel, lockable from the inside and outside.

1. Design: As selected from manufacturer's full range.
2. Finish: As selected from manufacturer's full range of finishes.

2.6 ACCESSORIES

A. Fasteners: Noncorrosive and compatible with door members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to the greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

B. Anchors, Clips, and Accessories: Provide anchors, clips, and accessories of aluminum, nonmagnetic stainless steel, or zinc-coated steel or iron for hinged wood-framed glass doors, complying with ASTM B 456 or ASTM B 633 for SC 3 severe service conditions; provide sufficient strength to withstand design pressure indicated.

1. Windborne-Debris Resistance: Provide anchors of same design used in windborne-debris resistance testing.

2.7 FABRICATION

A. Fabricate hinged wood-framed glass doors in sizes indicated. Include a complete system for assembling components and anchoring doors.

B. Fabricate hinged wood-framed glass doors that are reglazable without dismantling panel framing.

C. Weather Stripping: Provide full-perimeter weather stripping for each door panel unless otherwise indicated.
D. Factory machine hinged wood-framed glass doors for openings and hardware that is not surface applied.

E. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.

F. Factory-Glazed Fabrication: Glaze hinged aluminum-framed glass doors in the factory.

2.8 WOOD FINISHES

A. Factory-Applied Color Finish: Provide manufacturer's standard factory-applied finish. Apply finish to exposed interior wood surfaces.

1. Color: As selected by Architect from manufacturer's full range.

2.9 ALUMINUM FINISHES

A. Baked-Enamel or Powder-Coat Finish: AAMA 2603 except with a minimum dry film thickness of 1.5 mils. Comply with coating manufacturer's written instructions for cleaning, conversion coating, and applying and baking finish.

1. Color and Gloss: As selected by Architect from manufacturer's full range.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of Work.

B. Verify rough opening dimensions, levelness of threshold substrate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure a coordinated, weathertight hinged door installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with Drawings, Shop Drawings, and manufacturer's written instructions for installing hinged doors, hardware, accessories, and other components.

B. Install hinged wood-framed glass doors level, plumb, square, true to line; without distortion, warp, or rack of frames and panels, and without impeding thermal movement; anchored securely in place to structural support; and in proper relation to wall flashing, vapor retarders,
air barriers, water/weather barriers, and other adjacent construction. Comply with ASTM E 2112.

C. Set sill members in bed of sealant or with gaskets, as indicated, to provide weathertight construction.

D. Separate aluminum and other corrodible surfaces from sources of corrosion or electrolytic action at points of contact with other materials according to ASTM E 2112.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Lubricate hardware and moving parts.

B. Adjust operating panels and screens to provide a tight fit at contact points and weather stripping for smooth operation, without binding, and weathertight closure.

C. Adjust hardware for proper alignment, smooth operation, and proper latching without unnecessary force or excessive clearance.

D. Clean exposed surfaces immediately after installing hinged wood-framed glass doors. Avoid damaging protective coatings and finishes. Remove nonpermanent labels, excess sealants, glazing materials, dirt, and other substances.

E. Remove and replace glass that has been broken, chipped, cracked, abraded, or damaged during construction period.

F. Protect hinged wood-framed glass door surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances contact hinged wood-framed glass door surfaces, remove contaminants immediately according to manufacturer's written instructions.

G. Refinish or replace hinged doors with damaged finishes.

H. Replace damaged components.

END OF SECTION 081436
SECTION 083113 - ACCESS DOORS AND FRAMES

PART 1 - GENERAL

1.1 RELATED DOCUMENTS
   A. Refer to mechanical, electrical, plumbing, and architectural drawings for locations and sizes of access doors.

1.2 SUMMARY
   A. This Section includes the following:
      1. Access doors and frames for walls and ceilings.

1.3 SUBMITTALS
   A. Product Data: For each type of access door and frame indicated. Include construction details, fire ratings, materials, individual components and profiles, and finishes.
   B. Shop Drawings: Show fabrication and installation details of access doors and frames for each type of substrate. Include plans, elevations, sections, details, and attachments to other work.

1.4 QUALITY ASSURANCE
   A. Source Limitations: Obtain each type of access door(s) and frame(s) through one source from a single manufacturer.
   B. Fire-Rated Access Doors and Frames: Units complying with NFPA 80 that are identical to access door and frame assemblies tested for fire-test-response characteristics per the following test method and that are listed and labeled by UL or another testing and inspecting agency acceptable to authorities having jurisdiction:
      1. NFPA 252 or UL 10B for vertical access doors and frames.
      2. ASTM E 119 or UL 263 for horizontal access doors and frames.
   C. Size Variations: Obtain Architect's acceptance of manufacturer's standard-size units, which may vary slightly from sizes indicated.

1.5 COORDINATION
   A. Verification: Determine specific locations and sizes for access doors needed to gain access to concealed plumbing, mechanical, or other concealed work, and indicate in the schedule specified in "Submittals" Article.
2.1 STEEL MATERIALS

A. Steel Sheet: Uncoated cold-rolled steel sheet substrate complying with ASTM A 1008/A 1008M, Commercial Steel (CS), exposed.

B. Steel Finishes: Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

   1. Surface Preparation for Steel Sheet: Clean surfaces to comply with SSPC-SP 1, "Solvent Cleaning," to remove dirt, oil, grease, or other contaminants that could impair paint bond. Remove mill scale and rust, if present, from uncoated steel, complying with SSPC-SP 5/NACE No. 1, "White Metal Blast Cleaning," or SSPC-SP 8, "Pickling."
   2. Factory-Primed Finish: Apply shop primer immediately after cleaning and pretreating.

C. Drywall Beads: Edge trim formed from 0.0299-inch zinc-coated steel sheet formed to receive joint compound and in size to suit thickness of gypsum board.

2.2 ALUMINUM MATERIALS

A. Aluminum Extrusions: ASTM B 221, Alloy 6063-T6.

   1. Mill finish, AA-M10 (Mechanical Finish: as fabricated, unspecified).

B. Aluminum Sheet: ASTM B 209, alloy and temper recommended by aluminum producer and finisher for type of use and finish indicated, and with not less than strength and durability properties of Alloy 5005-H15; with minimum sheet thickness indicated representing specified thickness according to ANSI H35.2 (ANSI H35.2).


2.3 ACCESS DOORS AND FRAMES FOR WALLS AND CEILINGS

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. Acudor Products, Inc.
   2. Babcock-Davis; A Ciera Products Co.
   4. Cendrex Inc.
   5. Dur-Red Products.
   6. Elmdor/Stoneman; Div. of Acorn Engineering Co.
   7. Jensen Industries.
   8. J. L. Industries, Inc.
   11. MIFAB, Inc.
   12. Milcor Inc.
   1. Locations: Wall and ceiling surfaces.
   2. Door: Minimum 0.060-inch-thick sheet metal, set flush with exposed face flange of frame.
   3. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
   5. Latch: Self-latching bolt operated by screwdriver with interior release.

   1. Locations: Wall surfaces.
   2. Fire-Resistance Rating: Not less than that of adjacent construction.
   3. Door: Minimum 0.060-inch-thick sheet metal, flush construction.
   4. Frame: Minimum 0.060-inch-thick sheet metal with 1-inch-wide, surface-mounted trim.
   5. Hinges: Concealed-pin type.

2.4 FABRICATION

A. General: Provide access door and frame assemblies manufactured as integral units ready for installation.

B. Metal Surfaces: For metal surfaces exposed to view in the completed Work, provide materials with smooth, flat surfaces without blemishes. Do not use materials with exposed pitting, seam marks, roller marks, rolled trade names, or roughness.

C. Doors and Frames: Grind exposed welds smooth and flush with adjacent surfaces. Furnish attachment devices and fasteners of type required to secure access panels to types of supports indicated.
   1. Exposed Flanges: Nominal 1 to 1-1/2 inches wide around perimeter of frame.
   2. Provide mounting holes in frames for attachment of units to metal framing.
   3. Provide mounting holes in frame for attachment of masonry anchors.

D. Latching Mechanisms: Furnish number required to hold doors in flush, smooth plane when closed.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Comply with manufacturer's written instructions for installing access doors and frames.

B. Set frames accurately in position and attach securely to supports with plane of face panels aligned with adjacent finish surfaces.

C. Install doors flush with adjacent finish surfaces or recessed to receive finish material.

3.2 ADJUSTING AND CLEANING

A. Adjust doors and hardware after installation for proper operation.
B. Remove and replace doors and frames that are warped, bowed, or otherwise damaged.

END OF SECTION 083113
SECTION 083323 - OVERHEAD COILING DOORS

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. Counter doors.

1.3 ACTION SUBMITTALS
A. Product Data: For each type and size of overhead coiling door and accessory. Include the following:
   1. Construction details, material descriptions, dimensions of individual components, profiles for slats, and finishes.
   2. Rated capacities, operating characteristics, electrical characteristics, and furnished accessories.
B. Shop Drawings: For each installation and for special components not dimensioned or detailed in manufacturer's product data. Include plans, elevations, sections, details, and attachments to other work.
   1. Detail equipment assemblies and indicate dimensions, weights, loads, required clearances, method of field assembly, components, and location and size of each field connection.
C. Samples for Initial Selection: Manufacturer's finish charts showing full range of colors and textures available for units with factory-applied finishes.
   1. Include similar Samples of accessories involving color selection.

1.4 CLOSEOUT SUBMITTALS
A. Maintenance Data: For overhead coiling doors to include in maintenance manuals.

1.5 QUALITY ASSURANCE
A. Installer Qualifications: Manufacturer's authorized representative who is trained and approved for both installation and maintenance of units required for this Project.
B. Source Limitations: Obtain overhead coiling doors from single source from single manufacturer.
   1. Obtain operators and controls from overhead coiling door manufacturer.

PART 2 - PRODUCTS

2.1 DOOR CURTAIN MATERIALS AND CONSTRUCTION

A. Door Curtains: Fabricate overhead coiling-door curtain of interlocking metal slats, designed to withstand wind loading indicated, in a continuous length for width of door without splices. Unless otherwise indicated, provide slats of thickness and mechanical properties recommended by door manufacturer for performance, size, and type of door indicated, and as follows:

1. Steel Door Curtain Slats: Zinc-coated (galvanized), cold-rolled structural steel sheet; complying with ASTM A 653/A 653M, with G90 (Z275) zinc coating; nominal sheet thickness (coated) of 0.028 inch and as required to meet requirements.
2. Aluminum Door Curtain Slats: ASTM B 209 sheet or ASTM B 221 extrusions, alloy and temper standard with manufacturer for type of use and finish indicated; thickness of 0.050 inch and as required to meet requirements.
3. Metal Interior Curtain-Slat Facing: Match metal of exterior curtain-slat face.
4. Gasket Seal: Provide insulated slats with manufacturer's standard interior-to-exterior thermal break or with continuous gaskets between slats.

B. Endlocks for Counter Doors: Manufacturer's standard locks on not less than alternate curtain slats for curtain alignment and resistance against lateral movement.

C. Bottom Bar for Counter Doors: Manufacturer's standard continuous channel or tubular shape, fabricated from manufacturer's standard hot-dip galvanized steel, stainless steel, or aluminum extrusions to match curtain slats and finish.

D. Astragal for Interior Doors: Equip each door bottom bar with a replaceable, adjustable, continuous, compressible gasket of flexible vinyl, rubber, or neoprene as a cushion bumper.

E. Curtain Jamb Guides: Manufacturer's standard angles or channels and angles of same material and finish as curtain slats unless otherwise indicated, with sufficient depth and strength to retain curtain, to allow curtain to operate smoothly, and to withstand loading. Slot bolt holes for guide adjustment. Provide removable stops on guides to prevent overtravel of curtain.

F. Integral Frame, Hood, and Fascia for Counter Door: Welded sheet metal assembly of the following sheet metal:

1. Stainless Steel: 0.062-inch-thick stainless-steel sheet, Type 304, complying with ASTM A 666.

G. Integral Metal Sill for Counter Door: Fabricate sills as integral part of frame assembly of Type 304 stainless steel in manufacturer's standard thickness with No. 4 finish.

2.2 LOCKING DEVICES

A. Locking Device Assembly: Fabricate with cylinder lock, spring-loaded dead bolt, operating handle, cam plate, and adjustable locking bars to engage through slots in tracks.

1. Lock Cylinders: Provide cylinders and keyed to building keying system.
2. Keys: Provide three for each cylinder.
2.3 COUNTERBALANCING MECHANISM

A. General: Counterbalance doors by means of manufacturer's standard mechanism with an adjustable-tension, steel helical torsion spring mounted around a steel shaft and contained in a spring barrel connected to top of curtain with barrel rings. Use grease-sealed bearings or self-lubricating graphite bearings for rotating members.

B. Counterbalance Barrel: Fabricate spring barrel of manufacturer's standard hot-formed, structural-quality, welded or seamless carbon-steel pipe, of sufficient diameter and wall thickness to support rolled-up curtain without distortion of slats and to limit barrel deflection to not more than 0.03 in./ft. of span under full load.

C. Spring Balance: One or more oil-tempered, heat-treated steel helical torsion springs. Size springs to counterbalance weight of curtain, with uniform adjustment accessible from outside barrel. Secure ends of springs to barrel and shaft with cast-steel barrel plugs.

D. Torsion Rod for Counterbalance Shaft: Fabricate of manufacturer's standard cold-rolled steel, sized to hold fixed spring ends and carry torsional load.

E. Brackets: Manufacturer's standard mounting brackets of either cast iron or cold-rolled steel plate.

2.4 MANUAL DOOR OPERATORS

A. Equip door with manufacturer's recommended manual door operator unless another type of door operator is indicated.

B. Push-up Door Operation: Design counterbalance mechanism so required lift or pull for door operation does not exceed 25 lbf.

2.5 DOOR ASSEMBLY - Kitchen Counter Door

A. Counter Door: Overhead coiling door formed with curtain of interlocking metal slats.

1. Basis-of-Design Product: Subject to compliance with requirements, provide Overhead Door Company Model #652 Metal Curtain Rolling Counter Door.
   a. Cookson Company.
   b. Overhead Door Corporation-Basis of Design.
   c. Raynor.
   d. Wayne-Dalton Corp

B. Operation Cycles: Not less than 20,000.

1. Include tamperproof cycle counter.


D. Curtain Jamb Guides: Stainless steel.

E. Hood: Stainless steel.

1. Shape: As shown on Drawings.
2. Mounting: As shown on Drawings.
F. Integral Frame, Hood, and Fascia for Counter Door:  Galvanized steel.
   1. Mounting:  As shown on Drawings.

G. Sill Configuration for Counter Door:  Integral metal sill.

H. Locking Devices:  Equip door with locking device assembly.
   1. Locking Device Assembly:  Single-jamb side locking bars, operable from inside with thumb turn.


J. Door Finish:

K. Interior Curtain-Slat Facing:  Match finish of exterior curtain-slat face.

2.6 GENERAL FINISH REQUIREMENTS

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designating finishes.

B. Appearance of Finished Work:  Noticeable variations in same piece are not acceptable.  Variations in appearance of adjoining components are acceptable if they are within the range of approved Samples and are assembled or installed to minimize contrast.

2.7 ALUMINUM FINISHES

A. Clear Anodic Finish:  AAMA 611, AA-M12C22A31, Class II, 0.010 mm or thicker.

2.8 STEEL AND GALVANIZED-STEEL FINISHES

A. Baked-Enamel or Powder-Coat Finish:  Manufacturer's standard and premium baked-on finish consisting of prime coat and thermosetting topcoat.  Comply with coating manufacturer's written instructions for cleaning, pretreatment, application, and minimum dry film thickness.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates areas and conditions, with Installer present, for compliance with requirements for substrate construction and other conditions affecting performance of the Work.

B. Proceed with installation only after unsatisfactory conditions have been corrected.
3.2 INSTALLATION

A. Install overhead coiling doors and operating equipment complete with necessary hardware, anchors, inserts, hangers, and equipment supports; according to manufacturer's written instructions and as specified.

B. Install overhead coiling doors, hoods, and operators at the mounting locations indicated for each door.

C. Accessibility: Install overhead coiling doors, switches, and controls along accessible routes in compliance with regulatory requirements for accessibility.

3.3 ADJUSTING

A. Adjust hardware and moving parts to function smoothly so that doors operate easily, free of warp, twist, or distortion.

B. Lubricate bearings and sliding parts as recommended by manufacturer.

C. Adjust seals to provide weathertight fit around entire perimeter.

END OF SECTION 083323
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 vinyl-framed windows.

1.3 ACTION SUBMITTALS
A. Product Data: For each type of product.
   1. Include construction details, material descriptions, glazing and fabrication methods, dimensions of individual components and profiles, hardware, and finishes for vinyl windows.
B. Shop Drawings: For vinyl windows.
   1. Include plans, elevations, sections, hardware, accessories, insect screens, operational clearances, and details of installation, including anchor, flashing, and sealant installation.
C. Samples for Initial Selection: For units with factory-applied finishes.
   1. Include Samples of hardware and accessories involving color selection.
D. Samples for Verification: For vinyl windows and components required, prepared on Samples of size indicated below:
   1. Exposed Finishes: 2 by 4 inches.
   2. Exposed Hardware: Full-size units.
E. Product Schedule: For vinyl windows. Use same designations indicated on Drawings.

1.4 INFORMATIONAL SUBMITTALS
A. Qualification Data: For manufacturer and Installer.
B. Product Test Reports: For each type of vinyl window, for tests performed by a qualified testing agency.
C. Sample Warranties: For manufacturer's warranties.
1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: A manufacturer capable of fabricating vinyl windows that meet or exceed performance requirements indicated and of documenting this performance by test reports and calculations.

B. Installer Qualifications: An installer acceptable to vinyl window manufacturer for installation of units required for this Project.

1.6 WARRANTY

A. Manufacturer's Warranty: Manufacturer agrees to repair or replace vinyl windows that fail in materials or workmanship within specified warranty period.

1. Failures include, but are not limited to, the following:
   a. Failure to meet performance requirements.
   b. Structural failures including excessive deflection, water leakage, and air infiltration.
   c. Faulty operation of movable sash and hardware.
   d. Deterioration of materials and finishes beyond normal weathering.
   e. Failure of insulating glass.

2. Warranty Period:
   a. Window: 10 years from date of Substantial Completion.
   b. Glazing Units: 10 years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Source Limitations: Obtain vinyl windows from single source from single manufacturer.

2.2 WINDOW PERFORMANCE REQUIREMENTS

A. Product Standard: Comply with AAMA/WDMA/CSA 101/I.S.2/A440 for definitions and minimum standards of performance, materials, components, accessories, and fabrication unless more stringent requirements are indicated.

B. Performance Class and Grade: AAMA/WDMA/CSA 101/I.S.2/A440 as follows:
   1. Minimum Performance Class: CW.

C. Thermal Transmittance: NFRC 100 maximum whole-window U-factor of 0.32 Btu/sq. ft. x h x deg F.
D. Solar Heat-Gain Coefficient (SHGC): NFRC 200 maximum whole-window SHGC of 0.40.

2.3 VINYL WINDOWS

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 Pella 350 Series or comparable product by one of the following:

1. All Seasons Window & Door Mfg.; All Seasons Commercial Division, Inc.
2. CertainTeed Corporation.
3. Crestline Windows and Doors.
5. Gerkin Windows and Doors.
8. Jeld-Wen, Inc.
10. Milgard Manufacturing, Inc.
11. Pella Corporation.
12. PGT Industries.
13. Quaker Construction Products, Inc.
14. Shwinco Architectural Products LLC.
15. Simonton Windows.
17. Thermo-Tech Premium Windows and Doors, Inc.
18. Weather Shield Mfg., Inc.
19. YKK AP America Inc.

C. Operating Types: Provide the following operating types in locations indicated on Drawings:

1. Double hung.
2. Fixed.


1. Finish: Integral color, white.
2. Gypsum Board Returns: Provide at interior face of frame.

E. Glass: Clear annealed glass, ASTM C 1036, Type 1, Class 1, q3.


F. Insulating-Glass Units: ASTM E 2190.

1. Glass: ASTM C 1036, Type 1, Class 1, q3.
   a. Tint: Clear.

2. Lites: Two.

3. Filling: Fill space between glass lites with argon.

4. Low-E Coating: Pyrolytic on second surface.

5. Integral Louver Blinds: Glass manufacturer's standard, horizontal louver blinds with aluminum slats and polyester fiber cords, located in space between glass lites, and operated by hardware located on inside face of sash.

a. Operation: Tilt, raising, and lowering.

b. Color: As selected by Architect from manufacturer's full range.

G. Glazing System: Manufacturer's standard factory-glazing system that produces weathertight seal.

H. Hardware, General: Provide manufacturer's standard hardware fabricated from aluminum, stainless steel, carbon steel complying with AAMA 907, or other corrosion-resistant material compatible with adjacent materials; designed to smoothly operate, tightly close, and securely lock windows, and sized to accommodate sash weight and dimensions.

1. Exposed Hardware Color and Finish: As selected by Architect from manufacturer's full range.

I. Hung Window Hardware:

1. Counterbalancing Mechanism: Complying with AAMA 902, concealed, of size and capacity to hold sash stationary at any open position.

2. Locks and Latches: Allow unobstructed movement of the sash across adjacent sash in direction indicated and operated from the inside only.

3. Tilt Hardware: Releasing tilt latch allows sash to pivot about horizontal axis to facilitate cleaning exterior surfaces from the interior.

J. Weather Stripping: Provide full-perimeter weather stripping for each operable sash unless otherwise indicated.

K. Fasteners: Noncorrosive and compatible with window members, trim, hardware, anchors, and other components.

1. Exposed Fasteners: Do not use exposed fasteners to greatest extent possible. For application of hardware, use fasteners that match finish hardware being fastened.

2.4 INSECT SCREENS

A. General: Fabricate insect screens to integrate with window frame. Provide screen for each operable exterior sash. Screen wickets are not permitted.

1. Type and Location: Full, outside for double-hung sashes.
B. Aluminum Frames: Manufacturer's standard aluminum alloy complying with SMA 1004 or SMA 1201. Fabricate frames with mitered or coped joints or corner extrusions, concealed fasteners, and removable PVC spline/anchor concealing edge of frame.

1. Tubular Framing Sections and Cross Braces: Roll formed from aluminum sheet.
2. Finish for Interior Screens: Baked-on organic coating in color selected by Architect from manufacturer's full range.

C. Glass-Fiber Mesh Fabric: 18-by-14 or 18-by-16 mesh of PVC-coated, glass-fiber threads; woven and fused to form a fabric mesh resistant to corrosion, shrinkage, stretch, impact damage, and weather deterioration. Comply with ASTM D 3656/D 3656M.

1. Mesh Color: Manufacturer's standard.

2.5 FABRICATION

A. Fabricate vinyl windows in sizes indicated. Include a complete system for installing and anchoring windows.

B. Glaze vinyl windows in the factory.

C. Weather strip each operable sash to provide weathertight installation.

D. Mullions: Provide mullions and cover plates, compatible with window units, complete with anchors for support to structure and installation of window units. Allow for erection tolerances and provide for movement of window units due to thermal expansion and building deflections. Provide mullions and cover plates capable of withstanding design wind loads of window units. Provide manufacturer's standard finish to match window units.

E. Hardware: Mount hardware through double walls of vinyl extrusions or provide corrosion-resistant reinforcement.

1. Clear pine head and seat boards.
2. Top and bottom plywood platforms.
3. Exterior head and sill casings and trim.
4. Support brackets.

F. Complete fabrication, assembly, finishing, hardware application, and other work in the factory to greatest extent possible. Disassemble components only as necessary for shipment and installation. Allow for scribing, trimming, and fitting at Project site.
PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine openings, substrates, structural support, anchorage, and conditions, with Installer present, for compliance with requirements for installation tolerances and other conditions affecting performance of the Work.

B. Verify rough opening dimensions, levelness of sill plate, and operational clearances.

C. Examine wall flashings, vapor retarders, water and weather barriers, and other built-in components to ensure weathertight window installation.

D. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Comply with manufacturer's written instructions for installing windows, hardware, accessories, and other components. For installation procedures and requirements not addressed in manufacturer's written instructions, comply with installation requirements in ASTM E 2112.

B. Install windows level, plumb, square, true to line, without distortion, anchored securely in place to structural support, and in proper relation to wall flashing and other adjacent construction to produce weathertight construction.

3.3 ADJUSTING, CLEANING, AND PROTECTION

A. Adjust operating sashes and hardware for a tight fit at contact points and weather stripping for smooth operation and weathertight closure.

B. Clean exposed surfaces immediately after installing windows. Remove excess sealants, glazing materials, dirt, and other substances.

1. Keep protective films and coverings in place until final cleaning.

C. Remove and replace sashes if glass has been broken, chipped, cracked, abraded, or damaged during construction period.

D. Protect window surfaces from contact with contaminating substances resulting from construction operations. If contaminating substances do contact window surfaces, remove contaminants immediately according to manufacturer's written instructions.

END OF SECTION 085313
SECTION 087100 - BUILDERS HARDWARE

PART 1 - GENERAL

1.1 SUMMARY:
A. Definition: "Builders Hardware" includes items known commercially as builders hardware which are required for swing, sliding and folding doors, except special types of unique and non-matching hardware specified in the same section as the door and frame.

B. Extent of hardware as indicated on drawings and schedules; see Schedule that follows. Types of items in this section include (but are not necessarily limited to):
   1. Hinges
   2. Lock cylinders and keys (including locks, lock cylinders and keys for doors specified in other Division 8 sections.)
   3. Lock and latch sets
   4. Bolts
   5. Exit devices
   6. Push/pull units
   7. Closers
   8. Overhead holders
   9. Miscellaneous door control devices
   10. Door trim units
   11. Protection plates
   12. Automatic drop seal (door bottoms)
   13. Astragals or meeting seals on pairs of doors
   14. Thresholds

1.2 QUALITY ASSURANCE
A. Manufacturer: Obtain each kind of hardware (latch and lock sets, hinges, closers, etc.) from only one manufacturer, although several may be indicated as offering products complying with requirements.

B. Supplier: A recognized builders hardware supplier who has been furnishing hardware in the project's vicinity for not less than 2 years; and who is, or employs an experienced hardware consultant who is available, at reasonable times during the course of the work, for consultation about project's hardware requirements, to Owner, Architect and Project expediter.

C. Fire-Rated Openings: Provide hardware for fire-rated openings in compliance with NFPA Standard No. 80 and local building code requirements. Provide only hardware which has been tested and listed by UL for types and sizes of doors required and complies with requirements of door and door frame labels.

   1. Where emergency exit devices are required on fire-rated doors (with supplementary marking on doors UL labels indicating "Fire Door to be Equipped with Fire Exit Hardware") provide UL label on exit devices indicating "Fire Exit Hardware."
1.3 SUBMITTALS

A. Product Data: Submit manufacturers' technical information for each item of hardware. Include whatever information may be necessary to show compliance with requirements, and include instructions for installation and for maintenance of operating parts and finish. Transmit copy of applicable data to installer. Include letter of compliance from Hardware manufacturer stating that the owner’s system has been verified and coordinated and all components of the system are fully compatible with owner’s current system. Include letter from supplier stating that the hardware installer has met with the owner’s representative and is fully aware of the current hardware system of the campus.

B. Hardware Schedule: Submit final hardware in manner indicated below. Hardware schedules are intended for coordination of work.

1. Final Hardware Schedule Content: Based on builders hardware indicated, organize hardware schedule into "hardware sets" indicating complete designations of every item required for each door or opening. Include the following information:
   a. Type, style, function, size and finish of each hardware item.
   b. Name and manufacturer of each item.
   c. Fastenings and other pertinent information.
   d. Location of hardware set cross-referenced to indications on drawings both on floor plans and in door and frame schedule.
   e. Explanation of all abbreviations, symbols, codes, etc., contained in schedule.
   f. Mounting locations for hardware.
   g. Door and frame sizes and materials.
   h. Keying information.
   i. Verify and coordinate hardware in this section with Section 09820.

2. Submittal Sequence: Submit schedule at earliest possible date, particularly where acceptance of hardware schedule must precede fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Include with schedule the product data, samples, shop drawings of other work affected by builders hardware, and other information essential to the coordinated review of hardware schedule. Meet with Owner and Architect to review schedule.

3. Submittal Sequence: Submit initial draft of schedule, along with essential product data, in order to facilitate the fabrication of other work (e.g., hollow metal frames) which is critical in the project construction schedule. Submit final draft of schedule after samples, product data, coordination with shop drawings of other work, delivery scheduled, and similar information has been completed and accepted.

4. Keying Schedule: Submit separate detailed schedule indicating clearly how the Owner's final instructions on keying of locks has been fulfilled.

C. Samples: Prior to submittal of the final hardware schedule and prior to final ordering of builders hardware, submit one sample of each type of exposed hardware unit, finished as required, and tagged with full description for coordination with schedule that may be requested.

1. Samples will be returned to the supplier. Units which are acceptable and remain undamaged through submittal, review and field comparison procedures may, after final check of operation, be used in the work, within limitations of keying coordination requirements.

D. All locks and cylinders shall be construction master keyed. Detailed keying requirements shall be obtained at a meeting with the designer, supplier and Owner prior to submittal. The supplier shall furnish
the Owner with a bitting list in full compliance with the Owner’s requirements via a secured carrier.

1.4 PRODUCT HANDLING

A. Packaging of hardware, on a set by set basis, is the responsibility of the supplier. As material is received by the hardware supplier from the various manufacturers, sort and repackage in containers marked with the hardware set number. Two or more identical sets may be packed in the same container.

B. Inventory hardware jointly with representatives of the hardware supplier and the hardware installer until each is satisfied that the count is correct.

C. Provide secure lock-up for hardware delivered to the project, but not yet installed. Control any handling and installation of hardware items which are not immediately replaceable, so that the completion of the work will not be delayed by hardware losses, both before and after installation.

1.5 JOB CONDITIONS

A. Coordination: Coordinate hardware with other work. Tag each item or package separately, with identification related to the final hardware schedule, and include basic installation instructions in the package. Furnish hardware items of proper design for use on doors and frames of the thicknesses, profile, swing, security and similar requirements indicated, as necessary for proper installation and function. Deliver individually packaged hardware items at the proper times to the proper locations (shop or project site) for installation.

B. Templates: Furnish hardware templates to each fabricator of doors, frames and other work to be factory-prepared for the installation of hardware. Upon request, check the shop drawings of such other work, to confirm that adequate provisions are made for the proper installation of hardware.

PART 2-PRODUCTS

1.6 SCHEDULED HARDWARE

A. Requirements for design, grade, function, finish, size and other distinctive qualities of each type of builders hardware is indicated in the Builders Hardware Data Sheet and Hardware Schedule at the end of this section. Products are identified by using hardware designation numbers of the following:

B. Manufacturer’s product designations: Manufacturers are listed for each hardware type required. Provide the product designated.

3. Exit Devices: Von Duprin 9900 Rim and 3300 Series, Yale or Sargent.
4. Door Controls - Closers: LCN 4010, Corbin DC 6200 or Sargent.
5. Auxiliary Locks: Yale, Sargent or Corbin Russwin.
7. Door Controls - Overhead Holders: Glynn Johnson, ABH or Sargent.
Weatherstripping and Thresholds: Reese, Penko or National Guard.
Automatic Power Assist Openers: LCN 4010, Dorma or Horton.
Deluxe wall cabinet 2 Tag key system: Lund or equal 1200 series with capacity for number of keys in specification

C. In addition to requirements of the hardware schedule, comply with the requirements below.
1. Fire-Rated Doors: Provide hardware of types and quality required to comply with NFPA 80

1.7 MATERIALS AND FABRICATION

A. General
1. Hand of door: The drawings show the direction of slide, swing or hand of each door leaf. Furnish each item of hardware for proper installation and operation of the door movement as shown.
2. Manufacturer's Name Plate: Do not use manufacturer's products which have manufacturer's name or trade name displayed in a visible location (omit removable nameplates), except in conjunction with required UL labels and as otherwise acceptable to the Architect.
   a. Manufacturer's identification will be permitted on rim of lock cylinders only.

B. Fasteners: Manufacture hardware to conform to published templates, generally prepared for machine screw installation. Do not provide hardware which has been prepared for self-tapping sheet metal screws, except as specifically indicated.
   1. Provide all fasteners required for secure installation.
   2. Select fasteners appropriate to substrate and material being fastened.
   3. Use flathead Phillips screws unless otherwise indicated.
   4. Use wood screws for installation in wood.
   5. Use fasteners impervious to corrosion outdoors and on exterior doors.
   7. Where it is not possible to reinforce substrate adequately for screws, use through-bolts with sleeves or use sex bolts.
      a. Do not use where head or nut would be exposed on face of door, unless specifically indicated or made necessary by other requirements.
      b. Finish exposed heads and nuts the same as hardware on that side of the door.
   8. Use expansion shield anchors in concrete and masonry.

C. Furnish screws for installation with each hardware item. Provide Phillips flat-head screws except as otherwise indicated. Finish exposed (exposed under any condition) screws to match the hardware finish or, if exposed in surfaces of other work, to match the finish of such other work as closely as possible, including "prepared for paint" in surfaces to receive painted finish.

D. Tools for Maintenance: Furnish a complete set of specialized tools as needed for Owner's continued adjustment, maintenance and removal and replacement of builders hardware.
1.8 HINGES, BUTTS AND PIVOTS

A. Templates: Except for hinges and pivots to be installed entirely (both leaves) into wood doors and frames, provide only template-produced units.

B. Screws: Furnish Phillips flat-head all-purpose or machine screws for installation of units, except furnish Phillips flat-head all-purpose wood screws for installation of units into wood. Finish screw heads to match surface of hinges or pivots.

C. Butt Hinges: Five-knuckle, flush-barrel butt hinges.
   1. Comply with applicable requirements of BHMA A156.1.
   2. Use heavy weight hinges.
   3. Use full mortise hinges unless otherwise specified.
   4. Dimensions: As indicated, within limits prescribed by ANSI/BHMA A156.7.
      a. Size(s): 4-1/2 by 4-1/2 inches.
      b. Size hinges to suit thickness of door, including applied facings.
      c. Exception: Where both leaves are to be installed into wood, template size units are not required.

D. Hinge Pins: Except as otherwise indicated, provide hinge pins as follows:
   1. Steel Hinges: Steel pins.
   5. Interior Doors: Non-rising pins.
   6. Tips: Flat button and matching plug, finished to match leaves.
   7. Number of Hinges: Provide number of hinges indicated, but not less than 4 hinges per door leaf for doors 90” or more in height.

1.9 LOCK CYLINDERS AND KEYING

A. General: Supplier will meet with Owner to finalize keying requirements and obtain final instructions in writing.

B. Existing System: Grand master key the locks to the Owner's existing system

C. Review the keying system with the Owner and provide the type required (master, grandmaster or great-grandmaster), integrated with Owner's existing system.

D. Equip locks with cylinders for interchangeable-core pin tumbler inserts. Furnish temporary inserts for the construction period, and remove these when directed. Owner then will install permanent cores provided under this contract.

E. Metal: Construct lock cylinder parts from brass/bronze, stainless steel or nickel silver.

F. 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.
G. Key Material: Brass, with plain bow.
   1. Stamp each key with manufacturer's change symbol.
   2. Provide individual change key for each lock which is not designated to be keyed alike with a group of related locks.

H. Key Quantity: Furnish 4 change keys for each lock; 4 master keys for each new master system, 4 Grand masters, 4 Great Grand Masters, with extra blanks equal to total number plus 25%.

I. In addition to keys and locks for wood and hollow metal doors and frames, verify and coordinate keying and locks with all doors specified in section 08411.

1.10 LOCKS, LATCHES AND BOLTS

A. 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.

B. Lock Throw: Provide 5/8" minimum throw of latch and deadbolt used on pairs of
   1. Comply with UL requirements for throws of bolts and latch bolts on rated fire openings.

C. Flush Bolt Heads: Minimum of 1/2" diameter rods of brass, bronze or stainless steel with minimum 12" long rod.

D. 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.

1.11 PUSH/PULL UNITS

A. Exposed Fasteners: Provide manufacturer's standard exposed fasteners for installation; through-bolted for matched pairs, but not for single units.

B. Concealed Fasteners: Provide manufacturer's special concealed fastener system for installation; through-bolted for matched pairs, but not for single units.

1.12 CLOSERS AND DOOR CONTROL DEVICES

A. 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.
   1. Where parallel arms are indicated for closers, provide closer unit one size larger than recommended for use with standard arms.
   2. Size closer or adjust closer opening force to comply with applicable codes.
   3. At interior doors, the force required to open the door shall not exceed five (5) pounds when applied at the handle or door pull. At exterior doors or where air pressure differences require greater pressure for closers, the force required to open the doors shall not exceed eight and one-half (8 1/2) pounds when applied at the handle or door pull. In the case of fire doors, the closing
force shall be adequate to assure automatic latching.

B. Wall/Floor-Mounted Stops/ Holders: Comply with requirements of ANSI A156.16.
   1. Resilient bumpers: Gray.

C. Surface-Mounted Closers:
   1. Comply with requirements of BHMA A156.4, Grade 1.
      a. Provide the following features:
         1) PT 4A: Additional 15 percent adjustment in closing force.
         2) PT 4B: Additional 35 percent adjustment in closing force.
         3) PT 4C: Additional 50 percent adjustment in closing force.
         4) PT 4D: Adjustable hydraulic back check.
         5) PT 4E: Factory preset hydraulic back check.
         6) PT 4F: Delayed action.
         7) PT 4G: Built-in, factory-set dead stop.
         8) PT 4H: Nonsized closer with closing force adjustable through range of sizes required.
   2. Finish: Metallic paint finish, color similar to metal hardware on same door.
   3. On fire-rated wood doors, fasten with through-bolts.

D. Overhead Stops/ Holders: Comply with requirements of BHMA A156.8.

1.13 ARCHITECTURAL DOOR TRIM

A. Manufacturers:
   1. Architectural door trim: Provide products complying with requirements of the contract documents and made by one of the following:
      a. Baldwin Hardware Corporation.
      b. Yale Security, Inc.
      c. Jackson Exit Device/Builders Brass Works.
      d. Hiawatha, Inc.
      e. H. B. Ives, a Harrow Company.
      f. NT Quality Hardware Manufacturing Company.
      g. Rockwood Manufacturing Company.
      h. Triangle Brass Manufacturing Company, Inc.

B. Push/pulls:
   1. Pull handles and push plates:
      a. Comply with requirements of BHMA A156.6.
      b. Provide concealed fasteners.
   2. Pull handles which are not mounted on plates: Fasten with through-bolts concealed under plate on opposite side.
C. Protection Plates: Stainless steel, 0.050 inch thick, satin finish (630).

1. Comply with requirements of BHMA A156.6.
2. Kickplates: See schedule. high by 2 inches less than door width.
3. Bevel all edges.
4. Fasten with countersunk flathead screws.

1.14 SEALS AND THRESHOLDS

A. Manufacturers:

1. Weatherstripping: Provide products complying with requirements of the contract documents and made by one of the following:

   a. A. J. May, Inc.
   b. National Guard Products, Inc.
   c. Pemko Manufacturing Company.
   d. Reese Enterprises, Inc.
   e. Sealeze Corporation.

2. Thresholds: Provide products complying with requirements of the contract documents and made by one of the following:

   a. A. J. May, Inc.
   b. National Guard Products, Inc.
   c. Pemko Manufacturing Company.
   d. Reese Enterprises, Inc.
   e. Sealeze Corporation.

1.15 HARDWARE FINISHES

A. Provide matching finishes 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.

B. Provide finishes which match those established by BHMA or, if none established, match the Architect's sample.

C. 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.

D. Provide protective lacquer coating on all exposed hardware finishes of brass, bronze and aluminum, except as otherwise indicated. The suffix "-NL" is used with standard finish designations to indicate "no lacquer."

E. The designations used in schedules and elsewhere to indicate hardware finishes are
the industry-recognized standard commercial finishes, except as otherwise noted.

1. Rust-Resistant Finish: For iron and steel base metal, required for exterior work and in areas shown as "High Humidity" areas (and also when designated with the suffix -RR), provide 0.2 mil thick copper coating on base metal before applying brass, bronze, nickel or chromium plated finishes.

PART 3-EXECUTION

1.16 INSTALLATION

A. Mount hardware units at heights indicated in "Recommended Locations for Builders Hardware for Standard Steel Doors and Frames" by the Door and Hardware Institute, except as specifically indicated or required to comply with governing regulations, and except as may be otherwise directed by Architect. Provide the services of an architectural hardware consultant (AHC) to advise on proper installation, to inspect the finished work, and either to adjust or to instruct those who are adjusting.

B. 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.

C. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

D. Drill and countersink units which are not factory prepared for anchorage fasteners. Space fasteners and anchors in accordance with industry standards.

E. Thresholds: Apply continuous bead of sealant to all contact surfaces before installing.

F. Set up key control system.

1.17 ADJUST AND CLEAN

A. Adjust and clean each operating item of hardware and each door, to ensure proper operation or function of every unit. Replace units which cannot be adjusted to operate freely and smoothly as intended for the application made.

B. 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.

C. Instruct Owner’s Personnel in proper adjustment and maintenance of hardware and hardware finishes, during the final adjustment of hardware.

D. Continued Maintenance Service: Approximately six (6) 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 readjust 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 of installation of
hardware units. Prepare a written report of current and predictable problems (of substantial nature) in the
performance of the hardware.

1.18 CONTRACT CLOSEOUT

A. Place keys in cabinet as determined by final key schedule.

B. Place extra blanks in cabinet.

END OF SECTION 087100
SECTION 092900 - GYPSUM BOARD

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. This Section includes the following:
   1. Interior gypsum board.
   2. Tile backing panels.

B. Related Sections include the following:
   1. Division 06 Section "Rough Carpentry" for wood framing and furring that supports gypsum board.
   2. Division 06 Section "Sheathing" for gypsum sheathing.
   3. Division 07 Section "Thermal Insulation" for insulation and vapor retarders installed in assemblies that incorporate gypsum board.
   4. Division 09 Section "Tiling" for cementitious backer units installed as substrates for ceramic tile.
   5. Division 09 painting Sections for primers applied to gypsum board surfaces.

1.3 SUBMITTALS

1.4 QUALITY ASSURANCE

A. Fire-Resistance-Rated Assemblies: For fire-resistance-rated assemblies, provide materials and construction identical to those tested in assembly indicated according to ASTM E 119 by an independent testing agency.

1.5 STORAGE AND HANDLING

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

1.6 PROJECT CONDITIONS

A. Environmental Limitations: Comply with ASTM C 840 requirements or gypsum board manufacturer's written recommendations, whichever are more stringent.

B. Do not install interior products until installation areas are enclosed and conditioned.

C. Do not install panels that are wet, those that are moisture damaged, and those that are mold damaged.
1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

PART 2 - PRODUCTS

2.1 PANELS, GENERAL

A. Recycled Content: Provide gypsum panel products with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of Insert number 36.5 percent by weight.

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

2.2 INTERIOR GYPSUM BOARD

A. General: Complying with ASTM C 36/C 36M or ASTM C 1396/C 1396M, as applicable to type of gypsum board indicated and whichever is more stringent.

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 following:
2. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. American Gypsum Co.
   b. BPB America Inc.
   c. G-P Gypsum.
   d. Lafarge North America Inc.
   e. National Gypsum Company.
   f. PABCO Gypsum.
   g. Temple.
   h. USG Corporation.

B. Type X:

1. Thickness: 5/8 inch.
2. Long Edges: Tapered and featured (rounded or beveled) for prefilling.

C. Abuse-Resistant Type: Manufactured to produce greater resistance to surface indentation, through-penetration (impact resistance), and abrasion than standard, regular-type and Type X gypsum board.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.

D. Moisture- and Mold-Resistant Type: With moisture- and mold-resistant core and surfaces.

1. Core: 5/8 inch, Type X.
2. Long Edges: Tapered.
2.3 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9.

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. Custom Building Products; Wonderboard.
   b. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
   c. USG Corporation; DUROCK Cement Board.

3. Thickness: As indicated on Drawings.

2.4 TRIM ACCESSORIES

A. Interior Trim: ASTM C 1047.

1. Material: Galvanized or aluminum-coated steel sheet, rolled zinc, plastic, or paper-faced galvanized steel sheet.
2. Shapes:
   a. Cornerbead.
   b. LC-Bead: J-shaped; exposed long flange receives joint compound.
   c. L-Bead: L-shaped; exposed long flange receives joint compound.
   d. U-Bead: J-shaped; exposed short flange does not receive joint compound.
   e. Expansion (control) joint.
   f. W-Bead: W-shaped; two exposed long flanges receive joint compound.
   g. ½" reglet

2.5 JOINT TREATMENT MATERIALS

A. General: Comply with ASTM C 475/C 475M.

B. Joint Tape:

1. Interior Gypsum Wallboard: Paper.
2. Tile Backing Panels: As recommended by panel manufacturer.

C. Joint Compound for Interior Gypsum Wallboard: For each coat use formulation that is compatible with other compounds applied on previous or for successive coats.

1. Prefilling: At open joints, rounded or beveled panel edges, and damaged surface areas, use setting-type taping compound.
2. Embedding and First Coat: For embedding tape and first coat on joints, fasteners, and trim flanges, use drying-type, all-purpose compound.
   a. Use setting-type compound for installing paper-faced metal trim accessories.
3. Fill Coat: For second coat, use drying-type, all-purpose compound.
4. Finish Coat: For third coat, use drying-type, all-purpose compound.
D. Joint Compound for Tile Backing Panels:

1. Cementitious Backer Units: As recommended by backer unit manufacturer.

2.6 AUXILIARY MATERIALS

A. General: Provide auxiliary materials that comply with referenced installation standards and manufacturer's written recommendations.

B. Steel Drill Screws: ASTM C 1002, unless otherwise indicated.

1. Use screws complying with ASTM C 954 for fastening panels to steel members from 0.033 to 0.112 inch thick.
2. For fastening cementitious backer units, use screws of type and size recommended by panel manufacturer.

C. Sound Attenuation Blankets: ASTM C 665, Type I (blankets without membrane facing) produced by combining thermosetting resins with mineral fibers manufactured from glass, slag wool, or rock wool.

1. Fire-Resistance-Rated Assemblies: Comply with mineral-fiber requirements of assembly.
2. Recycled Content: Provide blankets with recycled content such that postconsumer recycled content plus one-half of preconsumer recycled content constitutes a minimum of 25 percent by weight.

D. Acoustical Sealant: As specified in Division 07 Section "Joint Sealants."

1. Provide sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and substrates, with Installer present, and including welded hollow-metal frames and framing, for compliance with requirements and other conditions affecting performance.

B. Examine panels before installation. Reject panels that are wet, moisture damaged, and mold damaged.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 APPLYING AND FINISHING PANELS, GENERAL

A. Comply with ASTM C 840.

B. Install ceiling panels across framing to minimize the number of abutting end joints and to avoid abutting end joints in central area of each ceiling. Stagger abutting end joints of adjacent panels not less than one framing member.

C. Install panels with face side out. Butt panels together for a light contact at edges and ends with not more
than 1/16 inch of open space between panels. Do not force into place.

D. Locate edge and end joints over supports, except in ceiling applications where intermediate supports or gypsum board back-blocking is provided behind end joints. Do not place tapered edges against cut edges or ends. Stagger vertical joints on opposite sides of partitions. Do not make joints other than control joints at corners of framed openings.

E. Form control and expansion joints with space between edges of adjoining gypsum panels.

F. Cover both faces of support framing with gypsum panels in concealed spaces (above ceilings, etc.), except in chases braced internally.
   1. Unless concealed application is indicated or required for sound, fire, air, or smoke ratings, coverage may be accomplished with scraps of not less than 8 sq. ft. in area.
   2. Fit gypsum panels around ducts, pipes, and conduits.
   3. Where partitions intersect structural members projecting below underside of floor/roof slabs and decks, cut gypsum panels to fit profile formed by structural members; allow 1/4- to 3/8-inch- wide joints to install sealant.

G. Isolate perimeter of gypsum board applied to non-load-bearing partitions at structural abutments, except floors. Provide 1/4- to 1/2-inch- wide spaces at these locations, and trim edges with edge trim where edges of panels are exposed. Seal joints between edges and abutting structural surfaces with acoustical sealant.

H. Attachment to Steel Framing: Attach panels so leading edge or end of each panel is attached to open (unsupported) edges of stud flanges first.

I. Install sound attenuation blankets before installing gypsum panels, unless blankets are readily installed after panels have been installed on one side.

3.3 APPLYING INTERIOR GYPSUM BOARD

A. Install interior gypsum board in the following locations:
   1. Type X: As indicated on Drawings.
   2. Abuse-Resistant Type: As indicated on Drawings.
   3. Moisture- and Mold-Resistant Type: In all damp or wet locations including but not limited to toilet rooms, janitors closets, mechanical rooms, kitchens, food prep areas,

B. Single-Layer Application:
   1. On ceilings, apply gypsum panels before wall/partition board application to greatest extent possible and at right angles to framing, unless otherwise indicated.
   2. On partitions/walls, apply gypsum panels horizontally (perpendicular to framing), unless otherwise indicated or required by fire-resistance-rated assembly, and minimize end joints.
      a. Stagger abutting end joints not less than one framing member in alternate courses of panels.
   3. On Z-furring members, apply gypsum panels vertically (parallel to framing) with no end joints. Locate edge joints over furring members.
   4. Fastening Methods: Apply gypsum panels to supports with steel drill screws.

C. Multilayer Application:
1. On ceilings, apply gypsum board indicated for base layers before applying base layers on walls/partitions; apply face layers in same sequence. Apply base layers at right angles to framing members and offset face-layer joints 1 framing member, 16 inches minimum, from parallel base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly.

2. On partitions/walls, apply gypsum board indicated for base layers and face layers vertically (parallel to framing) with joints of base layers located over stud or furring member and face-layer joints offset at least one stud or furring member with base-layer joints, unless otherwise indicated or required by fire-resistance-rated assembly. Stagger joints on opposite sides of partitions.

3. On Z-furring members, apply base layer vertically (parallel to framing) and face layer either vertically (parallel to framing) or horizontally (perpendicular to framing) with vertical joints offset at least one furring member. Locate edge joints of base layer over furring members.

4. Fastening Methods: Fasten base layers and face layers separately to supports with screws.

3.4 APPLYING TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A108.11, at locations indicated to receive tile.

B. Where tile backing panels abut other types of panels in same plane, shim surfaces to produce a uniform plane across panel surfaces.

3.5 INSTALLING TRIM ACCESSORIES

A. General: For trim with back flanges intended for fasteners, attach to framing with same fasteners used for panels. Otherwise, attach trim according to manufacturer’s written instructions.

B. Control Joints: Install control joints according to ASTM C 840 and in specific locations approved by Architect for visual effect.

C. Interior Trim: Install in the following locations:

1. Cornerbead: Use at outside corners, unless otherwise indicated.
2. LC-Bead: Use at exposed panel edges.
3. L-Bead: Use where indicated.
4. U-Bead: Use at exposed panel edges.
5. W-Shape: Use where indicated.
6. ½” reglet: Use where indicated.

3.6 FINISHING GYPSUM BOARD

A. General: Treat gypsum board joints, interior angles, edge trim, control joints, penetrations, fastener heads, surface defects, and elsewhere as required to prepare gypsum board surfaces for decoration. Promptly remove residual joint compound from adjacent surfaces.

B. Prefill open joints, rounded or beveled edges, and damaged surface areas.

C. Apply joint tape over gypsum board joints, except those with trim having flanges not intended for tape.

D. Gypsum Board Finish Levels: Finish panels to levels indicated below and according to ASTM C 840:

1. Level 1: Ceiling plenum areas, concealed areas, and where indicated.
2. Level 4: At panel surfaces that will be exposed to view, unless otherwise indicated.
   a. Primer and its application to surfaces are specified in other Division 09 Sections.

E. Cementitious Backer Units: Finish according to manufacturer's written instructions.

3.7 PROTECTION

A. Protect installed products from damage from weather, condensation, direct sunlight, construction, and other causes during remainder of the construction period.

B. Remove and replace panels that are wet, moisture damaged, and mold damaged.
   1. Indications that panels are wet or moisture damaged include, but are not limited to, discoloration, sagging, or irregular shape.
   2. Indications that panels are mold damaged include, but are not limited to, fuzzy or splotchy surface contamination and discoloration.

END OF SECTION 092900
SECTION 093000 - TILING

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. Ceramic tile.
2. Stone thresholds.
3. Waterproof membrane.
5. Tile backing panels.
6. Metal edge strips.

B. Related Sections:

1. Division 09 Section "Gypsum Board" for cementitious backer units.

1.3 DEFINITIONS

A. General: Definitions in the ANSI A108 series of tile installation standards and in ANSI A137.1 apply to Work of this Section unless otherwise specified.


C. Module Size: Actual tile size plus joint width indicated.

D. Face Size: Actual tile size, excluding spacer lugs.

1.4 PERFORMANCE REQUIREMENTS

A. Static Coefficient of Friction: For tile installed on walkway surfaces, provide products with the following values as determined by testing identical products per ASTM C 1028:

1. Level Surfaces: Minimum .60 .
2. Step Treads: Minimum .60 .
3. Ramp Surfaces: Minimum .60 .
1.5 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Verification:
   1. Full-size units of each type and composition of tile and for each color and finish required.
   2. Assembled samples mounted on a rigid panel, with grouted joints, for each type and composition of tile and for each color and finish required. Make samples at least 12 inches square, but not fewer than 4 tiles. Use grout of type and in color or colors approved for completed Work.
   3. Full-size units of each type of trim and accessory for each color and finish required.
   4. Metal edge strips in 6-inch lengths.

C. Product Certificates: For each type of product, signed by product manufacturer.

D. Material Test Reports: For each tile-setting and -grouting product.

1.6 QUALITY ASSURANCE

A. Source Limitations for Tile: Obtain tile of each type and color or finish from one source or producer.
   1. Obtain tile of each type and color or finish from same production run and of consistent quality in appearance and physical properties for each contiguous area.

B. Source Limitations for Setting and Grouting Materials: Obtain ingredients of a uniform quality for each mortar, adhesive, and grout component from one manufacturer and each aggregate from one source or producer.

C. Source Limitations for Other Products: Obtain each of the following products specified in this Section from a single manufacturer for each product:
   1. Waterproof membrane.
   2. Crack isolation membrane.
   4. Cementitious backer units.
   5. Metal edge strips.

D. Mockups: Build mockups to verify selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
   1. Build mockup of each type of floor tile installation.
   2. Build mockup of each type of wall tile installation.
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.7 DELIVERY, STORAGE, AND HANDLING

A. Deliver and store packaged materials in original containers with seals unbroken and labels intact until time of use. Comply with requirements in ANSI A137.1 for labeling tile packages.

B. Store tile and cementitious materials on elevated platforms, under cover, and in a dry location.
C. Store aggregates where grading and other required characteristics can be maintained and contamination can be avoided.

D. Store liquid materials in unopened containers and protected from freezing.

E. Handle tile that has temporary protective coating on exposed surfaces to prevent coated surfaces from contacting backs or edges of other units. If coating does contact bonding surfaces of tile, remove coating from bonding surfaces before setting tile.

1.8 PROJECT CONDITIONS

A. Environmental Limitations: Do not install tile until construction in spaces is complete and ambient temperature and humidity conditions are maintained at the levels indicated in referenced standards and manufacturer's written instructions.

1.9 EXTRA MATERIALS

A. Furnish extra materials that match and are from same production runs as products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Tile and Trim Units: Furnish quantity of full-size units equal to 3 percent of amount installed for each type, composition, color, pattern, and size indicated.

a. 

2. Grout: Furnish quantity of grout equal to 3 percent of amount installed for each type, composition, and color indicated.

PART 2 - PRODUCTS

2.1 PRODUCTS, GENERAL

A. ANSI Ceramic Tile Standard: Provide tile that complies with ANSI A137.1 for types, compositions, and other characteristics indicated.

1. Provide tile complying with Standard grade requirements unless otherwise indicated.

B. ANSI Standards for Tile Installation Materials: Provide materials complying with ANSI A108.02, ANSI standards referenced in other Part 2 articles, ANSI standards referenced by TCA installation methods specified in tile installation schedules, and other requirements specified.

C. Factory Blending: For tile exhibiting color variations within ranges, blend tile in factory and package so tile units taken from one package show same range in colors as those taken from other packages and match approved Samples.

D. Mounting: For factory-mounted tile, provide back- or edge-mounted tile assemblies as standard with manufacturer unless otherwise indicated.

1. Where tile is indicated for installation in wet areas, do not use back- or edge-mounted tile assemblies unless tile manufacturer specifies in writing that this type of mounting is suitable for
installation indicated and has a record of successful in-service performance.

E. Factory-Applied Temporary Protective Coating: Where indicated under tile type, protect exposed surfaces of tile against adherence of mortar and grout by precoating with continuous film of petroleum paraffin wax, applied hot. Do not coat unexposed tile surfaces.

2.2 TILE PRODUCTS

A. Tile Type CT-1: Tile number designates differing color.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DalTile Semi-Gloss or comparable product by one of the following:
   a. American Olean; Division of Dal-Tile International Inc.
   b. DalTile; Division of Dal-Tile International Inc.
   c. Deutsche Steinzeug America, Inc.
   d. Florida Tile Industries, Inc.
   e. Seneca Tiles, Inc.
   f. Summitville Tiles, Inc.

2. Face Size: 4-1/4 inches by 4-1/4 inches.
3. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
4. Grout Color: As selected by Architect from manufacturer's full range.
5. Trim Units: Coordinated with sizes and coursing of adjoining flat tile and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
   a. External Corners for Thin-Set Mortar Installations: quirk miter.
   b. Internal Corners: Field-butted square corners. For coved base and cap use angle pieces designed to fit with stretcher shapes.

B. Tile Type CT-2: Tile number designates differing color.

1. Basis-of-Design Product: Subject to compliance with requirements, provide DalTile Keystones Mosaic Tile or comparable product by one of the following:
   a. American Olean; Division of Dal-Tile International Inc.
   b. DalTile; Division of Dal-Tile International Inc.
   c. Florida Tile Industries, Inc.
   d. Seneca Tiles, Inc.

3. Tile Color and Pattern: As selected by Architect from manufacturer's full range.
4. Grout Color: As selected by Architect from manufacturer's full range.
5. Trim Units: Coordinated with sizes and coursing of adjoining flat tile and matching characteristics of adjoining flat tile. Provide shapes as follows, selected from manufacturer's standard shapes:
   a. Cove Base.

2.3 THRESHOLDS

A. Marble Thresholds: ASTM C 503, with a minimum abrasion resistance of 10 per ASTM C 1353 or ASTM C 241 and with honed finish.
1. Description: Uniform, fine- to medium-grained white stone with gray veining.

2.4 TILE BACKING PANELS

A. Cementitious Backer Units: ANSI A118.9 or ASTM C 1325, in maximum lengths available to minimize end-to-end butt joints.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. C-Cure; C-Cure Board 990.
   b. Custom Building Products; Wonderboard.
   c. FinPan, Inc.; Util-A-Crete Concrete Backer Board.
   d. USG Corporation; DUROCK Cement Board.

2. Thickness: 5/8 inch.

2.5 WATERPROOF MEMBRANE

A. General: Manufacturer's standard product, selected from the following, that complies with ANSI A118.10 and is recommended by the manufacturer for the application indicated. Include reinforcement and accessories recommended by manufacturer.

B. Fluid-Applied Membrane: Liquid-latex rubber or elastomeric polymer.

1. Products: Subject to compliance with requirements, provide one of the following:
   a. Boiardi Products; a QEP company; Elastiment 644 Membrane Waterproofing System.
   b. Bonsal American; an Oldcastle company; B 6000 Waterproof Membrane.
   c. Bostik, Inc.; Durabond D-222 Duraguard Membrane.
   d. C-Cure; Pro-Red Waterproofing Membrane 63.
   e. Custom Building Products; Redgard Waterproofing and Crack Prevention Membrane.
   f. Jamo Inc.; Waterproof.
   g. Laticrete International, Inc.; Laticrete Watertight Floor N' Wall Waterproofing.
   h. MAPEI Corporation; Mapelastic HPG.
   i. Southern Grouts & Mortars, Inc.; Southcrete 1100 Crack Suppression and Waterproofing.
   j. TEC; a subsidiary of H. B. Fuller Company; HydraFlex - Waterproofing Crack Isolation Membrane.

2.6 SETTING MATERIALS


1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Boiardi Products; a QEP company.
   b. Bonsal American; an Oldcastle company.
   c. Bostik, Inc.
   d. C-Cure.
   e. Custom Building Products.
   f. Jamo Inc.
2. Provide prepackaged, dry-mortar mix combined with acrylic resin liquid-latex additive at Project site.
3. For wall applications, provide mortar that complies with requirements for nonsagging mortar in addition to the other requirements in ANSI A118.4.


1. Cleavage Membrane: Asphalt felt, ASTM D 226, Type I (No. 15); or polyethylene sheeting, ASTM D 4397, 4.0 mils thick.

2.7 GROUT MATERIALS

A. Polymer-Modified Tile Grout: ANSI A118.7.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Boiardi Products; a QEP company.
   b. Bonsal American; an Oldcastle company.
   c. Bostik, Inc.
   d. C-Cure.
   e. Custom Building Products.
   f. Jamo Inc.
   g. Laticrete International, Inc.
   h. MAPEI Corporation.
   i. Southern Grouts & Mortars, Inc.
   j. Summitville Tiles, Inc.
   k. TEC; a subsidiary of H. B. Fuller Company.

2. Polymer Type: Acrylic resin in liquid-latex form for addition to prepackaged dry-grout mix.

2.8 ELASTOMERIC SEALANTS

A. General: Provide sealants, primers, backer rods, and other sealant accessories that comply with the following requirements and with the applicable requirements in Division 07 Section "Joint Sealants."

1. Use sealants that have a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
2. Use primers, backer rods, and sealant accessories recommended by sealant manufacturer.

B. Colors: Provide colors of exposed sealants to match colors of grout in tile adjoining sealed joints unless otherwise indicated.

C. One-Part, Mildew-Resistant Silicone Sealant: ASTM C 920; Type S; Grade NS; Class 25; Uses NT, G,
A, and, as applicable to nonporous joint substrates indicated, O; formulated with fungicide, intended for
sealing interior ceramic tile joints and other nonporous substrates that are subject to in-service exposures
of high humidity and extreme temperatures.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. DAP Inc.; 100 percent Silicone Kitchen and Bath Sealant.
   b. Dow Corning Corporation; Dow Corning 786.
   c. GE Silicones; a division of GE Specialty Materials; Sanitary 1700.
   e. Pecora Corporation; Pecora 898 Sanitary Silicone Sealant.
   f. Tremco Incorporated; Tremsil 600 White.
   g. 

2.9 MISCELLANEOUS MATERIALS

A. Metal Edge Strips: Angle or L-shape, height to match tile and setting-bed thickness, metallic or
   combination of metal and PVC or neoprene base, designed specifically for flooring applications;
   stainless-steel, ASTM A 666, 300 Series exposed-edge material.

B. Tile Cleaner: A neutral cleaner capable of removing soil and residue without harming tile and grout
   surfaces, specifically approved for materials and installations indicated by tile and grout manufacturers.

C. Grout Sealer: Manufacturer's standard product for sealing grout joints and that does not change color or
   appearance of grout.

2.10 MIXING MORTARS AND GROUT

A. Mix mortars and grouts to comply with referenced standards and mortar and grout manufacturers' written
   instructions.

B. Add materials, water, and additives in accurate proportions.

C. Obtain and use type of mixing equipment, mixer speeds, mixing containers, mixing time, and other
   procedures to produce mortars and grouts of uniform quality with optimum performance characteristics
   for installations indicated.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, areas, and conditions where tile will be installed, with Installer present, for
   compliance with requirements for installation tolerances and other conditions affecting performance of
   installed tile.

   1. Verify that substrates for setting tile are firm, dry, clean, free of coatings that are incompatible
      with tile-setting materials including curing compounds and other substances that contain soap,
      wax, oil, or silicone; and comply with flatness tolerances required by ANSI A108.01 for
      installations indicated.

   2. Verify that concrete substrates for tile floors installed with thin-set mortar comply with surface
finish requirements in ANSI A108.01 for installations indicated.

a. Verify that surfaces that received a steel trowel finish have been mechanically scarified.
b. Verify that protrusions, bumps, and ridges have been removed by sanding or grinding.

3. Verify that installation of grounds, anchors, recessed frames, electrical and mechanical units of work, and similar items located in or behind tile has been completed.

4. Verify that joints and cracks in tile substrates are coordinated with tile joint locations; if not coordinated, adjust joint locations in consultation with Architect.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Fill cracks, holes, and depressions in concrete substrates for tile floors installed with thin-set mortar with trowelable leveling and patching compound specifically recommended by tile-setting material manufacturer.

B. Where indicated, prepare substrates to receive waterproofing by applying a reinforced mortar bed that complies with ANSI A108.1A and is sloped 1/4 inch per foot toward drains.

C. Blending: For tile exhibiting color variations, verify that tile has been factory blended and packaged so tile units taken from one package show same range of colors as those taken from other packages and match approved Samples. If not factory blended, either return to manufacturer or blend tiles at Project site before installing.

3.3 TILE INSTALLATION

A. Comply with TCA's "Handbook for Ceramic Tile Installation" for TCA installation methods specified in tile installation schedules. Comply with parts of the ANSI A108 Series "Specifications for Installation of Ceramic Tile" that are referenced in TCA installation methods, specified in tile installation schedules, and apply to types of setting and grouting materials used.

B. Extend tile work into recesses and under or behind equipment and fixtures to form complete covering without interruptions unless otherwise indicated. Terminate work neatly at obstructions, edges, and corners without disrupting pattern or joint alignments.

C. Accurately form intersections and returns. Perform cutting and drilling of tile without marring visible surfaces. Carefully grind cut edges of tile abutting trim, finish, or built-in items for straight aligned joints. Fit tile closely to electrical outlets, piping, fixtures, and other penetrations so plates, collars, or covers overlap tile.

D. Jointing Pattern: Lay tile in grid pattern unless otherwise indicated. Lay out tile work and center tile fields in both directions in each space or on each wall area. Lay out tile work to minimize the use of pieces that are less than half of a tile. Provide uniform joint widths unless otherwise indicated.

1. For tile mounted in sheets, make joints between tile sheets same width as joints within tile sheets so joints between sheets are not apparent in finished work.
2. Where adjoining tiles on floor, base, walls, or trim are specified or indicated to be same size, align joints.
3. Where tiles are specified or indicated to be whole integer multiples of adjoining tiles on floor, base, walls, or trim, align joints unless otherwise indicated.
E. Joint Widths: Unless otherwise indicated, install tile with the following joint widths:

2. Unglazed floor tile: 1/8 inch.
3. Unglazed Wall Tile: 1/8 inch

F. Lay out tile wainscots to dimensions indicated or to next full tile beyond dimensions indicated.

G. Expansion Joints: Provide expansion joints and other sealant-filled joints, including control, contraction, and isolation joints, where indicated. Form joints during installation of setting materials, mortar beds, and tile. Do not saw-cut joints after installing tiles.

1. Where joints occur in concrete substrates, locate joints in tile surfaces directly above them.
2. Prepare joints and apply sealants to comply with requirements in Division 07 Section "Joint Sealants."

H. Metal Edge Strips: Install where exposed edge of tile flooring meets carpet, wood, or other flooring that finishes flush with top of tile.

3.4 TILE BACKING PANEL INSTALLATION

A. Install cementitious backer units and treat joints according to ANSI A108.11 and manufacturer's written instructions for type of application indicated.

3.5 WATERPROOFING INSTALLATION

A. Install waterproofing to comply with ANSI A108.13 and manufacturer's written instructions to produce waterproof membrane of uniform thickness and bonded securely to substrate.

B. Do not install tile or setting materials over waterproofing until waterproofing has cured and been tested to determine that it is watertight.

3.6 CLEANING AND PROTECTING

A. Cleaning: On completion of placement and grouting, clean all ceramic tile surfaces so they are free of foreign matter.

1. Remove latex-Portland cement grout residue from tile as soon as possible.
2. Clean grout smears and haze from tile according to tile and grout manufacturer's written instructions but no sooner than 10 days after installation. Use only cleaners recommended by tile and grout manufacturers and only after determining that cleaners are safe to use by testing on samples of tile and other surfaces to be cleaned. Protect metal surfaces and plumbing fixtures from effects of cleaning. Flush surfaces with clean water before and after cleaning.
3. Remove temporary protective coating by method recommended by coating manufacturer and that is acceptable to tile and grout manufacturer. Trap and remove coating to prevent drain clogging.

B. Protect installed tile work with kraft paper or other heavy covering during construction period to prevent staining, damage, and wear. If recommended by tile manufacturer, apply coat of neutral protective cleaner to completed tile walls and floors.

C. Prohibit foot and wheel traffic from tiled floors for at least seven days after grouting is completed.
D. Before final inspection, remove protective coverings and rinse neutral protective cleaner from tile surfaces.

3.7 INTERIOR TILE INSTALLATION SCHEDULE

A. Interior Floor Installations, Concrete Subfloor:

1. Tile Installation F122: Thin-set mortar on waterproof membrane; TCA F122.
   
a. Tile Type: CT-1.
   c. Grout: Polymer-modified sanded grout.

B. Interior Wall Installations:

1. Tile Installation W244: Thin-set mortar on cementitious backer units or fiber cement underlayment; TCA W244.
   
a. Tile Type: CT-2
   c. Grout: Polymer-modified sanded grout.

END OF SECTION 093000
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. Resilient base.
      2. Resilient molding accessories.
   B. Related Sections:
      1. Division 09 Section "Resilient Tile Flooring" for resilient floor tile.

1.3 SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Samples for Verification: For each type of product indicated, in manufacturer's standard-size Samples but not less than 12 inches (300 mm) long, of each resilient product color, texture, and pattern required.

1.4 QUALITY ASSURANCE
   A. Fire-Test-Response Characteristics: As determined by testing identical products according to ASTM E 648 or NFPA 253 by a qualified testing agency.
      1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Store resilient products and installation materials in dry spaces protected from the weather, with ambient temperatures maintained within range recommended by manufacturer, but not less than 50 deg F (10 deg C) or more than 90 deg F (32 deg C).

1.6 PROJECT CONDITIONS
   A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F (21 deg C) or more than 95 deg F (35 deg C) in spaces to receive resilient products during the following time periods:
1. 48 hours before installation.
2. During installation.
3. 48 hours after installation.

B. Until Substantial Completion, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F (13 deg C) or more than 95 deg F (35 deg C).

C. Install resilient products after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.

1. Furnish not less than 10 linear feet (3 linear m) for every 500 linear feet (150 linear m) or fraction thereof, of each type, color, pattern, and size of resilient product installed.

PART 2 - PRODUCTS

2.1 RESILIENT BASE

A. Resilient Base:

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

   a. Armstrong World Industries, Inc.
   b. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
   c. Flexco, Inc.
   d. Johnsonite (Basis of Design for Rubber base 1 & 2).
   e. Mondo Rubber International, Inc.
   f. Roppe Corporation, USA.


1. Material Requirement: Type TS (rubber, vulcanized thermoset)

C. Minimum Thickness: 0.125 inch (3.2 mm)

D. Height: 4 inches (102 mm).

E. Lengths: Coils in manufacturer's standard length.

F. Outside Corners: Job formed or preformed.

G. Inside Corners: Job formed or preformed.

H. Finish: Satin.
2.2 RESILIENT MOLDING ACCESSORY

A. Resilient Molding Accessory:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
   a. Burke Mercer Flooring Products; Division of Burke Industries, Inc.
   b. Flexco, Inc.
   c. Johnsonite.
   d. Roppe Corporation, USA.

B. Description: Reducer strip for resilient floor covering, Transition strips

C. Material: Rubber.

D. Colors and Patterns: As selected by Architect from full range of industry colors.

2.3 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.

B. Adhesives: Water-resistant type recommended by manufacturer to suit resilient products and substrate conditions indicated. Utilize low VOC less than 250g/L.

C. Stair-Tread-Nose Filler: Two-part epoxy compound recommended by resilient tread manufacturer to fill nosing substrates that do not conform to tread contours.

D. Floor Polish: Provide protective liquid floor polish products as recommended by resilient stair tread manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of resilient products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION
A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 RESILIENT BASE INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient base.

B. Apply resilient base to walls, columns, pilasters, casework and cabinets in toe spaces, and other permanent fixtures in rooms and areas where base is required.

C. Install resilient base in lengths as long as practicable without gaps at seams and with tops of adjacent pieces aligned.

D. Tightly adhere resilient base to substrate throughout length of each piece, with base in continuous contact with horizontal and vertical substrates.

E. Do not stretch resilient base during installation.

F. On masonry surfaces or other similar irregular substrates, fill voids along top edge of resilient base with manufacturer's recommended adhesive filler material.

G. Preformed Corners: Install preformed corners before installing straight pieces.

H. Job-Formed Corners:
   1. Outside Corners: Use straight pieces of maximum lengths possible. Form without producing discoloration (whitening) at bends.
   2. Inside Corners: Use straight pieces of maximum lengths possible.

3.4 RESILIENT ACCESSORY INSTALLATION

A. Comply with manufacturer's written instructions for installing resilient accessories.

B. Resilient Molding Accessories: Butt to adjacent materials and tightly adhere to substrates throughout length of each piece. Install reducer strips at edges of carpet and resilient floor covering that would otherwise be exposed.

3.5 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of resilient products.

B. Perform the following operations immediately after completing resilient product installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect resilient products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.
D. Cover resilient products until Substantial Completion.

END OF SECTION 096513
SECTION 096519 - RESILIENT TILE FLOORING

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. Vinyl composition floor tile.
   B. Related Sections:
      1. Division 09 Section "Resilient Base and Accessories" for resilient base, reducer strips, and other
         accessories installed with resilient floor coverings.

1.3 SUBMITTALS
   A. Product Data: For each type of product indicated.
   B. Samples for Initial Selection: For each type of floor tile indicated.
   C. Product Schedule: For floor tile. Use same designations indicated on Drawings.
   D. Qualification Data: For qualified Installer.
   E. Maintenance Data: For each type of floor tile to include in maintenance manuals.

1.4 QUALITY ASSURANCE
   A. Fire-Test-Response Characteristics: As determined by testing identical products according to
      ASTM E 648 or NFPA 253 by a qualified testing agency.
      1. Critical Radiant Flux Classification: Class I, not less than 0.45 W/sq. cm.

1.5 DELIVERY, STORAGE, AND HANDLING
   A. Store floor tile and installation materials in dry spaces protected from the weather, with ambient
      temperatures maintained within range recommended by manufacturer, but not less than 50 deg F or more
      than 90 deg F. Store floor tiles on flat surfaces.

1.6 PROJECT CONDITIONS

RESILIENT TILE FLOORING
A. Maintain ambient temperatures within range recommended by manufacturer, but not less than 70 deg F or more than 95 deg F, in spaces to receive floor tile during the following time periods:
   1. 48 hours before installation.
   2. During installation.
   3. 48 hours after installation.

B. Until Project Acceptance, maintain ambient temperatures within range recommended by manufacturer, but not less than 55 deg F or more than 95 deg F.

C. Close spaces to traffic during floor tile installation.

D. Close spaces to traffic for 48 hours after floor tile installation.

E. Install floor tile after other finishing operations, including painting, have been completed.

1.7 EXTRA MATERIALS

A. Furnish extra materials that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Floor Tile: Furnish 1 box for every 50 boxes or fraction thereof, of each type, color, and pattern of floor tile installed.

PART 2 - PRODUCTS

2.1 VINYL COMPOSITION FLOOR TILE (VCT-1)

A. Products: Subject to compliance with requirements, provide the following:
   1. AB ColorPlus, American Biltrite (Canada) Ltd.;
   3. Congoleum Corporation;
   4. Mannington Mills, Inc.;
   5. Tarkett, Inc.;
   6. Vinylasa Tile, Distributed by American Tile Inc.;
   7. The Mohawk Group-

B. Tile Standard: ASTM F 1066, Class 2, through-pattern tile.

C. Wearing Surface: Smooth.

D. Thickness: 0.125 inch.

E. Colors and Patterns: As selected by Architect from full range of industry colors.

2.2 INSTALLATION MATERIALS

A. Trowelable Leveling and Patching Compounds: Latex-modified, portland cement based or blended hydraulic-cement-based formulation provided or approved by manufacturer for applications indicated.
B. Adhesives: Water-resistant type recommended by manufacturer to suit floor tile and substrate conditions indicated.

1. Use adhesives that comply with the following limits for VOC content when calculated according to 40 CFR 59, Subpart D (EPA Method 24):

   a. VCT Tile Adhesives: Not more than 50 g/L.

C. Floor Polish: Provide protective liquid floor polish products as recommended by manufacturer.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates, with Installer present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work.

B. Verify that finishes of substrates comply with tolerances and other requirements specified in other Sections and that substrates are free of cracks, ridges, depressions, scale, and foreign deposits that might interfere with adhesion of floor tile.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Prepare substrates according to manufacturer's written instructions to ensure adhesion of resilient products.

B. Concrete Substrates: Prepare according to ASTM F 710.

1. Verify that substrates are dry and free of curing compounds, sealers, and hardeners.
2. Remove substrate coatings and other substances that are incompatible with adhesives and that contain soap, wax, oil, or silicone, using mechanical methods recommended by manufacturer. Do not use solvents.
3. Alkalinity and Adhesion Testing: Perform tests recommended by manufacturer. Proceed with installation only after substrates pass testing.
4. Moisture Testing: Perform tests recommended by manufacturer and as follows. Proceed with installation only after substrates pass testing.

   a. Perform anhydrous calcium chloride test, ASTM F 1869. Proceed with installation only after substrates have maximum moisture-vapor-emission rate of 3 lb of water/1000 sq. ft. in 24 hours.

C. Fill cracks, holes, and depressions in substrates with trowelable leveling and patching compound and remove bumps and ridges to produce a uniform and smooth substrate.

D. Do not install floor tiles until they are same temperature as space where they are to be installed.

1. Move resilient products and installation materials into spaces where they will be installed at least 48 hours in advance of installation.
E. Sweep and vacuum clean substrates to be covered by resilient products immediately before installation.

3.3 FLOOR TILE INSTALLATION

A. Comply with manufacturer's written instructions for installing floor tile.

B. Lay out floor tiles 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 using cut widths that equal less than one-half tile at perimeter.
   1. Lay tiles square with room axis.

C. Match floor tiles for color and pattern by selecting tiles from cartons in the same sequence as manufactured and packaged, if so numbered. Discard broken, cracked, chipped, or deformed tiles.
   1. Lay tiles with grain direction alternating in adjacent tiles (basket-weave pattern) in pattern of colors and sizes indicated.

D. Scribe, cut, and fit floor tiles to butt neatly and tightly to vertical surfaces and permanent fixtures including built-in furniture, cabinets, pipes, outlets, and door frames.

E. Extend floor tiles into toe spaces, door reveals, closets, and similar openings. Extend floor tiles to center of door openings.

F. Maintain reference markers, holes, and openings that are in place or marked for future cutting by repeating on floor tiles as marked on substrates. Use chalk or other nonpermanent, nonstaining marking device.

G. Adhere floor tiles to flooring substrates using a full spread of adhesive applied to substrate to produce a completed installation without open cracks, voids, raising and puckering at joints, telegraphing of adhesive spreader marks, and other surface imperfections.

3.4 CLEANING AND PROTECTION

A. Comply with manufacturer's written instructions for cleaning and protection of floor tile.

B. Perform the following operations immediately after completing floor tile installation:
   1. Remove adhesive and other blemishes from exposed surfaces.
   2. Sweep and vacuum surfaces thoroughly.
   3. Damp-mop surfaces to remove marks and soil.

C. Protect floor tile products from mars, marks, indentations, and other damage from construction operations and placement of equipment and fixtures during remainder of construction period.

D. Floor Polish: Remove soil, visible adhesive, and surface blemishes from floor tile surfaces before applying liquid floor polish.
   1. Apply three coat(s).

E. Cover floor tile until Substantial Completion.
SECTION 099113 - EXTERIOR PAINTING

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 surface preparation and the application of paint systems on the following exterior substrates:
   1. Wood.
   2. Fiber cement board.

B. Related Sections include the following:
   1. Division 09 Section "Interior Painting" for surface preparation and the application of paint systems on interior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

1.4 QUALITY ASSURANCE

A. MPI Standards:
   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."

B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.
1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
   a. Vertical and Horizontal Surfaces: Provide samples of at least 100 sq. ft..
   b. Other Items: Architect will designate items or areas required.

2. Final approval of color selections will be based on benchmark samples.
   a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING
A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS
A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.
B. Do not apply paints in snow, rain, fog, or mist; when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS
A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.
   1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

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:
   1. Benjamin Moore & Co.
   2. Duron, Inc.
3. ICI Paints.
4. PPG Architectural Finishes, Inc.
5. Sherwin-Williams Company (The).

2.2 PAINT, GENERAL

A. Material Compatibility:
   1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
   2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. Colors: As selected by Architect from manufacturer's full range.

2.3 PRIMERS/SEALERS

C. Bonding Primer (Water Based): MPI #17.

2.4 WOOD PRIMERS


2.5 EXTERIOR LATEX PAINTS

E. Exterior Latex (Semigloss): MPI #11 (Gloss Level 5).

2.3 EXTERIOR ALKYD PAINTS

A. Exterior Alkyd Enamel (Semigloss): MPI #94 (Gloss Level 5).
   1. VOC Content: E Range of E2.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Wood: 15 percent.
C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION
A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates and paint systems indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
   2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

D. Fiber Cement Board
   1. Prime cut edges
   2. After priming, fill holes and imperfections in the finish surface with putty or plastic wood filler, verify capatability with substrate material. Sand smooth when dried.

E. Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

3.3 APPLICATION
A. Apply paints according to manufacturer's written instructions.
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable items same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed items with prime coat only.
B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
   1. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 EXTERIOR PAINTING SCHEDULE

A. Fiber Cement Board and panel Substrates:
   1. Latex System: MPI EXT 9.2A.
      c. Topcoat: Exterior latex (semigloss).

END OF SECTION 099113

EXTERIOR PAINTING 099113 - 5
SECTION 099123 - INTERIOR PAINTING (NOTE: ALL INTERIOR PAINTING BY VOLUNTEER STAFF; ALL INTERIOR SURFACE PREPARATION BY GC).

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 surface preparation and the application of paint systems on the following interior substrates:
   1. Concrete.
   2. Wood.

B. Related Sections include the following:
   1. Division 09 Section "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Samples for Initial Selection: For each type of topcoat product indicated.

C. Product List: For each product indicated, include the following:
   1. Cross-reference to paint system and locations of application areas. Use same designations indicated on Drawings and in schedules.
   2. Printout of current "MPI Approved Products List" for each product category specified in Part 2, with the proposed product highlighted.

D. Project paint information schedule

1.4 QUALITY ASSURANCE

A. MPI Standards:
   1. Products: Complying with MPI standards indicated and listed in "MPI Approved Products List."
B. Mockups: Apply benchmark samples of each paint system indicated and each color and finish selected to verify preliminary selections made under sample submittals and to demonstrate aesthetic effects and set quality standards for materials and execution.

1. Architect will select one surface to represent surfaces and conditions for application of each paint system specified in Part 3.
   a. Wall and Ceiling Surfaces: Provide samples of at least 100 sq. ft..
   b. Other Items: Architect will designate items or areas required.

2. Apply benchmark samples after permanent lighting and other environmental services have been activated.

3. Final approval of color selections will be based on benchmark samples.
   a. If preliminary color selections are not approved, apply additional benchmark samples of additional colors selected by Architect at no added cost to Owner.

1.5 DELIVERY, STORAGE, AND HANDLING

A. Store materials not in use in tightly covered containers in well-ventilated areas with ambient temperatures continuously maintained at not less than 45 deg F.

1. Maintain containers in clean condition, free of foreign materials and residue.
2. Remove rags and waste from storage areas daily.

1.6 PROJECT CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F.

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F above the dew point; or to damp or wet surfaces.

1.7 EXTRA MATERIALS

A. Furnish extra materials described below that are from same production run (batch mix) as materials applied and that are packaged for storage and identified with labels describing contents.

1. Quantity: Furnish an additional 5 percent, but not less than 1 gal. of each material and color applied.

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:

1. Benjamin Moore & Co.
2. Duron, Inc.
3. Envirocoat Technologies Inc.
4. ICI Paints.
5. PPG Architectural Finishes, Inc.

2.2 PAINT, GENERAL

A. Material Compatibility:

1. Provide materials for use within each paint system that are compatible with one another and substrates indicated, under conditions of service and application as demonstrated by manufacturer, based on testing and field experience.
2. For each coat in a paint system, provide products recommended in writing by manufacturers of topcoat for use in paint system and on substrate indicated.

B. VOC Content of Field-Applied Interior Paints and Coatings: Provide products that comply with the following limits for VOC content, exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24); these requirements do not apply to paints and coatings that are applied in a fabrication or finishing shop:

1. Flat Paints, Coatings, and Primers: VOC content of not more than 50 g/L.
2. Nonflat Paints, Coatings, and Primers: VOC content of not more than 150 g/L.
3. Anti-Corrosive and Anti-Rust Paints Applied to Ferrous Metals: VOC not more than 250 g/L.
4. Floor Coatings: VOC not more than 100 g/L.
5. Shellacs, Clear: VOC not more than 730 g/L.
6. Shellacs, Pigmented: VOC not more than 550 g/L.

C. Colors: As selected by Architect from manufacturer's full range.

2.3 PRIMERS/SEALERS

A. Interior Latex Primer/Sealer: MPI #50.

B. Wood-Knot Sealer: Sealer recommended in writing by topcoat manufacturer for use in paint systems indicated.

2.4 WOOD PRIMERS

A. Interior Latex-Based Wood Primer: MPI #39.
2.5 LATEX PAINTS

A. Institutional Low-Odor/VOC Latex (Low Sheen): MPI #144 (Gloss Level 2).
B. Institutional Low-Odor/VOC Latex (Semigloss): MPI #147 (Gloss Level 5).

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of work.

B. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   1. Concrete: 12 percent.
   3. Wood: 15 percent.
   4. Gypsum Board: 12 percent.

C. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers.

D. Begin coating application only after unsatisfactory conditions have been corrected and surfaces are dry.
   1. Beginning coating application constitutes Contractor's acceptance of substrates and conditions.

3.2 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Architectural Painting Specification Manual" applicable to substrates indicated.

B. Remove plates, machined surfaces, and similar items already in place that are not to be painted. If removal is impractical or impossible because of size or weight of item, provide surface-applied protection before surface preparation and painting.
   1. After completing painting operations, use workers skilled in the trades involved to reinstall items that were removed. Remove surface-applied protection if any.
   2. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.

C. Clean substrates of substances that could impair bond of paints, including dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers as required to produce paint systems indicated.

INTERIOR PAINTING
D. Concrete Substrates: Remove release agents, curing compounds, efflorescence, and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces to be painted exceeds that permitted in manufacturer's written instructions.

E. Wood Substrates:
   1. Scrape and clean knots, and apply coat of knot sealer before applying primer.
   2. Sand surfaces that will be exposed to view, and dust off.
   3. Prime edges, ends, faces, undersides, and backsides of wood.
   4. After priming, fill holes and imperfections in the finish surfaces with putty or plastic wood filler. Sand smooth when dried.

F. Gypsum Board Substrates: Do not begin paint application until finishing compound is dry and sanded smooth.

3.3 APPLICATION

A. Apply paints according to manufacturer's written instructions.
   1. Use applicators and techniques suited for paint and substrate indicated.
   2. Paint surfaces behind movable equipment and furniture same as similar exposed surfaces. Before final installation, paint surfaces behind permanently fixed equipment or furniture with prime coat only.
   3. Paint front and backsides of access panels, removable or hinged covers, and similar hinged items to match exposed surfaces.

B. Tint each undercoat a lighter shade to facilitate identification of each coat if multiple coats of same material are to be applied. Tint undercoats to match color of topcoat, but provide sufficient difference in shade of undercoats to distinguish each separate coat.

C. If undercoats or other conditions show through topcoat, apply additional coats until cured film has a uniform paint finish, color, and appearance.

D. Apply paints to produce surface films without cloudiness, spotting, holidays, laps, brush marks, roller tracking, runs, sags, ropiness, or other surface imperfections. Cut in sharp lines and color breaks.

E. Painting Mechanical and Electrical Work: Paint items exposed in equipment rooms and occupied spaces including, but not limited to, the following:
   1. Mechanical Work:
      a. Uninsulated metal piping.
      b. Uninsulated plastic piping.
      c. Pipe hangers and supports.
      d. Tanks that do not have factory-applied final finishes.
      e. Visible portions of internal surfaces of metal ducts, without liner, behind air inlets and outlets.
      f. Duct, equipment, and pipe insulation having cotton or canvas insulation covering or other paintable jacket material.
Mechanical equipment that is indicated to have a factory-primed finish for field painting.

2. Electrical Work:
   a. Switchgear.
   b. Panelboards.
   c. Electrical equipment that is indicated to have a factory-primed finish for field painting.

3.4 FIELD QUALITY CONTROL

A. Testing of Paint Materials: Owner reserves the right to invoke the following procedure at any time and as often as Owner deems necessary during the period when paints are being applied:
   1. Owner may direct Contractor to stop applying paints if test results show materials being used do not comply with product requirements. Contractor shall remove noncomplying-paint materials from Project site, pay for testing, and repaint surfaces painted with rejected materials. Contractor will be required to remove rejected materials from previously painted surfaces if, on repainting with complying materials, the two paints are incompatible.

3.5 CLEANING AND PROTECTION

A. At end of each workday, remove rubbish, empty cans, rags, and other discarded materials from Project site.

B. After completing paint application, clean spattered surfaces. Remove spattered paints by washing, scraping, or other methods. Do not scratch or damage adjacent finished surfaces.

C. Protect work of other trades against damage from paint application. Correct damage to work of other trades by cleaning, repairing, replacing, and refinishing, as approved by Architect, and leave in an undamaged condition.

D. At completion of construction activities of other trades, touch up and restore damaged or defaced painted surfaces.

3.6 INTERIOR PAINTING SCHEDULE

A. Dressed Lumber Substrates: Including architectural woodwork.
   1. Institutional Low-Odor/VOC Latex System: MPI INT 6.3V.

B. Wood Panel Substrates: Including medium-density fiberboard.
1. Latex System: MPI INT 6.4R.
   c. Topcoat: Interior latex (gloss).

C. Gypsum Board Substrates:

1. Institutional Low-Odor/VOC Latex System: MPI INT 9.2M.

END OF SECTION 099123
SECTION 102113 – PHENOLIC TOILET COMPARTMENTS

PART 1 - GENERAL

1.1 SUMMARY: PROVIDE IN LOCATIONS AS INDICATED ON THE DRAWINGS

A. Section Includes:
   1. Compartments.
   2. Screens.
      a. Urinal screens.

B. Related Sections:
   1. Toilet accessories: Elsewhere in Division 10.

1.2 REFERENCES


1.3 SUBMITTALS

A. Product Data: Submit written technical information for each distinct panel system indicated. Include data on hardware, accessories, leveling-and-anchorage devices, and fasteners.

B. Shop Drawings: Submit shop drawings detailing construction of compartments.
   1. Show layout of panels and associated hardware and accessories.
   2. Include details showing panel connections, anchorage, and support systems.

C. Coordination Drawings: Before distribution to installers, submit coordination drawings specified under "Coordination" for information.

D. Samples for Initial Selection: Submit manufacturer's standard samples for the following:
   1. Panel color samples: Submit for each distinct type of panel system required.
   2. Hardware and accessory samples: Submit for each type of panel system required.

E. Panel Color Verification Samples: Submit 6-inch-square samples of each panel finish type and color to be installed.

F. Manufacturer's Qualification Statement: Submit statement indicating compliance with qualifications
requirements specified under "Quality Assurance."

G. Installer's Qualification Statement: Submit statement indicating compliance with qualifications requirements specified under "Quality Assurance."

H. Manufacturer's Instructions: Submit for each product specified in this section. Include instructions for examination, preparation, and protection of adjacent work.

I. Maintenance Data: Submit for each product specified in this section. Include instructions for cleaning and preventive maintenance.

1.4 QUALITY ASSURANCE

A. Manufacturer's Qualifications: A company regularly engaged in manufacture of products specified in this section, and whose products have been in satisfactory use under similar service conditions for not less than 10 years.

B. Installer's Qualifications: A company regularly engaged in installation of products specified in this section, with a minimum of 10 years of experience.

C. Regulatory Requirements: Products and finished installations to be used by handicapped persons must comply with requirements of North State Accessibility Code and the ADA.

1.5 PROJECT CONDITIONS

A. Field Measurements: If possible, determine field measurements before beginning shop fabrication. Wherever field measurements have not been made before fabrication, provide components capable of adjustment during installation.

1.6 COORDINATION

A. Use manufacturer's instructions and data to determine anchorage requirements for panel systems. In a timely manner, distribute to affected installers of related work those system components and anchorage devices provided by panel manufacturer for incorporation into other work.

B. Coordination Drawings: Prepare coordination drawings for panel system assemblies. Include information necessary to properly coordinate work of this section with other work. Distribute to affected installers of related work.

PART 2 - PRODUCTS

2.1 PANEL SYSTEMS

A. Compartments: Provide compartments fabricated of partitions and erected using the following panel systems at locations indicated on the drawings:

1. Phenolic core with decorative finish
B. Screen Systems: Provide screens erected using the following panel systems at locations indicated on the drawings:

1. Phenolic core with decorative finish

2.2 PANEL MATERIALS

A. General: Provide manufacturer's standard panels fabricated for installations indicated. Provide internal reinforcement as required for hardware and accessories. Premachine panels for field installation.

B. Panels, doors and pilasters shall be made of multiples layers of phenolic resin impregnated kraft papers compressed under heat and pressure, the phenolic component is decoratively faced as an integral part of the core. No two part construction will be accepted. Construction: Stiles and doors shall be made of phenolic core to a correct dimension producing a stile unit of not less than 3/4" thick and door unit of not less than 3/4" thick.

1. Panel colors: Selected by architect, after contract award, from manufacturer's complete set of standard colors, if basis of design is not utilized.

2. Hardware, accessories, and mounting brackets: Manufacturer's standard styles. The following materials will be acceptable:

   a. Stainless steel.

3. Manufacturers: Provide products complying with requirements of the contract documents and made by one of the following:

   b. General Partitions Corporation.
   c. Capital Partitions Corporation

2.3 ACCESSORIES

A. General: Provide hardware and accessories as necessary to properly install panel systems indicated.

1. Hardware, accessories, and mounting brackets: Selected by architect, after contract award, from manufacturer's standard styles. Provide continuous angle for mounting at wall connections.

2. Hinge: Self-closing, pivot type hinge, recess-mounted within door; adjustable to permit door to rest at any angle.

3. Latch for nonhandicapped compartments: Concealed type, with emergency access feature. Provide stop and keeper with rubber bumper.

4. Latch for handicapped compartments: Surface-mounted sliding latch (for inner side of compartment doors), with emergency access feature, designed for use by handicapped persons.

5. Door pull for handicapped compartments (for outer side of compartment doors): Suitable for use by handicapped persons.

6. Combination coat hook with rubber bumper: Provide unit of sufficient length to prevent compartment door from striking installed toilet accessories.

7. Leveling-and-anchorage devices: Rust-resistant steel devices as recommended by panel manufacturer for installation of panels in conditions indicated.

8. Pilaster shoes: ASTM A 167 (Type 302/304) minimum 20 gage stainless steel, finish to match compartment hardware. Minimum shoe height: 3 inches.
9. Fasteners: Tamper-resistant rust-proof, exposed fasteners as recommended by panel manufacturer for installation of panels and hardware in conditions indicated. Finish to match hardware.
10. Overhead bracing: Antigrip headrail bracing fabricated from continuous extruded aluminum, clear anodized finish.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that conditions conform to requirements of contract documents.

B. Verify all dimensions by field measurements.

C. Verify locations of plumbing fixtures to determine placement of panel assemblies.

D. Verify that anchorage devices, provided by panel manufacturer to installers of related work, have been properly installed and aligned.

E. Correct unsatisfactory substrate conditions before start of panel system installation.

3.2 INSTALLATION

A. Perform installation in accordance with manufacturer's instructions, except where more restrictive requirements are shown, specified, or are necessary for project conditions.

B. Secure panels using number and type of brackets recommended by manufacturer for conditions indicated. Provide continuous angle at wall mounting.

1. Panels attached to unit masonry walls: Where possible, place brackets so that anchorage fasteners penetrate joints, not masonry units.

C. Compartments:

1. Securely attach panels to pilasters using manufacturer's recommended number and type of brackets. Align brackets with corresponding brackets at wall connections. Clearances exceeding 1/2 inch between panels and pilasters are not acceptable. Provide level, plumb installation.


   a. Compartments with doors: Properly align door.

D. Screens:

1. Form solid connection between panel system and building structure using manufacturer's recommended devices for conditions indicated. Anchorage must be designed to support weight of panels without damaging building finishes. Provide level, plumb installation. Provide screens capable of resisting impacts and stresses imposed during anticipated use and maintenance.

E. Hardware and Accessories: Mount items in accordance with manufacturer's instructions.
3.3 ADJUSTING

A. Operating Hardware:

1. In-swinging door: Adjust hinges to automatically bring door to rest in fully closed position when door is not latched.
2. Out-swinging door: Adjust hinges to automatically bring door to rest at an angle approximately 30 degrees from fully closed position when door is not latched.

3.4 CLEANING

A. Clean panel system components using manufacturer's recommended procedures and cleaning agents.

3.5 PROTECTION

A. Protect installed components from damage until project completion.

END OF SECTION 102113
SECTION 104413 - FIRE EXTINGUISHER CABINETS AND ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY-

A. This section includes:
   1. Fire extinguisher cabinets.

1.2 SUBMITTALS

A. Product Data: Manufacturer's data showing compliance with contract documents. Verify cabinet thickness with partition thickness to maintain required fire resistant rating of partition.

B. Samples: Finishes of cabinets, on actual or similar material.

C. Operating and Maintenance Data: Instruction manual complying with requirements of NFPA 10.

PART 2 - PRODUCTS

2.1 CABINETS AND CABINET ACCESSORIES

A. Manufacturers: Products of the following manufacturers, provided they comply with requirements of contract documents, will be among those considered acceptable:

   1. Cabinets and accessories:
      a. J.L. Industries.
      b. Larsen's Manufacturing Company.
      c. Modern Metal Products, Division of Technico.
      d. Samson Metal Products, Inc.
      e. Thomas Enterprises.

B. Fire Extinguisher Cabinets:

   1. Basis of design: "FS SS 2409-RK fire rated full glass door" Larsen's
      a. Products of other manufacturers, provided they comply with requirements of contract documents, will be acceptable.
      b. To house one extinguisher –PROVIDED by Contractor. Extinguisher: Multi-purpose 10 lb.

   2. Size: 27 1/2 inches high, 13 inches wide and 3 3/4” inches deep, semi-recessed into wall.
   3. Style: Semi-recessed mounted, protruding not more than 2-1/2 inches from face of wall.
      a. Square trim.
4. Single flat door.
   a. Full glazing, with frame.
      1) Tempered glass, 1/4 inch thick.
      2) Clear.
   b. Door material: Stainless steel, satin finished.
   c. Surface mounted door handle, finished to match door.
   d. Friction or roller catch.

5. Trim (box flange or frame): Same material and finish as door.

6. Manufacturer's standard vertical lettering identifying contents of cabinet.
   a. Die-cut vinyl letters.
   b. Letter color: Black.


C. Hinges: Provide hinges for each door; concealed or continuous type; allow full 180 degree opening of door.
   1. Exposed hinges: Finish to match door.

PART 3 - EXECUTION

3.1 PREPARATION

A. Prepare openings for recessed cabinets.

3.2 INSTALLATION

A. Perform installation in accordance with the manufacturer's instructions except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.

B. Install cabinets at locations indicated or at areas throughout the structure that prevent a travel distance of more than 75'-0". Final location shall be coordinated with architect.

C. Install with top of cabinet not more than 48 inches above finish floor.

END OF SECTION 10523
SECTION 108000 - TOILET AND BATH ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Toilet paper dispensers
   2. Grab bars.
   3. Soap dispensers
   4. Paper Towel dispensers

1.2 SUBMITTALS

A. Product Data: Written technical information for each accessory specified.

B. Shop Drawings:
   1. Submit rough-in drawings. Include the following details and all other information necessary to demonstrate compliance with contract documents:
      a. Dimensions.
      b. Rough-in requirements.
      c. Required clearances.
      d. Methods of assembling components.
      e. Anchorages.

C. Certificates: Submit certification that work complies with requirements of contract documents.

D. Qualifications Statements: Submit statements indicating compliance with qualifications requirements specified under "Quality Assurance."

E. Manufacturer's Instructions: Submit for each product specified in this section.
   1. Include installation instructions and instructions for examination, preparation, and protection of adjacent work.

1.3 QUALITY ASSURANCE

A. Manufacturer's Qualifications: A company regularly engaged in manufacture of products specified in this section, whose products have been in satisfactory use, under similar service conditions, for not less than 10 years.

B. Installer's Qualifications: A company regularly engaged in installation of products specified in this section, with a minimum of 10 years of experience.
1.4 DELIVERY, STORAGE, AND HANDLING

A. Execute product manufacturer's special instructions to prevent damage to products. Store products in manufacturer's original shipping containers.

1.5 COORDINATION

A. Use manufacturer's instructions and data to determine anchorage requirements for products specified. In a timely manner, distribute the following to affected installers of related work:
   1. Components and anchorage devices provided by toilet accessory manufacturer for incorporation into other work.
   2. Coordination data including setting drawings, templates, instructions, etc., for cutouts and installations.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. For each distinct type of toilet accessory, provide accessories fabricated by a single manufacturer.

B. All model numbers specified are products of Bobrick

C. Only equivalent products of the following other manufacturers, provided they comply with requirements of the contract documents, will be considered acceptable:

   1. American Specialties, Inc.
   2. Bobrick Washroom Equipment, Inc.

2.2 TOILET ACCESSORIES

A. Toilet Paper Dispenser:
   1. Bobrick B-2740 Double roll, heavy duty type

B. Roll towel Dispenser:
   1. Basis of design: Model B-52860 Surface Mount; Bobrick
      a. ABS Plastic Grey Color.

C. Grab Bar 1 :
   1. Basis of design: Model No.B-6806.99x36; Bobrick.

D. Grab Bar 2 :
1. Basis of design: Model No:B-6806.99x42; Bobrick, .

E. Grab Bar 3 :
1. Basis of design: Model No:B-6806.99x24; Bobrick, .

F. Grab Bar 4 :
1. Basis of design: Model No:B-6806.99x48; Bobrick, .

G. Grab Bar 5 :
1. Basis of design: Model No:B-6806.99x18; Bobrick, .

H. Soap Dispenser:
1. Basis of design: Model B-2111, Surface Mount; Bobrick
   a. Stainless steel.

I. Glass mirror with stainless steel angle frame.
1. Basis of Design: B-290;Bobrick

2.3 MATERIALS

A. Mounting Devices and Fasteners: Provide toilet accessory manufacturer's recommended items for substrates and conditions indicated.

2.4 FABRICATION

A. Manufacturer's Trademarks and Model Numbers: Neither name nor trademark of manufacturer is acceptable on exposed surfaces of accessories, unless approved by the architect. Permanently affix manufacturer's name and model number to unexposed surface of accessory.

B. Surface Mounted Accessories: Where possible, design accessory to provide concealed anchorage when installed. Precisely-fit seams and joints. Roll exposed edges unless indicated otherwise. Use full-length stainless steel piano-type hinges for access doors and panels.

C. Recess Mounted Accessories: Design accessories to provide concealed anchorage when closed. Weld all joints. Precisely miter corners where indicated. Use full-length stainless steel piano-type hinges for access doors and panels.

PART 3 - EXECUTION
3.1 EXAMINATION
   A. Accessory Locations: Coordinate accessory locations with other work to avoid interference and to ensure proper operation and servicing of accessories. Notify the architect in writing of any conflicts concerning product placement, for resolution. Do not proceed without resolution.
   B. Correct unsatisfactory substrate conditions before start of accessory installation.

3.2 PREPARATION
   A. Clean surfaces to receive accessories. Protect surrounding elements from damage during accessory installation.

3.3 INSTALLATION
   A. Perform installation in accordance with manufacturer's instructions, except where more stringent requirements are shown or specified, and except where project conditions require extra precautions or provisions to ensure satisfactory performance of the work.
   B. Provide plumb, level accessory installations.
   C. Securely attach accessories to substrate.
   D. Accessories Installed for Use by Handicapped Persons: Install as indicated on drawings.

3.4 ADJUSTING
   A. Adjust accessories as required to provide smooth operation and trouble free servicing.

3.5 CLEANING
   A. Clean and polish exposed surfaces of accessories using accessory manufacturer's recommended procedures and cleaning agents.

3.6 PROTECTION
   A. Provide coverings as required to protect installed accessories.

END OF SECTION 108000
DIVISION 22 - PLUMBING

DODD MEADOWS COMMUNITY CENTER
HENDERSON COUNTY
CREST ROAD & EAST BLUE RIDGE ROAD
EAST FLAT ROCK, NORTH CAROLINA 28726

CLARK NEXSEN PROJECT #5917

ESE PROJECT NO.: 7526

ESSENTIAL SYSTEMS ENGINEERING, P.A.
LICENSE NUMBER: C-0516
109 CENTRAL AVENUE
ASHEVILLE, NORTH CAROLINA  28801
(828) 232-1695

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PRELIMINARY
NOT FOR CONSTRUCTION

MARCH 9, 2015
SECTION 220500 - PLUMBING GENERAL REQUIREMENTS

PART 1 GENERAL

1.1 WORK INCLUDED

1. Work consists of furnishing all labor, material, equipment and services necessary and reasonably incidental to the proper completion and proper operation of the plumbing systems.

1.2 DEFINITIONS

A. Words and phrases used throughout the Contract Documents shall be interpreted as indicated below:

1. Contractor - The person or organization awarded the contract for construction services. In the case of a construction project administered as a multiple-prime contract, the term shall be further defined as the Contractor holding a prime contract for plumbing construction work. Any reference to “contractor” or “subcontractor” shall be superseded by the actual contractual arrangement used on the project.

2. The term "Plumbing Contractor" is used interchangeably with the term Contractor.

3. Provide - To furnish and install materials, equipment or systems.

4. Submittals - Submittals shall include Manufacturer's Catalog Data, Shop Drawings, Calculations, Certificates of Compliance, Testing Reports, Samples, and Operation and Maintenance Manuals.

5. Professional - The Architect and/or Engineer of record.

6. Work By Others - Work provided by a person or organization other than the Contractor.

1.3 CODES, REFERENCES AND STANDARDS

A. The Contractor shall comply with all laws, ordinances, and regulations of all Authorities Having Jurisdiction, including those of all applicable City, County, State, Federal and Public Utility entities. All licenses, permits, fees, connection fees, tapping fees, inspection fees, etc., shall be obtained by the Contractor and the cost shall be included in the Contract price.

B. The publications listed below form a part of this specification to the extent referenced. All publications shall be the latest edition as adopted by the Authority Having Jurisdiction. The publications are referred to in the text by basic designation only.

1. American National Standards Institute (ANSI)  ANSI/NSF 372
   11 W. 42nd St.
   New York, New York 10036

2. American Water Works Association (AWWA)
   6666 West Quincy Avenue
   Denver, Colorado 80235

3. Cement Mortar Lining for Ductile-Iron Pipe
   ANSI A21.4  AWWA C104
4. Rubber Gasket Joints for Ductile-Iron Pipe  
   ANSI A21.11  AWWA C111
5. Ductile-Iron Pipe  
   ANSI A21.51  AWWA C151
6. Cast Iron Screwed Fittings  
   ANSI B16.4
7. Cast Iron Drainage Fittings, Threaded  
   ANSI B16.12
8. Pipe Fittings, Bronze, and 250 lb. Cast  
   ANSI B16.15
9. Cast Copper Alloy Solder-Joint Pressure Fittings  
   ANSI B16.18
10. Solder-Joint Fittings, Pressure Wrought Copper and Copper Alloy  
    ANSI B16.22
11. Cast Copper Alloy Solder-Joint Drainage Fittings  
    ANSI B16.23
12. Bronze Pipe Flanges and Flanged Fittings  
    ANSI B16.24
13. Solder-joint fittings, Drainage, DWV Wrought Copper and Copper Alloy  
    ANSI B16.29
14. American Society of Heating Refrigeration (ASHRAE) and Air Conditioning Engineers  
    1791 Tullie Circle NE  
    Atlanta, GA 30329
15. American Society of Mechanical Engineers (ASME)  
    345st 47th Street  
    New York, New York 10017
16. Cast Copper Alloy Fittings for Flared Copper Tubes  
    ASME Boiler and Pressure Vessel Code.  
    Section IV Low Pressure Heating Boilers.  
    Section VIII, Unfired Pressure Vessels.
17. American Society of Testing and Materials (ASTM)  
    1916 Race Street  
    Philadelphia, PA 19103
18. Cast Iron Soil Pipe and Fittings Hub and Spigot  
    ASTM A74
19. Seamless Copper Water Tube  
    ASTM B88
20. Copper Tube, Drainage DWV  
    ASTM B306
21. Recommended Practices for Laying Sewer Pipe  
    ASTM C-12
22. ASTM D1557, Method D and ASTM D1556S Sand Cone Method
23. Billet-Steel Bars for Concrete Reinforcement,  
    ASTM Spec. A-615
24. Cast Iron Soil Pipe Institute (CISPI)  
1400 Chain Bridge Road  
McLean, VA  22101

25. Cast Iron Soil Pipe and Fittings  
For Hubless Cast Iron Sanitary Systems  
CISPI301

26. Manufacturer's Standardization Society (MSS)  
5203 Leesburg Pike, Suite 502  
Falls Church, VA  22041

27. Unions, Brass or Bronze, 250 pounds  
MSS-SP-72

28. Private Fire Service Main and Their Appurtenances  
NFPA24

29. National Fire Protection Association (NFPA)  
1 Batterymarch Park  
Quincy, MA 02269

30. Flammable and Combustible Liquids Code  
NFPA 30

31. Standard on Fire Protection for Laboratories Using Chemicals  
NFPA 45

NFPA 54

33. National Electrical Code  
NFPA 70

34. Handling Underground Releases of Flammable and Combustible Liquids  
NFPA 329

35. North Carolina Department of Labor  
Boiler and Pressure Vessel Division  
4 West Edenton Street  
Raleigh, North Carolina 27601-1092

36. The Uniform Boiler and Pressure Vessel Act of North Carolina and Administrative Rules  
January 1995

37. Plumbing and Drainage Institute (PDI)  
5342 Boulevard Place  
Indianapolis, IN 46208

38. Shock Absorbers  
PDI WH 201

a. General Construction  
b. Plumbing  
c. Mechanical  
d. Fuel Gas Code  
e. Energy
1.4 QUALITY ASSURANCE, WORKMANSHIP AND COORDINATION

A. The Contractor must coordinate his work with that of the other trades so that the all will be performed in an orderly manner and with the least possible interference. Where coordination with other trades is required, the Professional shall make the final decision regarding changes to be made in the work.

B. The Contractor must thoroughly familiarize himself with all specifications and drawings for the project so that he clearly understands his responsibility in relationship to the work to be performed. The Contractor must plan and perform his work so as to permit the use of the building at the earliest possible date.

C. The Contractor shall guarantee the workmanship, materials and equipment, furnished against defects, leaks, performance and non-operation for a period of one (1) year after the date of final acceptance. Defective workmanship shall be construed as meaning defective materials and unsatisfactory installation and not intended to apply to ordinary wear and tear. The Contractor shall pay for any repairs or replacements caused by defective workmanship as construed herein within the period covered by the Guarantee, including all incidental work required to correct the deficiency.

D. The Contractor shall expressly and completely follow all manufacturer instructions required for validation of the manufacturer's warranty agreement including but not limited to service, maintenance and adjustments of the equipment.

E. The Contractor will be held responsible for the proper installation of all materials and equipment required for a complete installation within the intent and meaning of the Contract Documents.

1.5 PROJECT RECORD DRAWINGS

A. Changes from the Contract Drawings necessary to coordinate the work with other trades, to conform to the building conditions or to conform to the rules and regulations of Authorities Having Jurisdiction shall be made only after obtaining written permission from the Professional.

B. The Contractor shall keep a record of construction changes and deviations from the original Contract Drawings. All changes shall be recorded on a separate set of blueprints and shall be kept at the job site specifically for that purpose. The record shall be made immediately after the work is completed.

C. Documentation shall include:

1. location and elevation of new and existing utility lines
2. points of connection to existing utility lines
3. changes in pipe routing location
4. valve locations
5. equipment locations, etc.
6. actual capacities and values of equipment provided as indicated in equipment schedules.
7. The marked-up record set of drawings shall be delivered to the Professional before final acceptance of the Plumbing Contract work.

1.6 FIELD MEASUREMENTS

A. It shall be the Contractor's responsibility to verify the location of any and all existing underground utilities in the vicinity of his work. When it has been indicated that these utilities
are to remain in place, the Contractor shall provide adequate means of support and protection during excavation operations.

B. Before ordering any equipment and material, or performing any work, the Contractor shall verify all measurements and dimensions at the job site and shall be held responsible for the correctness of same.

C. No extra compensation will be allowed on account of differences between actual dimensions and measurements and those indicated on the drawings.

D. Any differences which are identified shall be submitted to the Professional for consideration before proceeding with the work.

1.7 PROTECTION OF SERVICES AND EQUIPMENT

A. The Contractor, at his own expense, shall repair, replace and maintain in service any utilities, facilities or services (underground, aboveground, interior or exterior) damaged, broken, or otherwise rendered inoperative during the course of construction due to activities on the part of the Contractor. The method used by the Contractor in repairing, replacing or maintaining the services shall be approved by the Professional.

B. The Contractor shall protect, at his own expense, such of his work, materials or equipment that is subject to damage during the project duration. All openings into any piping, ducts or equipment must be securely covered, or otherwise protected, to prevent injury due to carelessly or maliciously dropped tools or materials, grit, dirt, or any foreign material. The Contractor shall be held responsible for all damage so done until his work is fully and finally accepted.

C. It shall be the responsibility of the Contractor to protect motors, pumps, electrical equipment, and all similar items of equipment from dirt, grime, plaster, water, etc. during all phases of construction. This protection shall be provided by covering equipment with transparent plastic sheeting and/or locating the materials and equipment in an area free from the elements.

1.8 INTERRUPTION OF SERVICES

A. Occupancy: The work is to be performed in and around existing facilities that are occupied by the public as a place of business. The work shall be coordinated and scheduled with the Owner and/or Owner’s representatives to minimize any disruption to normal functions and occupancy of the facility.

B. The Contractor shall schedule his work to avoid any major interruption of any utility services.

C. Existing utilities serving facilities occupied and used by the Owner or others shall not be interrupted except when such interruptions have been authorized in writing by the Owner or the Professional. Interruptions shall occur only after an acceptable temporary utility services have been provided. The Contractor shall provide a minimum of ten (10) working days notice to the owner and receive notice to proceed before interrupting any utility.

1.9 SUBMITTALS

A. General: The Contractor shall provide to the Professional for review 6 (six) copies of required submittals, unless noted otherwise. All Catalog Data, Shop Drawings, Calculations, and Certificates of Compliance shall be submitted as a single package. Failure of the Contractor to provide a complete submittal package may result in delay in processing time. All such delays to
the job resulting from the Contractor's failure to provide submittals at one time will be the responsibility of the Contractor. Three (3) copies will be returned to the Contractor. Submittals shall clearly identify the contract documents specification section or drawing referenced, identifying and highlighting each item to be reviewed.

B. Submittals provided for review shall clearly and completely describe the specific product(s) they represent. Where differences exist between the item specified and that submitted for review, the submittal shall be highlighted.

C. Submittals shall bear the review stamp of the Contractor. The review stamp of the Contractor shall be affixed to shop drawings to indicate:

D. The Contractor has coordinated the electrical characteristics of the equipment.

E. The Contractor has verified that the equipment submitted will physically fit into the space allocated with adequate clearances for maintenance, access, and egress requirements.

F. The Contractor shall bear all associated costs that may accrue due to failure to completely represent a given product.

G. Material and equipment shown on the drawings or specified herein shall not be incorporated in the work of this Contract until shop drawings, engineering data and catalog information have been reviewed and accepted by the Professional.

1.10 TRADE PRODUCT SUBSTITUTION

A. It is the intent of this specification that all qualified suppliers be provided a fair opportunity to bid work, regardless of whether they are named in the specification.

B. Where manufacturers are named it is to establish a general level of quality and features. Proposed substitutes must be equivalent to those named performance, sound, materials and means of construction, finishes, etc.

C. If any supplier wishes to substitute manufacturers other than those named, they shall submit to the engineer a written request for such substitution indicating the material or equipment they wish to supply along with data showing that such material or equipment meets specifications and is equivalent to that name. All such requests and data shall be in writing delivered to the engineer’s office no later than 10 days before bid date.

1.11 OPERATION AND MAINTENANCE MANUALS

A. General

1. Before final acceptance of the system, the Contractor shall submit to the Owner three copies of a manual containing the following, complete and at one time, in loose leaf ring binders with permanent covers, identified, and indexed. Manual shall be arranged in an easy to follow manner.

B. Maintenance Data

1. Descriptions of operation of each system, including required settings for use of the operator.
2. Wiring and block diagrams, where applicable.
3. Detailed and check out procedures to insure operation of systems and gear.
4. Complete list of diagnostic and troubleshooting procedures for systems and major equipment.
5. Recommended preventive maintenance program for each piece of mechanical equipment, and each system, including items to be inspected and service, frequency of inspection and servicing, the type of servicing required, and types of lubricants to be used.
6. Information required for proper maintenance of equipment and systems.
7. As built material list.
8. Catalog brochures for all components with specific parts used, marked clearly.
9. Suppliers and manufacturer’s conformance certificates.
10. Test reports.
11. Manufacturer’s directions.
13. Inspection certificates.

C. Parts List Data

1. Contractor's part number.
2. Complete description of part.
3. Manufacturer.
4. Manufacturer’s part number.
5. Quantity in system.

D. Operator's Data

1. Complete description of the automatic operation of the system.
2. Complete description of the safety features built into the system.
3. Complete description of the manual operation of the system.
4. Description of start up, check out and shutdown procedures.
5. Other information required for proper operation of the system and equipment.

1.12 ELECTRICAL WORK BY PLUMBING CONTRACTOR

A. All electrical work which is the responsibility of this contractor shall comply with electrical specifications and NEC.

PART 2 - PRODUCTS

2.1 GENERAL

A. Refer to the specific specification sections contained in the following sections for product requirements.

B. All materials used on plumbing systems shall comply with the following lead ban requirements:

1. Solders with lead content exceeding 0.2% (two-tenths of a percent) are prohibited. Brass and bronze materials containing 0.25% (25 hundredths of a percent) or greater lead are prohibited. All lead content shall be per ANSI/NSF 372.
2. All materials shall be compliant with the 2011 “Reduction of Lead in Drinking Water Act”.
3. Components that are specifically exempted in the Act, such as water closets, urinals, flush valves and shower valves need not comply.
2.2 CONCRETE
A. Concrete shall comply with Division 3 of the Project Manual.

2.3 MISCELLANEOUS STEEL AND ACCESSORIES
A. The Contractor shall provide all necessary steel angles, channels, pipe, rods, nuts, bolts, etcetera, as shown on plans, as specified, or as may be required for complete and proper installation of plumbing fixtures, systems and equipment. All material and workmanship shall be of the best quality and shall be installed in accordance with the best practices of the trade.

2.4 ACCESS PANELS
A. The Contractor shall furnish access doors to the General Contractor for installation in ceilings, walls, partitions and floors for access to valves, traps, fittings, and all appurtenances.
B. Access panels shall be of sufficient size to permit removal or access to equipment, except that the minimum size shall be 12-inches by 16-inches.
C. Access door locations shall be as determined by field conditions for optimum access to equipment, and shall be reviewed by the Professional before final installation, and shall be subject to the following:
   1. Bottom of access doors shall not be lower than the top of the partition base, or a minimum of 6 inches above floor.
   2. Tops and/or sides of access panels shall be a minimum of 6-inches from the ceiling or opening or from the edge of a wall return.
   3. Access doors shall be suitable for installation in the finish material of the ceilings, walls, partitions and floors.
   4. Frame and panel access doors in restrooms, kitchens and as indicated shall be stainless steel.
   5. Access doors with UL Listing shall be provided in rated construction assemblies. Access doors shall be "B-Label" and shall have a UL one and one-half (1-1/2) hour rating at 250 degrees F rating for both door and frame. Maximum size shall be 20" x 20" or 400 square inches in area. Frame shall be sixteen (16) gauge minimum steel, panel shall be twenty (20) gauge minimum steel. Access doors shall be provided with a baked-on enamel finish (prime coat), continuous type hinge on one side, flush-face type lock with key operation and self-latching cylinder locks.
   6. Access doors without UL label shall be provided in all non-rated construction assemblies: Frame shall be sixteen (16) gauge minimum steel, panel shall be fourteen (14) gauge minimum steel. Access doors shall be provided with a baked-on enamel finish (prime coat), concealed spring type hinges and flush-face type lock with key operation and self-latching cylinder locks. Door shall open 175 degrees (minimum).
   7. All access doors shall be keyed alike.
PART 3 - EXECUTION

3.1 GENERAL

A. All materials and equipment used shall be installed in strict accordance with the Standards under which the materials are accepted and approved, and in strict accordance with the manufacturer's instructions.

B. The Contract Documents are not intended to indicate every bend, offset, change in direction and appurtenance required to provide a complete and workable system.

C. The contract drawings are diagrammatic and are indicative of the work to be performed. It is not intended that they show every pipe, fitting or apparatus required for a complete installation.

D. Except where otherwise indicated, minimum cover shall not be less than the following:
   1. Sanitary sewer piping: 3'-0"
   2. Storm sewers: 1'-0"
   3. Water piping: 3'-0"

3.2 WATER AND SEWER SERVICE AND METERS

A. These shall be arranged for and paid for by the contractor, including any tap fees, meter fees, depletion fees or any other associated fees.

3.3 EXCAVATION, BACKFILLING AND COMPACTION

A. The Contractor shall notify ULOCO prior to any work.

B. The Contractor shall perform all excavation, backfilling, compaction and necessary finishing for all piping, equipment, and accessories. Piping installation shall be in accordance with local water, sewer and gas utility regulations and applicable State and Local codes.

C. The Contractor shall do all bracing, sheathing and shoring necessary to perform and protect his excavations. The Contractor shall provide safety rails, lights, signs, etc. as necessary or required for safety or as required to conform to governing laws.

D. The Contractor shall provide, maintain, and operate pumping equipment of sufficient capacity to insure that all his excavations and trenches are kept free of water at all times.

E. All surfaces of streets, walkways, seeded areas, or finished grade areas disturbed by the excavation shall be restored to their original condition and/or as indicated on the Project Documents.

F. Protect existing structures, utilities, sidewalks, pavements and other facilities not indicated for removal, from damage caused by settlement, lateral movement, undermining, washout and other hazards resulting from excavation operations.

G. Existing utility lines shown on the Project Documents do not indicate the exact in-place location of the lines. They do not show every pipe, fitting or appurtenance that may exist at the project site. The location and depth of all utilities shall be marked and recorded prior to any excavation. Should uncharted or incorrectly charted, existing piping or other utilities be uncovered during excavation, contact the Professional immediately for directions before proceeding further with
work in this area. Cooperate with owner and utility companies in keeping respective services and facilities in operation. Repair damaged utilities to the satisfaction of the utility owner.

H. If it becomes necessary to install any lines or equipment in locations other than those shown, the Professional's acceptance shall be obtained before starting the excavation.

I. The presence of explosives on the project site or the use of explosives in the execution of the work under this contract is not permitted.

J. Excavation:

1. All plumbing excavation is unclassified.

2. Trenches shall be dug to uniform width not less than 12-inches or more than 16-inches wider than the bell diameter of the piping. Trench sides shall be vertical. Except 4’-0’ and deeper shall be excavated with sides sloped at a 45 degree angle beginning one foot above bottom of trench to prevent cave-ins. Other OSHA approved methods of preventing cave-ins may be employed by the contractor. Excavate trenches to depth indicated or required. Carry depth of trenches for piping as required to establish required slopes and invert elevations. Beyond building perimeter, keep bottom of trenches sufficiently below finished grade to protect against frost. The bottom of trenches shall be accurately graded to provide uniform and smooth flow throughout. Any over-excavation shall be backfilled with modified aggregate and thoroughly tamped.

3. If trench excavation operations are performed when the atmospheric temperature is less than thirty-five (35) degrees Fahrenheit, the Contractor shall provide at his own expense cold weather protection as required to protect excavated trench bottoms from freezing. Under no circumstances will any pipe be permitted to be laid in a trench containing water or on a subgrade containing frost.

4. Take up and re-lay pipe that is not laid true to required alignment or grade. Pipe that has had it's joints disturbed after laying shall be taken up and re-laid. Deviation from the required lines and grades will not be permitted unless approved by the Professional.

5. Pipe Embedment - All pipe shall be laid on a First Class granular bedding. The bedding shall be a minimum depth of 6-inches (six) or 1/4 (one-fourth) the pipe diameter, whichever is greater. The bedding shall provide uniform longitudinal support to the pipe and shall be laid to provide the grade and line as shown on the drawings or as directed by the Professional. Compaction of embedment materials under the haunches and around the pipe to the springline of the pipe shall be by hand tamping. Final embedment for ferrous pipe materials shall extend from the springline of the pipe to a depth of 6-inches (minimum) above the top of the pipe. Final embedment for PVC pipe shall extend from the springline of the pipe to a depth of 18-inches (minimum) above the top of the pipe.

6. Backfilling shall not be undertaken until all tests and inspections have been made. Use care to avoid damaging or displacing piping systems. All backfill material shall be free from cinders, ashes, refuse, organic material, boulders, rocks or stones, frozen soil, or other material that is unsuitable. When the type of backfill material is not indicated on the plans or is not specified, the excavated material may be used, provided that such material consists of loam, clay, sand, gravel, or other material that is suitable for backfilling. From 1-foot above the top of the pipe to the subgrade of the pavement, material containing stones greater than 6-inches in their greatest dimension may not be used.
7. Backfilling shall be carefully performed and the original surface restored.

8. All trench backfill shall be brought to subgrade ready for base material or topsoil. After the initial aggregate backfill layer has been placed, refill remainder of the trench using backfill materials as follows:

   a. Lawns - Successive 6-inch layers of clean earth backfill material shall be deposited after initial aggregate backfill. This backfill shall consist of excavated material free from large clods of earth and stone. If large stones (greater than 6-inches) are encountered, remove stones from site and haul in clean earth backfill. The entire trench shall be uniformly tamped after each successive layer is deposited. Replace topsoil to approximate depth of existing as final refill operation and crown to such height as required by the Professional. Maintain crowned surface to the satisfaction of the Professional.

   b. Walks and Parking Areas - Clean earth backfill compacted in 6-inch layers to a point 8-inches below the adjacent existing surfaces. Refill the remaining 8-inches with compacted stone and replace walk or paving as required.

9. Thoroughly compact subgrade prior to the installation of 6-inches of First Class pipe bedding. Following satisfactory pipe laying and in-line structure installation, backfill trenches to a height of at least 12-inches above the top of the outside barrel of the pipe.

10. All fill shall be compacted to ninety-five (95) percent. Each layer shall be compacted to the specified percent of maximum density obtained at optimum moisture content, in accordance with ASTM D1557, method D and ASTM D1556 sand cone method.

11. Compaction shall be accomplished by approved equipment suited to the soil being compacted. Material shall be moistened or aerated as necessary to provide the moisture content that will readily facilitate obtaining the specified compaction with the equipment used.

12. Thoroughly compact successive layers of backfill material with a vibrating compactor of a type and size satisfactory to the Professional. Compacting of this backfill by puddling or jetting will not be permitted. Use mechanical tampers to compact backfill materials in trench refill operations to produce a density of backfill at the bottom of each layer of not less than 95-percent of the maximum density obtained at optimum moisture content.

13. All underground lines installed outside of building footprint shall have a magnetic type warning tape installed in the backfill 12” to 18” below grade.

3.4 CUTTING, PATCHING, FINISHING

A. Unless otherwise noted, the Contractor shall cut, patch and finish all chases and openings required for the installation of work to be performed under this Contract. All patching and finishing shall match existing adjacent undisturbed surfaces.

B. Cutting shall not cause damage to the building or leave unsightly surfaces. Where such unsightly conditions are caused by the Contractor, he shall be required to repair these.

C. The Contractor shall contact the holder of the guarantee and obtain written approval before cutting the roofing membrane so as not to void said guarantee.
D. No structural member shall be cut.

E. Penetrations made in existing fire rated chases, partitions, floors, etc. shall be sealed with an approved material and method as required to maintain the integrity of the fire separation.

F. All materials and methods to be used for patching and repairing shall be subject to the approval of the Professional and the Owner's Authorized Representative.

G. The Contractor shall set all sleeves, hangers, and anchors required for the Plumbing Contract work and shall be responsible for their proper and permanent location.

H. No cutting shall be done which may affect the building structurally or architecturally without first securing the approval of the Professional. Cutting shall be accomplished in such a manner as not to cause damage to the building or leave unsightly surfaces which cannot be concealed by plates, escutcheons or other construction. Where such unsightly conditions are caused, the Contractor shall be required, at his own expense, to repair the damaged areas.

I. Cutting of the construction excessively or carelessly done shall be repaired to match the original work by the Contractor and to the satisfaction of the Professional who will make the final decision with respect to excessive or careless cutting work. The Contractor shall seal all openings he has made in plenum spaces, fire rated floors, ceilings or partitions after his work has been installed. The material used for sealing the openings shall have a fire rating equal to or greater than the rating of the floor, ceiling or partition material.

3.5 CHASES AND OPENINGS

A. All chases and openings required for the installation of the work shall be coordinated with the other trades. The Contractor shall provide the other trades with sufficient time (1 (one) week minimum) for coordination of all chases and openings. The Contractor shall be responsible for all work required to cut and patch the required openings. The work shall be performed to the satisfaction of the Professional.

B. Penetrations made in fire rated chases, partitions, floors, etc. shall be sealed with an approved material and method as required to maintain the integrity of the fire separation.

C. The Contractor shall provide all sleeves, hangers, and anchors required for installation of the work in chases and openings.

3.6 INSPECTION AND TESTING

A. General: New plumbing systems and parts of existing systems which have been altered, extended or repaired shall be tested to disclose leaks and defects.

B. If the Professional determines that the plumbing systems do not pass the prescribed tests, then the Contractor shall be required to make the necessary repairs, at his own expense, and the Contractor shall re-inspect and re-test the systems. Repairing, inspection and testing shall be continued until all systems pass as determined by the Professional.

C. All new, altered, extended or replaced plumbing shall be left uncovered and unconcealed until it has been inspected, tested and accepted by the Professional. Where such work has been covered or concealed before it has been inspected, tested and accepted, it shall be uncovered by the Contractor, at his own expense as directed by the Professional.
D. All equipment, material, labor, etc., required for testing the plumbing systems shall be furnished by the Contractor.


F. Finished Plumbing: After the plumbing fixtures have been set and their traps filled with water, the plumbing fixture connections shall be tested and proved gas and water tight.

G. A pressure test of the building sewer shall be performed in accordance with the requirements of NC State building code.

H. Building Sewer: The building sewer shall be tested by insertion of a test plug at the point of connection with the existing exterior sewer system. The building sewer shall then be filled with water under a head of not less than 10-feet. The water level at the top of the test head of water shall not drop for at least 15 (fifteen) minutes.

I. Domestic Water Systems:
   1. The system shall be tested either in its entirety or in sections.
   2. The system shall be tested and proved tight under a water pressure of 150 pounds per square inch for a period of 2 hours.
   3. Potable water shall be used for testing.

3.7 STERILIZATION OF THE DOMESTIC WATER SYSTEM

A. After the system has been tested and approved, the entire new system, including valves and accessories, shall be chlorinated. Disinfecting to be in accordance with AWWA C651. The contractor shall provide test reports from and independent laboratory confirming the absence of bacterial coliform.

B. Calcium hypochlorite and water mixture
   1. Calcium hypochlorite shall be HTH, Perchlorene and Maxochlor, or accepted substitute. A solution consisting of five (5%) percent powder to ninety-five (95%) percent water by weight shall be prepared. The calcium hypochlorite and water mixture, first made into a paste and then thinned to a slurry, shall be injected or pumped into the system.
   2. The system or part thereof shall be filled with a water/chlorine solution containing at least 50 parts per million of chlorine. The system or part thereof shall be valved off and allowed to stand for 24 hours; or the system or part thereof shall be filled with a water/chlorine solution containing at least 200 parts per million of chlorine and allowed to stand for 3 hours. During the chlorination process all valves and accessories shall be operated.
   3. After the chlorination process, the chlorine shall be flushed from the system until the system water is equal chemically and bacteriologically to those of the permanent source of water supply.

C. Laboratory tests of the water shall be paid for by the Contractor.
D. The “Water Test Report for Use” is required to be submitted prior to Beneficial Occupancy permit.

3.8 INSTRUCTION OF THE OWNER

A. After acceptance of the Project, the Contractor shall furnish the services of personnel thoroughly familiar with the completed installation to instruct the Owner in the proper operation and maintenance of all equipment and appurtenances provided.

B. The Contractor shall provide the Owner with two weeks advance notice before the instruction session.

3.9 PAINTING

A. Painting shall be in accordance with Architectural specifications.

3.10 CLEANUP

A. The Contractor shall maintain buildings, grounds and public properties free from accumulations of waste materials, debris and rubbish. At reasonable intervals during the progress of work, and when directed by the Owner's Authorized Representative, the site and public properties shall be cleaned and waste materials, debris and rubbish shall be disposed of in appropriate manner. The Contractor shall provide containers for collection of waste materials, debris and rubbish. Waste materials, debris and rubbish shall be removed from the job site and legally disposed of at a landfill area in accordance with all applicable regulations. Burning or burying waste materials, debris or rubbish on project site shall not be permitted.

B. At the completion of the Project, remove waste materials, rubbish, tools, equipment, machinery, surplus materials, etc., and clean all sight-exposed plumbing fixtures and equipment. Remove grease, dust, dirt, stains, labels, fingerprints and other foreign materials from sight-exposed plumbing fixtures and equipment. Broom clean paved and concrete surfaces; rake clean other ground surfaces. Repair, patch and touch up marred surfaces to the specified finish or to match adjacent surfaces.

END OF SECTION 220500
SECTION  220700 - PLUMBING INSULATION

PART 1 - GENERAL

1.1   SECTION INCLUDES

A. Piping insulation.
B. Jackets and accessories.

1.2   REFERENCES

A. Requirements for references and standards.


X. NAIMA National Insulation Standards.


1.3 SUBMITTALS FOR REVIEW

A. Product Data: Provide product description, thermal characteristics, list of materials and thickness for each service, and locations.

1.4 SUBMITTALS FOR INFORMATION

A. Manufacturer's Instructions: Indicate installation procedures that ensure acceptable workmanship and installation standards will be achieved.

1.5 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum five years experience.

B. Applicator Qualifications: Company specializing in performing the work of this section with minimum three years experience.

1.6 REGULATORY REQUIREMENTS

A. Conform to maximum flame spread/smoke developed rating of 25/50 in accordance with ASTM E84, NFPA 255 or UL 723.
1.7 DELIVERY, STORAGE, AND PROTECTION

A. Material and Equipment: Transport, handle, store, and protect products.

B. Accept materials on site, labeled with manufacturer's identification, product density, and thickness.

1.8 ENVIRONMENTAL REQUIREMENTS

A. Maintain conditions required by manufacturers of each product.

PART 2 - PRODUCTS

2.1 TYPE A - GLASS FIBER

A. Insulation: ASTM C547 and ASTM C795; rigid molded or semi flexible, noncombustible.

1. 'K' value: ASTM C177, 0.24 Btu-in/hr-ft²-F at 75 degrees F.
2. Maximum service temperature: 850 degrees F.
3. Maximum moisture absorption: 0.2 percent by volume.

2.2 TYPE B - Not Used.

2.3 TYPE C - Not Used.

2.4 TYPE D – Not Used.

2.5 TYPE E - Not Used.

2.6 TYPE F – Not Used.

2.7 TYPE G - CELLULAR FOAM

A. Insulation: ASTM C534; flexible, unicellular elastomeric, molded slit tubing, or sheet.

1. 'K' value: ASTM C177; 0.27 at 75 degrees F.
2. Minimum service temperature: -40 degrees F.
3. Maximum service temperature: 220 degrees F.
5. Moisture vapor transmission: ASTM E96; 0.17 perm-inches.

2.8 INSULATION JACKETS

A. General: Provide Manufacturer’s standard white craft jacket wherever type “A” insulation is specified in all concealed locations or unless indicated elsewhere in this specification. At the contractors option, provide PVC plastic fitting covers wherever white kraft or canvas jackets are specified. Jackets are not required for insulation type “G”, except where exposed to the weather.
B. PVC Plastic.
   1. Jacket: ASTM D1784, one-piece molded type fitting covers and sheet material, white color.
      a. Minimum service temperature: 0 degrees F.
      b. Maximum service temperature: 150 degrees F.
      c. Moisture vapor transmission: ASTM E96; 0.002 perm-inches.
      d. Thickness: 15 mil.
      e. Connections: Brush on welding adhesive or pressure sensitive color matching vinyl tape.

C. Vapor Barrier Jacket: ASTM C921, White kraft paper with glass fiber yarn, bonded to aluminized film. Moisture vapor transmission: ASTM E96; 0.02 perm-inches.

D. Vapor Barrier Lap Adhesive:
   1. Neoprene contact adhesive or combination lagging and sizing type depending on application.

2.9 ACCEPTABLE MANUFACTURERS:
A. Insulating materials:
   1. Type “A” – Schuller, Knauf, or Owens Corning.
   2. Type “G” – Rubatex or Armstrong Armaflex

B. Coatings, Adhesives, Cements and Mastics: Foster, Childers, 3M, Marathon, Pittsburgh Corning, Vimasco.

C. Jackets and fitting covers:
   1. Jackets other than metal: Ceel-Co, Proto Corp., Exact-Fit, or Speedline.

PART 3 - EXECUTION
3.1 EXAMINATION
A. Verify that piping has been tested before applying insulation materials.
B. Verify that surfaces are clean and dry, with foreign materials removed.

3.2 INSTALLATION
A. Refer to manufacturer's instructions for application of all materials.
B. Install in accordance with NAIMA National Insulation Standards.
C. Exposed Piping: Locate insulation and cover seams in least visible locations.
D. Insulated pipes conveying fluids below ambient temperature: Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.
E. Glass fiber insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.

2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe. Finish with glass cloth and vapor barrier adhesive or PVC fitting covers.

F. For hot piping conveying fluids 160 degrees F or less, do not insulate flanges and unions at equipment, and bevel and seal ends of insulation.

G. For hot piping conveying fluids over 160, insulate flanges and unions at equipment.

H. Glass fiber insulated pipes conveying fluids above ambient temperature:

1. Provide standard jackets, with or without vapor barrier, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples.

2. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe. Finish with glass cloth and adhesive or PVC fitting covers.

I. Inserts and Shields:

1. Application: All piping 1-1/2 inches diameter or larger.
2. Shields: Galvanized steel between pipe hangers or pipe hanger rolls and inserts.
3. Insert location: Between support shield and piping and under the finish jacket.
4. Insert configuration: Minimum 6 inches (150 mm) long, of same thickness and contour as adjoining insulation; may be factory fabricated.
5. Insert material: Hydrous calcium silicate blocks or other heavy density insulating material suitable for the planned temperature range.

J. Continue insulation through walls, sleeves, pipe hangers, and other pipe penetrations. Finish at supports, protrusions, and interruptions. At fire separations, refer to plan details.

K. Omitted PLUMBING Insulation: Do not insulate exposed chrome plated piping, air chambers, trap primers, strainers, check valves, unions, balancing or isolation valves. Do not insulate lavatory or sink wastes or supplies unless scheduled as handicapped with pre-fabricated wrap system.

L. Provide cellular foam insulation as a substitute for Types “A” only where approved by the engineer.
### 3.3 SCHEDULES

#### A. Plumbing Piping:

<table>
<thead>
<tr>
<th>SERVICE</th>
<th>TYPE</th>
<th>1 and less</th>
<th>1¼ to 2</th>
<th>2½ to 5</th>
<th>≥ 6</th>
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<tbody>
<tr>
<td>Domestic Hot Water</td>
<td>A or G</td>
<td>1</td>
<td>1</td>
<td>1</td>
<td>-</td>
</tr>
<tr>
<td>Domestic Cold Water</td>
<td>A or G</td>
<td>1/2</td>
<td>1/2</td>
<td>1/2</td>
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END OF SECTION 220700
SECTION 221001 - PLUMBING PIPING

PART 1 GENERAL

1.1 WORK SECTION INCLUDED:

A. Interior domestic water piping systems
B. Interior sanitary drainage piping systems
C. Sleeves and floor plates
D. Supports, hangers, inserts and fasteners
E. Valves
F. Pipe identification
G. Valve tags

1.2 QUALITY CONTROL

A. All pipe, valves and fittings shall be manufactured in the United States of America and shall bear a USA mill stamp.

PART 2 PRODUCTS

2.1 DOMESTIC WATER PIPING

A. Above grade:
   Piping: Type "L" hard temper copper tubing, ASTM B88
   Fittings: Cast bronze or wrought copper solder end fittings, ANSI B16.18, ANSI B16.22
   Solder: 95-5 tin-antimony solder, ASTM B32 for sizes up to 1 1/4-inch
   Brazing solder: ASTM B260 for sizes 1 1/2-inch and larger

B. Below grade:
   Piping: Type "K" copper tubing, ASTM B88
   Fittings: Cast bronze or wrought copper solder end fittings, ANSI B16.18, ANSI B16.22
   Solder: 95-5 tin-antimony solder, ASTM B32 for sizes up to 1 1/4-inch
   Brazing solder: ASTM B260 for sizes 1 1/2-inch and larger

2.2 SANITARY WASTE AND VENT

A. Above Grade Drainage:
   Piping: Schedule 40 PVC DWV, ASTM D2446
   Fittings: Socket solvent weld, ASTM D26565

   Above grade sanitary vent lines:
   Piping: Schedule 40 PVC DWV, ASTM D2446
   Fittings: Socket solvent weld, ASTM D26565

B. Below grade:
   Piping: Schedule 40 PVC DWV, ASTM D2446
   Fittings: Socket solvent weld, ASTM D26565
2.3 DRAIN PIPING (Relief Valve and Water Heater Drain Pan Piping):

- Piping: SDR11, CPVC, ASTM D2846
- Fittings: socket type fittings, solvent weld joints. ASTM D2846
- Solder: Less than 510 g/L VOC, ASTM 493

2.4 SLEEVES AND FLOOR PLATES

A. Sleeves in finished areas shall be provided with chrome plated escutcheons sized to fit securely at the pipe or pipe insulation and shall cover the sleeve and penetration opening.

B. Floor sleeves located in areas with automatic sprinkler protection shall have sleeves extending 3-inches above the finish floor. Escutcheons shall accommodate the depth of the sleeve.

C. Sleeves in Non-Rated Construction:

1. Interior Partitions - New Construction:
   24-gauge galvanized sheet metal sleeve with mineral wool insulation packing between sleeve and piping/piping insulation.

2. Floor - New Construction:
   Schedule 40 black steel sleeve with retaining collar welded to sleeve with mineral wool insulation packing between sleeve and piping/piping insulation.

3. Slab on Grade:
   Schedule 40 black steel sleeve with retaining collar welded to sleeve, and expandable modular seals with molded rubber interlocking sections.

   Seal Manufacturers:
   Thunderline Corporation
   Metraflex Company

4. Below Grade Foundation Wall - New Construction:
   Schedule 40 black steel sleeve with retaining collar welded to sleeve and expandable modular seals with molded rubber interlocking sections.

   Seal Manufacturers:
   Thunderline Corporation
   Metraflex Company

5. Sleeves in Rated Construction:
   Piping which penetrates rated construction shall be provided with UL listed through penetration assemblies. Assemblies shall provide protection of the through penetration equal to or greater than the construction rating. Assemblies shall be selected after determining all characteristics of the assembly including piping material and size, construction type, rating (in hours) of the required construction and fill, sleeve, void or cavity materials. All voids between sleeve and wall or between sleeve and carrier pipe shall be filled with UL listed fireproofing material of rating equivalent to or exceeding that of the adjacent construction.

   Fireproofing material manufacturers:
   IPC
2.5 SUPPORTS, HANGERS, INSERTS AND FASTENERS

A. Provide all steel required for support of pipes and equipment other than steel shown on Structural Engineer's drawings.

B. All hanger materials including clevis hangers, rods, inserts, clamps, stanchions, brackets, shall have a factory applied finish of electro-plated zinc, unless noted otherwise.

C. Hangers, clamps and supports for use on uninsulated copper piping shall be provided with inserts to isolate the copper piping from the hanger. Inserts shall be made of felt or plastic and shall be as manufactured by the hanger manufacturer.

D. Insulated piping shall be provided with insulation shields.

E. Hanger Materials:

1. Horizontal Sanitary, Waste, Vent Piping and Storm water Piping:
   a. 3 inch and smaller:
      B-Line: B3100
      Grinnell (Anvil): 260
      PHD: 450
   b. 4 inch and larger:
      B-Line: B3102
      Grinnell (Anvil): 590
      PHD: 420

2. Horizontal Domestic Water Piping:
   a. 2 inch and smaller:
      B-Line: B3100
      Grinnell (Anvil): 260
      PHD: 450
   b. 2-1/2 inch and larger:
      B-Line: B3100
      Grinnell (Anvil): 260
      PHD: 450

3. AWWA piping:
   B-Line: B3102
   Grinnell (Anvil): 590
   PHD: 420

4. Insulation Shields:
   B-Line: B3155
   Grinnell (Anvil): 168
   PHD: 160
F. Vertical Piping (Riser Clamps):

1. Copper Pipe (copper plated with plastic coated formed portion.):
   - B-Line: B3373CT
   - Grinnell (Anvil): CT-121C
   - PHD: 554

2. Steel Pipe:
   - B-Line: B3373
   - Grinnell: 261
   - PHD: 550

G. Connectors:
1. Beam Clamps:
   - B-Line: B3033, B3050, B3291-B3297
   - Grinnell (Anvil): 88, 133, 134 or 292S.
   - PHD: 360, 620

2. Concrete inserts:
   - B-Line: B2500, B3014
   - Grinnell (Anvil): 282, 285
   - PHD: 950

3. Welded beam attachments:
   - B-Line: B3083
   - Grinnell (Anvil): 66
   - PHD: 900

4. Piping adjacent to walls or steel columns, brackets:
   - B-Line
   - Grinnell (Anvil): No. 194, 195, or 199, depending on weight to be supported.
   - PHD

5. Base supports:
   - B-Line
   - Grinnell (Anvil): Figure No. 259, or 264.
   - PHD

H. Hanger Rods:
   - Hanger rod, Figure No. 140.
   - Continuous threaded rod, Figure No. 146.
   - Eye Rods, Figure No. 248.

I. Trapeze Hangers:
   - Direct Mounting
   - Hangers: Figure No. 46.
2.6 VALVES

A. All valves shall be products regularly produced for the specified service and rating in accordance with the manufacturer's catalog or engineering data. All valves shall be marked with the manufacturer's name or trademark. The recommended service pressure and the size, by letters and figures, cast or stamped on the body of the valve.

B. All valves shall be standard 200 pounds per square inch (psi) WOG minimum unless otherwise specified. Valve ends shall be compatible with the piping system served.

C. Gate valves for water main service shall be iron body, bronze mounted, tapered seat non-rising stem, O-ring packing. AWWA C500, 200 psi working pressure. Open counterclockwise. Mechanical joint valve ends shall conform to AWWA C111. Valves shall be of a design that requires no more than fifty (50) lbs. pull on the standard valve wrench to provide positive shutoff against rated working pressure.

D. All flanges shall be plain faced, smooth finished and shall conform in dimensions and drilling to the American Cast Iron Flange Standard Class l25 (Bl6.1-48).

E. Ring gaskets 1/6 inch thick shall be used with all flanged valves. Gaskets shall be Cranite, Garlock. Coat one (1) side of gasket with graphite and oil, thread lubricant before installing.

F. Domestic Hot and Cold Water Valves:

1. Ball Valves:
   2-1/2-inch and Smaller: 600 psi WOG, full port, two piece, bronze body, chrome plated steel ball and stem NIBCO T-585-70; Apollo 70-100; Stockham S-216BR-R-T, threaded end; Nibco S-585-70; Apollo 70-200; Stockham S216BR-R-S, sweat ends.

2. Check Valves (Swing Type):
   2-inch and Smallier: Bronze body, bronze disk for general service. Sweat ends shall be Milwaukee #1509; Stockham #B-309; Powell #1825. Threaded ends shall be Milwaukee #509; Stockham #B931; Powell #578.

PART 3 - EXECUTION

3.1 GENERAL

A. All materials, equipment and accessories specified in this section shall be installed in strict accordance with the manufacturers' recommendations.

3.2 EXCAVATION, COMPACTION, BACKFILL

A. Excavation, compaction and backfill shall be as specified in Section 22 05 00, Plumbing General.

3.3 PIPING INSTALLATION

A. All piping in finished areas shall be run concealed except where specifically shown otherwise. All piping shall be installed as required to suit space available in building structure, above suspended ceilings, and other locations found necessary for installation. Install piping as high as possible.
B. The Contractor shall not install any piping that will interfere with any lights, openings, doors, windows, ductwork, equipment, and existing or special conditions. Headroom in front of openings, doors, or windows shall not be less than the top of the opening. Provide all piping offsets necessary to avoid interference with other work. Piping offsets shall include all devices and assemblies necessary to accommodate the change in direction of the piping.

C. All piping shall run straight with no more couplings and joints than necessary, shall be grouped wherever practical and shall be carefully installed to provide for proper alignment slope and expansion.

D. Pipes carrying fluids shall not be installed in transformer vaults, electrical equipment rooms, elevator hoist-way or equipment rooms, or similar areas having a collection of electrical equipment. Pipes shall not be installed over, around, in front of, in back of, or directly below, electrical controls, panels, switches, terminals, boxes, or similar electrical equipment, refer to the NEC code for clearance requirements.

E. All piping shall be installed with not less than 2 inches between finish covering of pipe and all other work or piping.

F. All piping shall have shut-off valves at all branch connections to mains.

G. Reduction in sizes of pipes shall be made with reducing fittings. Bushings will not be permitted.

H. The Contractor shall perform excavation of the subgrade where required for the installation of the work, including that for piping and piping enclosures. The backfill shall be stabilized by hand or pneumatic tamping as directed by the Professional and shall be returned to the original subgrade level. Piping shall not be run in cinder fill unless protected by a concrete envelope of 2 inches minimum thickness on all sides of pipe. All steel and copper piping and fittings installed underground shall be protected with two layers of tightly applied spirally wrapped tape, 3M number 50, or accepted substitute.

I. Bullhead connections in any piping service are prohibited.

J. All screwed joints shall be made with a non-corrosive, non-hardening compound or teflon tape applied on the male thread only. All compounds must be approved for the pipe on which they are used. Pipe ends shall be reamed or filed out to size of bore and all chips and cuttings removed. Ends of pipe must be cut square so as to seat in the bottom of the recess in drainage fittings. In making joints in chromium plated brass pipe no more than one thread shall remain exposed when joint is completed. Caulking of screwed joints is not permitted. Pipe joint cement and paint will be permitted only on external threads.

K. All soldered joints shall be made with fittings specified. Copper tube and brass pipe, valves, unions, flanges, fittings, and connections shall be joined by means of lead-free solder. Ends of all pipe and inside surfaces of fittings shall be cleaned, burnished and tinned before solder is applied. All joints in tubing 2 inches and larger shall be tinned and then soldered with a circular type flame torch. Pull joints, saddle type joints, and "T-Drill" type connections are prohibited.

L. Drainage Piping:

1. All sewer piping shall be set true to line and even slope using grade boards and targets or grade lines in accordance with ASTM C12, "Recommended Practice for Laying Sewer Pipe".
Horizontal sanitary and storm piping shall be installed to pitch towards drain points. Minimum pitch shall be 1/8 inch per foot for sanitary piping 4 inch and larger. Pitch for sanitary piping smaller than 4 inch shall be 1/4 inch per foot minimum. Minimum pitch shall be 1/4 inch per foot for storm piping 4 inch and larger. Roof drains serving emergency overflow roof drains shall be sloped at a minimum of 1/2 inch per foot. Minimum pipe size below grade shall be 2 inch for all drainage systems.

2. All changes in pipe size of soil, waste, and drain lines shall be made with reducing fittings or reducers. Changes in direction, where space permits, shall be made with long sweep bends, Y-fittings, and one-eighth (1/8) or one-sixteenth (1/16) bends, or combination "Y" and 1/8 bends.

3. Cleanouts shall be furnished installed on horizontal runs and at the base of stacks for all soil, waste, drain, and rain conductor lines. A cleanout shall be installed at every change of direction of greater than 45 degrees. Cleanouts shall be installed not more than 50 feet apart for piping 4 inch size and smaller. Cleanouts shall be installed no more than 100 feet apart for piping larger than 4 inch. Cleanouts on horizontal runs above ground, including crawl spaces, shall be cast brass plugs in wye fittings. Cleanouts at the base of each vertical stack shall be cast brass plugs in wye fittings. Cleanouts on buried or concealed lines shall be brought flush with grade or floor level. Cleanouts in walls shall be brought flush with finished face of the wall. Cleanouts on underground lines shall be made with wye and 45 degree fittings. Terminal (Yard) cleanouts on underground lines shall have a concrete cradle bearing block set against undisturbed earth. 45 degree fittings shall be set against concrete cradle to prevent separation or misalignment of joints. Cleanout plugs shall be full size for pipe up to and including 4 inch diameter and not less than 4 inch diameter for larger size pipe.

4. Water closet floor flanges shall be cast iron, screwed or caulked, not less than 1/4 inch thick; not less than 2 inches caulking depth. Bolted with approved gasket between closet bowl and flange. Closet screws shall be of brass. The use of commercial putty or plaster for setting closet bowls is prohibited.

M. Pressure Piping:

1. Branch piping shall be as indicated, but shall be a minimum 3/4 inch in nominal size with the last ten feet to each 1/2 inch outlet fixture a minimum of 1/2 inch in nominal size.

2. Each water piping system within the building shall be properly arranged and graded to low points where the entire system can be emptied through a drain. Install manual air vents at all high points in the system.

3. Drain Valves - Furnish and install a 1/2" ball valve with female hose connection at all low points of the domestic water piping systems. The hose bibb shall be located so as to be accessible and easily operable, and so that a hose can be connected to the outlet.

4. Outside water piping shall be so graded and arranged that water can be drained from the underground piping through drains installed in the building served. The drains shall be the same size and type specified for interior piping.

N. Equipment Piping:

1. Provide Isolation valves in supply and return to each item of equipment such as pumps, tanks, automatic valves, and similar items. Valves shall be suitably located to isolate each unit to
facilitate maintenance or removal of all equipment and apparatus. Valves shall be flanged or have a union installed between valve and equipment.

2. Provide all piping from backflow preventers, relief valves, or other drainage to spill over open sightdrains, floor drains, or other trapped acceptable discharge points, and terminate with plain end (unthreaded) pipe.

3. Provide thermometer wells and pressure gauge wells for specified thermometers and gauges, and at the inlet and outlet connection of each piece of equipment specified in this contract.

O. Electrolysis control:

1. All copper tubing installed under this Contract shall be installed so that the tubing will not touch or come in contact with ferrous metals. Where copper tubing or piping for fittings is anchored, guided, supported, secured, or may come in contact with ferrous metal, an insulating nonconductor spacer, similar to rubber or fiber, shall be installed to assure prevention of electrolysis.

2. When copper tubing or piping is connected to ferrous piping or equipment, connections shall be made with dielectric unions, couplings, or isolating flanges.

3.4 SLEEVES AND FLOOR PLATES

A. Sleeves shall be provided for all pipes passing through walls, partitions, floor slabs or roof slabs. Sleeves shall be cut flush with wall, floor or ceiling surfaces except that sleeves through waterproofed roof or floor slabs shall extend one inch (1") above the finished surface. Sleeves shall be sufficient size to allow a sealable annular space between the sleeve and the pipe or between the sleeve and the pipe insulation. All exposed piping passing through floors, walls or ceiling shall be provided with a chrome escutcheon plate securely fastened around the pipe. The annular space around the pipe in non-water-proof sleeves shall be filled with penetration sealant and smoothed out flush with all surface.

B. All pipe, tube, conduit, or similar through-penetrations of all fire rated walls, floor-ceiling, or roof-ceiling assemblies shall be provided with a fire stopping system to achieve a tight seal that will maintain the fire resistant rating of the assembly containing the through-penetration. Fire stopping system may be sealant or mechanical type.

3.5 PROTECTION AGAINST PHYSICAL DAMAGE

A. In concealed locations, where piping, other that cast-iron or galvanized steel, is installed through holes or notches in studs, joists, rafters or similar members less than 1¼-inches from the nearest edge of the member, the pipe shall be protected by shield plates. Protective shield plates shall be a minimum of 1/16-inch thick steel, shall cover the area of the pipe where the member is notched or bored and shall extend a minimum of 2-inches above sole plates and below top plates.

3.6 SUPPORTS, HANGERS, INSERTS AND FASTENERS

A. The Contractor shall furnish and install all supports, hangers, inserts and fasteners for the items incidental to the work in the construction of the project. Supports and hangers shall be provided to suit specific conditions for the type of construction. The method adopted shall be subject to the approval of the Professional.
B. Supports shall secure pipes in place, prevent swaying and vibration, maintain required grading, provide free expansion and shall have a neat appearance. Supports shall be selected for strength and service and installed in a manner which will not stress building construction. Supports shall be selected for safety factor of five (5) to one (1) for gross weight of piping system including fluid and installation.

C. Where support is from concrete construction, take care not to weaken concrete or penetrate waterproofing. Only use inserts for suspending hangers from concrete slabs. Use beam clamps for suspending hangers from building steel. Do not hang one pipe from another. Do not use perforated band iron, wire or chain as hangers. Do not use vertical expansion shields. Do not hang from joist bridging.

D. Fastenings required in masonry walls, bolts shall be galvanized U-bolts set in the construction during erection.

E. Where several pipes can be installed in parallel at the same elevation, provide trapeze hangers. Trapeze hangers shall be suspended by means of rods or angles. Brace trapeze hangers to prevent motion due to expansion and contraction of pipe. Support individual pipes by hangers or rollers.

F. All vertical piping shall be supported at each floor level. Riser clamps at exposed locations shall be of such design as to avoid creating a hazardous or unsightly condition and stay within space limitations. Pipe supports are required at the base of all vertical risers and shall be of riser size. In the case of waste and vent risers for plumbing system, support the fitting at the base of the riser independently from the adjacent pipe joint support. Support all piping from above as it changes from horizontal to vertical.

G. Where hanger rods are longer than 18 inches, provide lateral bracing at every fourth hanger. Do not support piping by wire, rope wood or other makeshift device. Provide additional steel supports where building construction does not permit the hanger spacing as specified in the schedules. Location and details shall be submitted to the Professional for review.

H. Where loading exceeds the safe allowable limit for any single insert, then multiple inserts shall be installed spaced no less than 12 inches on centers. The multiple inserts shall be connected with suitable size steel angles and locking bolts.

I. Where inserts in new construction have been omitted or are required in existing construction, the fastening shall be accomplished by means of approved lead sheathed expansion bolts. Wood plugs shall not be used. Expansion shields in precast concrete slabs shall not be loaded more than one-half (1/2) their maximum design capacity and never more than 200 pounds per bolt. Where bolts used with lead expansion bolts are spaced closer than one foot centers, the multiple bolts shall be connected with suitable size steel angles and locking bolts or with single bolts extending through the slab above with a bearing plate. Where finished floors occur, the welded plate and rod shall be recessed in the slab, finished in an approved manner.

J. Where fastenings are required in steel stud, wire lath or other non-masonry construction, a "J" hook and holding lock washer and nut shall be used which shall fasten to the opposite stud edge to which the item will abut. If the location of the fastening is not a steel stud, a structural steel shape shall be fastened to the wall with bolt and holding nut, with the fastening extension through the wall. The use of toggle bolts will not be permitted.

K. Where roofing construction is supported by structural steel members or bar joist, support piping systems, devices, and equipment from structural steel members or secondary fabricated supports.
L. Where concrete floor construction is supported by structural steel members or bar joist, support of piping, ductwork, devices and equipment may be from metal tabs integral with the metal deck system to the maximum of the equivalent of a 10 foot length of 4 inch Schedule 40 section of pipe filled with water or 6 inch cast iron drainage pipe. Where tabs projecting down from the metal deck system are not available, inserts for concrete deck construction shall be installed. Inserts in poured concrete slabs shall be iron, fabricated galvanized iron or steel of the type to receive a machine bolt head or nut after installation and shall permit adjustment of this bolt in one horizontal direction.

M. Where poured concrete roof and floor construction is supported by concrete members, support piping systems, devices, and equipment from roof to floor construction by use of concrete slab inserts.

N. Inserts in poured concrete slabs shall be iron or fabricated galvanized iron or steel of the type to receive a machine bolt head or nut after installation and shall permit adjustment of this bolt in one horizontal direction. Inserts shall be accurately located before the concrete is poured.

O. Piping, tanks and equipment shall be adequately supported either by suspension from the construction above or by means of struts or brackets to the construction below or to the side.

P. Before drilling any concrete for attachments, installer shall carefully check concrete drawings and shop drawings and shall locate drilled holes to avoid reinforcing by at least 1 inch.

3.7 HANGER AND ROD SCHEDULE

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Where unusual concentrated loads of valves and fittings occur, closer spacing shall be required. Submit specific cases for review and comment.

Where piping changes direction, supports shall be placed in each direction adjacent to joints and no more than 12 inches from the joint.

3.8 VALVES

A. Valves shall be installed at each riser, branch to equipment, at each group of fixtures, at each fixture not equipped with stop valves, and where shown on the drawings. Valves shall be installed with stems at or above the horizontal plane.

B. Where supplies to individual fixtures occur in base cabinets, or in other places where copper tubing supplies are used stops shall be solder end.

3.9 PAINTING

A. All painting shall be done in a careful, neat and workmanlike manner, with particular care being exercised to protect building equipment and finishes. All surfaces shall be thoroughly cleaned or rust,
scale, dirt, grease, dust, and like items, and sanded so as to provide a bond for new paint. All painted surfaces under this Contract shall be finished in an acceptable manner.

B. Insulation, galvanized piping, and copper piping in crawl spaces, in sump pits, inaccessible pipe spaces, and above ceilings shall not be painted.

C. All uninsulated non-galvanized steel piping, supports, hangers and other iron and steel work installed under this Contract, shall be painted with two (2) coats of rust preventative paint. Copper drain piping need not be painted.

3.10 PIPING IDENTIFICATION

A. All exposed piping shall be painted and identified with stenciling every 10 feet. Piping in concealed spaces (above ceilings etc.) must only be stenciled. Also stencil at every transition, wall penetration and at every branch. Identification and lettering shall be oriented to be easily observable from normal viewing locations.

B. Equipment, controls, valves, and other devices needed service, adjustments or maintenance but located in concealed spaces and above the ceiling shall be marked on surfaces visible from floor. A ½” color tape label placed on ceiling grid at approximate location of the device shall be acceptable. Selected marking scheme shall accompany a schedule or legend which copy shall be included in O&M manual and posted in mechanical room.

END OF SECTION 221000
SECTION 221005 - PLUMBING SPECIALTIES

PART 1 - GENERAL
1.1 SECTION INCLUDES

A. Work in this Section includes the following:
   1. Cleanouts
   2. Floor Drains
   3. Water Hammer Arrestors
   4. Hose Bibbs
   5. Backflow Preventors
   6. Thermometers
   7. Pressure Gauges

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Finished Floor Cleanouts: Coated cast-iron body, taper thread bronze plug, scoriated secured nickel bronze top. Cleanout shall have adjustable housing.
   1. Josam 56010-22
   2. Smith 4023
   3. Wade 6000
   4. Zurn ZN-1400-BP
   5. Watts Drainage CO-200-R-34B

B. Carpeted Area Cleanouts: Coated cast-iron body, taper thread bronze plug, scoriated secured nickel bronze top with carpet marker. Cleanout shall have adjustable housing.
   1. Josam 56010-22-14
   2. Smith 4023-Y
   3. Wade 6000-CM
   4. Zurn ZN-1400-BP-CM
   5. Watts Drainage CO-200-R-34B-RC

C. Tile Floors Cleanouts: Coated cast-iron body, taper thread bronze plug, with square top recessed for tile. Cleanout shall have adjustable housing.
   1. Josam 56010-22-12
   2. Smith 4163
   3. Wade 6000-TS
   4. Zurn ZN-1400-BP-TX
   5. Watts Drainage CO-200-TS

D. Wall Cleanouts: Round stainless steel wall access cover with center screw and recessed bronze tapped plug. Provide cleanout with threaded coated cast iron cleanout tee.
1. Josam 58890
2. Smith 4472
3. Wade 8480R-8590E
4. Zurn ZANB-1468
5. Watts Drainage CO-590-RD

E. Exposed Piping Cleanouts: Recessed bronze tapped plug in threaded cast-iron cleanout tee.

1. Josam 58890
2. Smith 4472
3. Wade 8480R-8590E
4. Zurn ZANB-1468
5. Watts Drainage CO-590-RD

2.2 FLOOR DRAINS

A. Acceptable Manufacturers: Josam, J. R. Smith, Wade, Zurn, Watts Drainage.

2.3 WATER HAMMER ARRESTORS

A. Water Hammer Arrestors shall be of Type "L", Type "K" copper or stainless steel bellows or plunger type construction conforming to PDI WH-201.

2.4 HOSE BIBBS

A. HB-1 Hose Bibb

Angle pattern hose bibb consisting of a brass body, vacuum breaker-backflow preventor with 3/4 inch male hose thread nozzle, tee-handle and 3/4 inch copper water tube inlet.

Chicago 15T
Wolverine Brass Encore
Woodford Manufacturing Co. Model 24C

2.5 THERMOMETERS

A. Solar power, variable angle, digital thermometers of appropriate range. When located outdoors, provide weather proof cover. Minimum operating light level 10 lux (1 foot candle). Wilka, Trerice, Weksler, Weiss, Milijoco.

2.6 PRESSURE GAGES

A. Acceptable manufacturers

1. Dwyer
2. Trerice
3. Weksler

B. Gage: Shall be 4-1/2" dial with stainless steel or cast aluminum case. Movement stainless steel and bourdon tube phosphor bronze. Accuracy, .5% of dial range with zero adjustment. Provide snubber
or throttling screw, incuated socket (.20” orifice). Trerice No. 500X or equal.

C. All gauges shall have brass valve. Graduation in psi.

PART 3 - EXECUTION

3.1 INSTALLATION

A. All materials, equipment and accessories shall be installed in strict accordance with manufacturer's recommendations.

B. Provide isolation valves for all fixtures, equipment, and accessories.

C. Drain piping from all backflow preventors, relief valves and vents, shall be extended to within 4" of a floor sink or floor drain. Minimum piping size shall be 1-1/4" diameter.

D. Locate all thermometers and gauges to be easily readable from normal viewing location.

END OF SECTION 221005
SECTION 221600 - FUEL GAS SYSTEMS

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. General: Provide a completely operational new fuel gas system in accordance with the intent of the Contract Documents and Related Documents and Referenced Codes and Standards.

B. Reference Codes & Standards: Comply with applicable provisions and recommendations of the following Codes:

1. NFPA Compliance: Fabricate and install natural gas systems in accordance with NFPA 54 "National Fuel Gas Code".

2. Utility Compliance: Fabricate and install natural gas systems in accordance with local gas utility company.


C. Provide gas systems in accordance with the intent of the Contract Documents. Where required, install all gas service regulators in accordance with the provisions of the local utility company and obtain all necessary approvals.

D. Make arrangement to provide gas service into the building. Ascertain what materials and/or labor will be provided by the local utility company and/or other authority.

E. Gas service contract limit line shall be as indicated on the drawings.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in the manufacture of products, of types, materials and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Gas Piping Installer's Qualifications: Firms regularly engaged in the installation of gas piping systems, with at least 3 years of successful installation experience on projects with piping similar to that required for the project.

C. All materials shall be protected and stored in such a manner as to prevent the accumulation of debris within the materials.

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data and installation instructions for natural gas systems materials and products.

B. Record Drawings: At project closeout, submit record drawings indicating installed natural gas systems piping and products; in accordance with the requirements of Section 22 05 00.
C. Maintenance Data: Submit maintenance data and parts lists for natural gas systems materials and products. Include this data, product data, shop drawings, and record drawings in Maintenance Manuals; in accordance with the requirements of Section 22 05 00.

D. Test Reports: Submit all test reports, witnessed by the Building Inspector or Local Authority.

PART 2 - PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, and capacities as indicated. Where not indicated, provide proper selection as determined by Installer to comply with installation requirements. Provide materials and products complying with NFPA 54 where applicable, base pressure rating on natural gas piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in natural gas systems. Where more than one type of materials or products are indicated, selection is Installer's option.

2.2 BASIC IDENTIFICATION

A. General: Provide identification complying with the following listing:

   1. Building Distribution Piping: Stenciled on labels.

2.3 BASIC PIPES AND PIPE FITTINGS

A. General: Provide pipes and pipe fittings complying with Division-22 Basic Mechanical Materials section "Pipes and Pipe Fittings", in accordance with the following listing:

B. Above Grade Exterior Gas Piping

   1. Pipe: Black steel pipe: Schedule 40; wrought-steel, screwed fittings sizes 2” and smaller (5 psi and less).

C. Interior Building Distribution Piping

   1. Pipe size 2” and smaller (5 psi and less): Black steel pipe, schedule 40, seamless, to comply with ANSI B36.10. Standard malleable iron screwed fittings, with flat band, for piping 2 inches and smaller.

2.4 BASIC PIPING SPECIALTIES

A. General: Provide piping specialties complying with section 22 10 00, in accordance with the following listing: option.

   1. Pipe escutcheons.
   2. Dielectric unions.
   3. Pipe Sleeves.
   4. Sleeve seals.
2.5 BASIC SUPPORTS AND ANCHORS

A. General: Provide supports and anchors complying with section 22 10 00, in accordance with the following listing:

1. Adjustable swivel pipe rings for horizontal-piping hangers and supports.
2. Two-bolt riser clamps for vertical piping supports.
3. Concrete inserts, C-clamps, and steel brackets for building attachments.

2.6 SPECIAL VALVES

A. General: Special valves required for natural gas systems include the following types:

B. Gas Rated Ball Valves

1. All ball valves shall comply with ANSI Z21.15, ANSI/ASME B16.33, ANSI/ASME B16.44.
2. The ball valves shall be of full port design, ¼ turn design.
3. The body of valve shall be composed of ASTM B 584 UNS Alloy C84400 bronze materials.
4. The ball shall be made of ASTM B-16 chrome plated brass.
5. Valves shall have PTFE seats and seals.
6. Valves shall be rated up to 125 psig.
7. Valves shall be listed for indoor and outdoor use, -40F to 150F.
8. Where indicated on plans, valve shall have single or dual pressure port tapping.

PART 3 - EXECUTION

3.1 INSPECTION

A. General: Examine areas and conditions under which natural gas systems materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF NATURAL GAS PIPING

A. General: Install natural gas piping in accordance with section 22 10 00.

B. Use sealants on metal gas piping threads which are chemically resistant to natural gas. Use sealants sparingly, and apply to only male threads of metal joints.

C. Remove cutting and threading burrs before assembling piping.
D. Do not install defective piping or fittings. Do not use pipe with threads which are chipped, stripped or damaged.

E. Plug each gas outlet, including valves, with threaded plug or cap immediately after installation and retain until continuing piping, or equipment connections are completed.

F. Ground gas piping electrically and continuously within project, and bond tightly to grounding connection.

G. Install dirt-legs in gas piping where indicated, and where required by code or regulations.

H. Install "tee" fittings with bottom outlet plugged or capped, at bottom of pipe risers.

I. Use dielectric unions where dissimilar metals are joined together.

J. Install piping with 1/64" per foot (1/8%) downward slope in direction of flow.

K. Install piping parallel to other piping, but maintain minimum of 12" clearance between gas piping and steam or hydronic piping above 200°F (93°C).

L. For risers running through concrete or asphalt, install through minimum 6" pipe sleeve. Fill annular space with gravel.

M. Unions are not permitted in the gas piping below ground or in plenums or concealed spaces.

N. For piping running through ducts or air plenums, install in welded conduit, ventilated on both ends.

3.3 GAS SERVICE

A. New, by utility.

3.4 INSTALLATION OF SUPPORTS AND ANCHORS

A. Install supports and anchors in accordance with section 22 10 00.

3.5 INSTALLATION OF VALVES

A. Gas Valves: Provide at connection to gas train for each gas-fired equipment item; and on risers and branches where indicated.

1. Locate gas valves where easily accessible, and where they will be protected from possible injury.

B. Control Valves: Install as indicated. Refer to electrical specifications for wiring.

C. Pressure Regulating Valves: Install as indicated; comply with Utility requirements. Install gas shutoff valve upstream of each pressure regulating valve. Pipe atmospheric vent to outdoors, full size of outlet.

3.6 EQUIPMENT CONNECTIONS

A. General: Connect gas piping to each gas-fired equipment item, with drip leg and shutoff gas cock. Comply with equipment manufacturer's instructions.
B. Provide gas piping runout within 5' of each gas-fired equipment item gas connection; provide drip leg, pressure regulator, and gas cock. Final connection is equipment installation work; not work of this section.

3.7 FIELD QUALITY CONTROL

A. Piping Tests: Inspect, test, and purge natural gas systems in accordance with NFPA 54, and local utility requirements.

B. Submit all test reports to the Engineer.

3.8 PAINTING

A. Paint all gas piping with two coats of rust-inhibiting enamel paint in safety yellow.

3.9 SPARE PARTS

A. Valve Wrenches: Furnish to Owner, with receipt, 2 valve wrenches for each type of gas valve installed, requiring same.

END OF SECTION 221600
SECTION 223000 - PLUMBING EQUIPMENT

PART 1 - GENERAL

1.1 WORK INCLUDE

A. Expansion Tank.
B. Domestic Hot Water Storage Heater.

PART 2 - PRODUCTS

2.1 ELECTRIC WATER HEATER

A. Provide electric fired storage water heater.
B. Provide foam insulation.
C. The water heater shall comply with the requirements of the latest edition of ASHRAE 90.1 standard.
D. Provide ASME rated temperature and pressure relief valve.
E. Manufacturers
   1. Lochinvar
   2. A.O. Smith
   3. State
   4. Rheem/ Rudd
F. Provide a 3 year non-prorated warrantee against tank failure from date of final project acceptance.

2.2 PRESSURE TANK

A. Bladder type prepressurized pressure tank.
B. Welded steel constructed, tested and stamped with Section VIII, Division 1 of the ASME Code for 125 psi and air precharged.
C. Tank shall have a heavy duty butyl bladder, minimum thickness of 0.10 inches with ANSI/NSF61 Code approvals.
D. Tank shall be supported by steel legs or integral ring mount base for vertical installation.
E. Tank shall be painted with one shop coat or red oxide primer.
F. Available Manufacturers
   1. Amtrol Wee-x-trol
   2. Wessels
   3. Hansen
PART 3  EXECUTION

3.1  INSTALLATION

A. All equipment, piping and accessories shall be installed in strict accordance with manufacturer's requirements.

B. Drain leave as is purge from all pumps shall be extended to within 4 inches of floor drain.

C. Sump pumps shall be vented through roof. Each pump discharge line shall be provided with a full flow gate valve and swing check valve.

D. Provide isolation valves for all equipment, and accessories.

E. Unions shall be provided adjacent to all equipment or wherever necessary to facilitate the removal of equipment for repair of replacement. Unions for copper tubing up to and including 2" diameter shall be brass ground joint with socket ends for solder. Unions for copper tubing 2-1/2" in diameter and over shall be standard brass flanges with socket ends for solder. Flanges to be drilled for ASA Standard 125 lbs. flanges and so stamped. No lip type unions or long screws will be permitted. The Contractor shall furnish and install all structural steel angles, channels, etc. necessary to properly support all fixtures and equipment to the satisfaction of the Professional.

F. Furnish and install isolation valves at the cold water and hot water supply tappings and an AGA/ASME pressure and temperature relief valve for each water heater.

G. The drawings are diagrammatic in showing plumbing equipment layout. Variations in differing manufacturer's piping arrangements and physical equipment size require careful layout by the Contractor. The Contractor shall coordinate his layout so as to provide adequate clearances to allow for maintenance and inspection. In particular, equipment supports shall not obstruct floor drains or utility trench access and piping shall be installed to allow sufficient vertical clearance above treatment tanks.

END OF SECTION 223000
SECTION 224000 - PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Sinks
B. Water Closets
C. Urinals
D. Electric Water Coolers
E. Lavatories

PART 2 - PRODUCTS

2.1 GENERAL

A. All fixtures shall be furnished complete with traps, faucets, wastes, supplies with stops, etc., as required. All exposed metal parts shall be chromium plated.

B. Fixtures and equipment shall be those of reputable manufacturers and shall be new.

C. All fixtures and equipment of similar types shall be of the same manufacturer unless indicated otherwise on the drawings or specified herein.

D. Fixtures shall be mounted at mounting heights as indicated.

E. If fixtures and equipment indicated in the Contract Documents are not currently manufactured, the manufacturer's current equivalent to the indicated fixtures and equipment shall be provided at no additional cost, subject to review and acceptance by the Professional.

F. All materials used on plumbing systems shall comply with the following lead ban requirements:

1. Solders with lead content exceeding 0.2% (two-tenths of a percent) are prohibited. Brass and bronze materials containing 0.25% (25 hundredths of a percent) or greater lead are prohibited. All lead content shall be per ANSI/NSF 372.

2. All materials shall be compliant with the 2011 “Reduction of Lead in Drinking Water Act”.

3. Components that are specifically exempted in the Act, such as water closets, urinals, flush valves and shower valves need not comply.

2.2 PLUMBING FIXTURES


B. Refer to the drawings for specific fixture selections.

2.3 FAUCETS

A. Acceptable Manufacturers: Delta, Chicago, T&S Brass, Moen.
B. Refer to the drawings for specific fixture selections.

2.4 FLUSH VALVES


B. Refer to the drawings for specific fixture selections.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Fixtures and equipment shall be installed in a neat and workmanlike manner and in accordance with the manufacturer's recommendations.

B. All wall mounted lavatories shall be provided with carriers and supports suitable to the type of construction wherein they are located. Wall mounted water closets shall be supported by chair carriers.

C. All fixtures and equipment must be protected against damage during the progress of construction. Upon completion of construction, all fixtures and equipment must be thoroughly cleaned and left in perfect working order. All piping and accessories having polished, plated or finished surfaces shall be protected to prevent scarring or other damage and protect the finish against damage.

D. Provide isolation valves for all fixtures, equipment, and accessories.

E. All fixture supplies and waste lines shall be routed to the wall unless construction or fixture type requires that they be routed to floor. All supplies through walls shall be provided with angle stops. All supplies through floors shall be provided with straight stops. Unions shall be provided adjacent to all equipment or wherever necessary to facilitate the removal of equipment for repair of replacement. Unions for copper tubing up to and including 2 inch diameter shall be brass ground joint with socket ends for solder. Unions for copper tubing 2-1/2 inches in diameter and over shall be standard brass flanges with socket ends for solder. Flanges to be drilled for ASA Standard 125 pounds flanges and so stamped. No lip type unions or long screws will be permitted. The Contractor shall furnish and install all structural steel angles, channels, etc. necessary to properly support all fixtures and equipment to the satisfaction of the Professional.

F. Mop receptors drains shall be sized for the outlet pipe size shown on drawings and shall be equipped with P-traps. The Contractor shall be responsible for proper height setting and leveling of drains.

G. Apply a bead of waterproof caulking around the edge of surface mounted plumbing fixture to mask any irregularities between the fixture and wall finish. Color of caulk shall match the fixture color.

3.2 MOUNTING HEIGHTS

A. Plumbing fixture mounting heights shall conform to that detailed on the Architectural drawings. The Contractor shall coordinate the mounting height of all fixtures with the mounting heights indicated. Mounting heights for barrier free fixtures shall meet the requirements of the ADA Accessibility Guidelines, and shall apply unless superseded by more stringent State or local code.

END OF SECTION 224000
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. General: This section specifies several categories of provisions of mechanical work, including: 1) Certain adaptive expansions of requirements specified in Division 1, as uniquely applicable to mechanical work, 2) General performance requirements within the mechanical work as a whole and 3) General work to be performed as mechanical work, because of its close association with mechanical work. This section applies to all subsequent Division 23 sections.

B. Heating, Ventilating, Air Conditioning and Refrigeration work shall include all material and labor to furnish and install all the HVAC systems as indicated on the M-series drawings and the mechanical specifications.

C. Mechanical Contractor: The Mechanical Contractor shall act as subcontractor and shall be responsible for all aspects of the mechanical work defined in the contract documents and coordinating all efforts with the General and other subcontractors. Refer to General and Supplemental conditions of the contract. References in these documents to the mechanical contractor as a prime or subcontractor shall be superseded by the actual contractual arrangement used on the project.

D. All start-up and testing and balancing shall be complete. Coordination between the TAB and mechanical contractors will be mandatory and the responsibility of each.

1.2 QUALITY ASSURANCE

A. Workmen shall be thoroughly experienced and fully capable of installing assigned work. Work shall be in accordance with the best standard practice of the trade. Work that is not of good quality will require removal and reinstallation at no additional expense to Owner and as approved.

B. Provide complete operational mechanical systems with facilities and services to requirements described, in accordance with applicable codes and statutes.

C. Drawings are diagrammatic and approximately to scale. The contract documents establish scope, material and quality and are not detailed installation instructions. The Contractor shall be responsible to prepare all necessary coordination and shop drawings to completely and correctly install systems and/or make field modifications necessary resulting from a failure to do so, at no additional cost to the contract

D. Provide labor and materials required to install, test and place into operation the mechanical systems. Provide additional labor and materials for modifications required to correct job conflicts resulting from a failure to coordinate between trades, at no additional cost to contract.

E. Certain terms such as "shall, provide, install, complete, start-up" are occasionally not used in some parts of these specifications. This does not indicate that the items shall be less than completely installed or that systems shall be less than complete.

F. Protect all materials and equipment from damage during storage at the Site and throughout the construction period. In the event of damage prior to final inspections, the Contractor shall repair or replace damaged items as determined by the Architect or Engineer, at no cost to the Owner.
G. Install all equipment and appurtenances in strict accordance with the manufacturer’s recommendations.

H. Working pressure of piping, fittings, valves, equipment and accessories in piping systems shall be of a pressure rating equal to or greater than the maximum working pressure of the system and/or the test pressure to which it will be subjected.

I. All welders shall be certified by the Welding Bureau of the Mechanical Contractors Association of America for the appropriate service, and shall perform all welding in accordance with Welding Bureau’s procedures and the ASA Code for pipe welding.

1.3 DEFINITIONS:

A. By other Trades: Shall mean by persons or parties who are not anticipated to be the contractor for this trade working together with the Prime Contractor. In this context the words “by other trades” shall not be interpreted to mean not included in the overall contract, unless specifically noted as not in contract (NIC).

B. Concealed: Embedded in masonry or other construction, installed behind wall furring, above ceilings, in crawl spaces, in shafts or otherwise not visible.

C. Contractor: As used in this Division of the specification refers to the Mechanical Contractor unless specifically noted otherwise.

D. Ductwork: All air distribution, recirculation and exhaust ducts, whether of sheet metal or other material, and includes all connections, hanger, supports, damper controls, insulation, accessories, fire and smoke control devices, and appurtenances necessary for and incidental to a complete system.

E. Exposed: Not concealed.

F. Furnish: Purchase and deliver to the project site complete with every necessary appurtenance and for installation.

G. Install: Unload at the delivery point and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.

H. Piping: Pipe, fittings, flanges, valves, controls, hangers, supports, traps, drains, gauges, insulation, vents and items customarily required in connection with the transfer of fluids.

I. Provide: Furnish and install complete ready for use.

1.4 INTERPRETATION OF CONTRACT DOCUMENTS

A. This section of the specifications and related drawings describe general provisions applicable to every section of Division 23.

B. Attention is directed to Instructions to Bidders and General Conditions, which are binding in their entirety on this portion of the work and in particular to paragraphs concerning materials, workmanship and substitutions.
C. Provide all materials called for in these specifications and accompanying drawings and provide the apparatus complete in every respect. Anything called for in the specifications and not shown on the drawings, or shown on the drawings and not called for in the specifications must be provided.

D. Mention in these specifications, indications and reasonable implications on drawings, whereby articles, materials, operation or methods related to execution of the mechanical work are noted, specified, drawn or described, thereby requires execution of each such item of work and provision of all labor, materials, equipment and appurtenances required for execution thereof.

E. Particular attention is directed to the drawings and other contract documents for information pertaining to required items or work which are related to and usually associated with the work of this Division of the specifications, but which are to be provided as part of the work of other Divisions of the specifications.

F. Drawings show arrangements of system desired and shall be followed as closely as practical. Because of the small scale of the drawings not all offsets and bends can be shown and these shall be provided as required, to fully complete the intent of plans. Verify and check all measurements in the field. Should conditions and substitutions of equipment necessitate a rearrangement, prepare and submit for review, scaled drawings of such rearrangement before beginning work.

G. No exclusions from, or limitations in, the language used in the drawings or specifications shall be interpreted as meaning that the appurtenance or accessories necessary to complete any required system or item of equipment are to be omitted.

H. The drawings of necessity utilize symbols and schematic diagrams to indicate various items of work. Neither of these have any dimensional significance nor do they delineate every item required for the intended installations. The work shall be installed, in accordance with the intent diagrammatically expressed on the drawings, and in conformity with the dimensions indicated on final architectural and structural working drawings and on equipment shop drawings. No interpretation shall be made from the limitations of symbols and diagrams that any elements necessary for complete work are excluded. When abbreviations appear on the drawings or specification in lower case letter with or without periods, their meanings shall be the same as stated above.

I. Certain details appear on the drawings that are specific with regard to the dimensioning and positioning of the work. These details are intended only for the purpose of establishing general feasibility. They do not make unnecessary the field coordination for the indicated work.

J. Information as to the general construction shall be derived from structural and architectural drawings and specifications only.

K. The use of words in the singular shall be considered as limited where other indications denote that more than one item is referred to.

L. Submission of a proposal and ultimate acceptance of an agreement or contract for execution of this section of work will be construed as evidence that the Prime Contractor, Subcontractor and Vendor has carefully read and accepts all conditions set forth in each Division under specification Divisions titled “Instruction to Bidders” and Division 1, “General Condition”, insofar as such conditions may affect both the bidding for and execution of this section or work.

1.5 DELINEATION OF WORK:

A. The “Division of Work:” as shown on the drawings, is a recommended division of work as an aid to
Contractors and Subcontractors for bidding and performance of the overall prime contract. This or any other reference to the Mechanical Contractor or any Subcontractor shall in no way be intended to interfere with or relieve the Prime Contractor as to his overall responsibility.

B. Division 23 contractors are required to supply all necessary supervision and coordination of information to any others who are performing work to accommodate Division 23 installations. Where the Division 23 contractors are required to install items which they do not purchase, they shall include for such items:

1. The coordination of their delivery.
2. Their unloading from delivery trucks driven in to any designated point on the property line at grade level.
3. Their safe handling and field storage up to the time of permanent placement in the project.
4. The correction of any damage, defacement or corrosion to which they may have been subjected.
5. Their field assembly and internal connection as may be necessary for their proper operation.
6. Their mounting in place including the purchase and installation of all dunnage, supporting members, fastenings necessary to adapt them to architectural and structural conditions.
7. Their connection to building systems including the purchase and installation of all terminating fittings necessary to adapt and connect them to the building systems.

C. Items that are to be installed but not purchased as part of the work of Division 23 shall be carefully examined upon delivery to the project. Claims that any of these items have been received in such condition that their installation will require procedures beyond the reasonable scope of the work will be considered only if presented in writing within one week of the date of delivery of the project of the items in question. The work under Division 23 shall include all procedures, regardless of how extensive, necessary to put into satisfactory operation, all items for which no claims have been submitted as outlined above.

1.6 MECHANICAL CODES, STANDARDS & REGULATIONS

A. General: All work shall comply with the current governing codes, ordinances and regulations of all National, State and Local authorities having jurisdiction. The requirements of the following governing bodies, codes and standards are included by reference and shall have the same force and affect as if printed here in full (in addition to specific applications specified by individual work sections of these specifications):

1. ADA: Air Diffusion Council.
2. AMCA: Air Moving and Conditioning Association, Inc.
3. ANSI: American National Standards Institute
4. ANSI Pressure Piping Standards (B31-Series).
5. ARI: American Refrigeration Institute
6. ASHRAE: American Society of Heating, Refrigeration and Air Conditioning Engineers
8. ASME: American Society of Mechanical Engineers
9. ASME Boiler and Pressure Vessel Code
10. ASTM: American Society of Testing and Materials
11. AWS Standards for Welding.
12. IBR: Institute of Boiler and Radiator Manufacturers
13. MSS: Manufacturers Standardization Society
14. North Carolina Department of Labor
   a. The Uniform Boiler and Pressure Vessel Act – current edition
   a. General Construction
   b. Plumbing
   c. Mechanical
   d. Energy
   e. Fuel Gas Code
   f. Fire Code

16. NEMA: National Electrical Manufacturer’s Association
17. NFPA 45: Standard on Fire Protection for Laboratorial Using Chemicals
19. OSHA: Occupational Safety and Health Administration
20. SMACNA: Sheet Metal and Air Conditioning Contractors National Association, Inc.

B. Include all items of labor and materials required to comply with such standards and codes. Where quantity, sizes or other requirements indicated on the drawings or herein specified are in excess of the standard or code requirements, the specifications or drawings, respectively, shall govern.

C. Should any change in plans or specifications be required to comply with governing regulations, the Contractor is to notify the Professional at the time of submitting his bid.

1.7 PERMITS AND FEES

A. The contractor shall arrange for, obtain and pay for all permits, certificates, tests, inspections, agency approvals, etc. and pay all fees levied by the state, local and municipal authorities and having jurisdiction over the work performed under this contract. Provide copies of all required permits, certificates, inspections and agency approvals to the owner. Contractor shall submit to the appropriate Regulatory Agencies all items necessary to obtain all required permits and to perform all tests and inspections.

B. Contractor shall pay royalties or fees required in connection with the use of any patented devices and systems.

1.8 VERIFICATION OF DIMENSIONS AND LOCATIONS:

A. The Contractor shall visit the premises and thoroughly familiarize himself with all details of the work, working conditions, verify all dimensions in the field, advise the Architect/Engineer of any discrepancy, and submit shop drawings of any significant changes affecting other work he proposes to make, in quadruplicate for approval, before starting the work.

B. The location of duct, pipe, fixture, equipment and appurtenances for existing facilities are shown on plans to indicate the extent of work required. Exact condition shall be field verified.

1.9 PRODUCT SUBMITTALS:

A. General: Refer to the Division 1 sections for general requirements concerning work-related submittals. In addition to those general requirements, the following are required for Division 23 submittals. Failure to comply with these requirements may result in rejection without further review.

1. Manufacturer or Vendor terms and conditions of sale are strictly between Vendor and Contractor. Approval of submittal data shall not be construed as approval of terms and conditions.
By providing submittals to the contractor to be forwarded to the engineer for review, the equipment vendor is acknowledging review of the contract documents and installation details, and that the submitted product is suitable for application in the manner indicated in the contract documents. Upon request, and at no additional charge, the equipment vendor will provide to the engineer a letter from the manufacturer stating the product has been applied in accordance with manufacturer’s recommendations.

B. Product Date, Shop Drawings and Samples: After checking and verifying all field measurements, the Contractor shall submit to the Engineer for review, in accordance with the accepted schedule of shop drawings submissions, copies of all product data, shop drawings and samples, which shall have been checked by and stamped with the approval of the Contractor and identified as the Engineer may require. The data shown on the shop drawings will be complete with respect to dimensions, design criteria, materials of construction and the like to enable the Engineer to review the information as required.

1. The Contractor shall review each submittal in detail. The work described in shop drawing submission shall be carefully checked for clearances (including those required for maintenance and servicing), field conditions, maintenance of architectural conditions and proper coordination with other trades on the job. If it is determined to be correct, the Contractor shall place an approval stamp on each copy; approval stamp shall be filed in with the date on which the items is checked and the checker's name. The Contractor=s approval stamp certifies that submittals and related job conditions have been checked and that conflicts do not exist. Any job conflicts arising from the contractor=s failure to fully complete these responsibilities shall be corrected as directed by the Professional at no additional cost to the contract. Drawings which the Contractor finds are incomplete or incorrect shall be returned to the source without being forwarded to the Professional. Drawings which do not contain the signed Contractor's stamp may be returned unchecked to the Contractor. Return of unchecked submittals and any delays in construction it may cause, will not be considered cause for any extensions or delays in construction by the Contractor.

2. Shop drawings shall be submitted well in advance of field requirements to allow ample time for checking. Submittals shall be complete and contain required detailed information. Shop drawings with multiple parts shall be submitted as a package.

3. Include with each submittal a permanent cover sheet for identification. Provide the following information on the cover sheet for proper processing and recording of action taken. A sample cover sheet can be made available by the Engineer for reproduction and use for each submittal.

a. Project name;
b. name and address of Professional;
c. name and address of Contractor;
d. name and address of supplier;
e. Sequential submittal number (e.g. FP-1, M-1, P-1, P-2, P-3, etc.); resubmittals shall be designated with the same submittal number but noted as a resubmittal (e.g. FP-1R, M-1R, P-1R, P-2R, P-3R, etc.);
f. name of manufacturer;
g. number and title of appropriate specification section, drawing number identifying symbol, and detail references, as appropriate.
h. similar definitive information as necessary.
i. space for the Contractor's review and approval markings
j. space for the Professional "Action" marking

4. Submit materials and equipment by manufacturer, trade name and model number. Include copies of applicable brochure or catalogue material. Do not assume applicable catalogues are available in the Professional=s office. Maintenance and operating manuals are not suitable substitutes for shop drawings.

5. Identify each sheet of printed submittal pages (using arrows, underlining or circling) to show applicable sizes, types, model numbers, ratings, capacities and options actually being proposed. Cross out non-applicable information. Note specified features such as special tank linings, pump seals, materials or painting.

6. Include dimensional data for roughing in and installation, technical data sufficient to verify that equipment meets requirements of drawings and specifications. Include wiring, piping and service connection data, motor sizes complete with voltage ratings and schedules.

7. Installed materials and equipment shall meet specified requirements regardless of whether or not shop drawings are reviewed by the Professional.

8. Furnish all submittals for the items used in this project as listed in their related sections.

9. The Contractor shall also submit to the Engineer for review, with such promptness as to cause no delay in work, all samples required by the Contract Documents. All samples shall have been checked by and stamped with the approval of the Contractor, identified clearly as to material, manufacturer, any pertinent catalog numbers and the use for which intended.

10. At the time of each submission, the Contractor shall in writing call the Engineer's attention to any deviations that the shop drawings or sample may have from the requirements of the Contract Documents. Make specific mention of such difference in a letter of transmittal, with request for substitution, together with reasons for same.

11. The Engineer shall review with reasonable promptness shop drawings and samples, but his review shall be only for conformance with the design concept of the project and for compliance with the information given in the Contract documents.

12. No work requiring a shop drawing or sample submission shall be commenced until the submission has been reviewed by the Engineer. A copy of each shop drawing and each approved sample shall be kept in good order by the Contractor at the site and shall be available to the Engineer and other authorities having jurisdiction.

13. The Engineer's review and acceptance of submitted data or shop drawings for material equipment apparatus, devices, arrangement and layout shall not relieve Contractor from responsibility of furnishing the proper dimensions and weight, capacities, sizes, quantity, quality and installation details to efficiently perform the requirements and intent of the Contract. Approval shall not relieve the Contractor from responsibility for errors, omissions or inadequacies of submitted data or shop drawings.

14. Upon final approval of shop drawings, the Contractor shall submit manufacturer's installation instructions to the Local Building Authority for all equipment and appliances at their request.

15. Upon final approval of shop drawings, the Contractor shall submit a record copy of all applicable items to the Balancing Agency.
1.10 SUBSTITUTIONS

A. Follow requirements listed in the general provisions of the contract.

B. Submittals are not opportunities for gaining acceptance of substitutions. Where three or more manufacturers are specified by name or by catalog reference, Contractor shall select for use any of those so specified.

1. Should Contractor desire to substitute another manufacturer's equipment for one specified by name, the Contractor shall apply to the Engineer in writing no later than the date of the prebid conference for such permission. He shall provide supporting data and samples for Engineers consideration. No substitution shall be made for any material, article or process required under the contract unless approved by the Engineer.

C. Contract documents are based on materials and equipment specified. Approval by Professional of equipment submitted by the mechanical trade as equal to that specified does not relieve the mechanical trade of any responsibility.

D. Revisions required to adapt alternative shall be included in such proposals. No increase in the contract price will be considered to accommodate the use of the equipment other than that specified.

E. Wherever operating results such as quantity delivered, pressure obtained, or similar results are specified, or a definite manufacturer and size of apparatus is specified, for which such quantities are readily determinable, the manufacturer and size of apparatus that the Contractor has proposed using must conform substantially (in regard to the operating results) to the quantities specified or implied. This requirement shall also apply to important dimensions relating to operation of apparatus in coordination with the rest of the system, and to properly locating the apparatus in available space conditions.

F. Acceptance of substitutions for equipment specified shall be given only after receipt of complete and satisfactory performance data covering the complete range of operating conditions in tabular and graphical form. Furnish complete and satisfactory information relative to equipment dimensions, weight, etc. Acceptance of equipment specified or shown on the Drawings, or substitutions submitted for that specified or shown on the drawings, will be granted if such equipment, in the opinion of the Professional, conforms to the performance requirements, space conditions, weight requirements and quality requirements. Acceptance by the Professional as “equivalent” does not relieve the contractor(s) of any responsibility. Any additional construction and design costs incurred as a result of any accepted substitution shall be borne by the Contractor.

1.11 REQUESTS FOR INFORMATION

A. During the course of construction, the Contractors may find it necessary to request additional information. The Professional encourages written requests for information (RFI=s) to clearly document the request. The response issued by the design Professional is an attempt to assist in the progress of construction. With a response, the design Professional is not conceding any deficiency of the design and is not assuming responsibility for means and methods. RFI=s may not be used and asserted as an excuse for late submittal of shop drawings. The Contractor bears the responsibility to prioritize RFI=s in the order in which it desires the professional to respond.
1.12 ALTERNATES

A. Refer to Division 1 for Schedule of Alternates, if any.

B. Alternate amounts quoted on bid forms shall include any and all costs to coordinate related work among all disciplines and modify surrounding work as required to obtain complete and operational systems.

1.13 PROJECT/SITE CONDITIONS

A. Install Work in locations shown on Drawings, unless prevented by Project conditions.

B. If conflicts arise, prepare drawings showing proposed rearrangement of Work to meet Project conditions, including changes to Work specified in other Sections. Obtain permission of Professional before proceeding.

1.14 FUTURE PROVISIONS

A. Where indicated on the Contract Documents there may be provisions for future work. Contractor shall carefully coordinate any associated work that could affect that future work. Future equipment space and working clearances shall be maintained by avoiding routing current mechanical systems through those areas. Where indications of “Capped For Future” are indicated, provide capped isolation valves in piping and for duct work provide dampers with capped ends, sealed with removable sealant.

1.15 OWNER FURNISHED PRODUCTS

A. Certain products may be furnished to the site and paid for by Owner: Rough-ins and final connections shall be provided by the HVAC subcontract as required. Contractor shall fully coordinate requirements with Owner and/or Owner’s vendor.

PART 2 - PRODUCTS

2.1 MECHANICAL PRODUCT REQUIREMENTS:

A. Under the Base Bid, the specified equipment shall be used as the basis of the proposal.

B. Standard Products: Provide not less quality than manufacturer's standard products, as specified by their published product data. Notwithstanding the indication that a particular product/model number is acceptable, comply with the specified requirements. Do not assume that the available off-the-shelf conditions of a product comply with the requirements; as an example, a specific finish or color may be required. Where the specifications do list a specific model number for a manufacturer, the construction of a product shall be equal to those models specifically listed.

C. Unencumbered Purchases: Wherever possible, avoid the purchase and use of products which are encumbered with questionable title transfers, patent rights, trade union restrictions, code compliance, non-listing as "approved products" for compliance with governing regulations, duties due, embargoes and similar possible encumbrances, claims, or seller's interest.

D. Purchasing: Do not purchase specific mechanical materials and equipment for the project until completion of submittals that might affect the purchase.

E. Conditions of Products: Unless noted otherwise, all equipment and materials required for installation
under these specifications shall be new and without blemish or defect. Applicable equipment and materials to be listed by Underwriter's Laboratories and manufactured in accordance with ASME, AWWA, or ANSI standards, and as approved by local authorities having jurisdiction. All equipment shall bear labels attesting to Underwriters Laboratories approval where subject to Underwriters Laboratories label service. Where no specific indication as to the type or quality of material or equipment is indicated, a first-class standard article shall be furnished. All manufacturers of equipment and materials pertinent to these items shall have been engaged in the manufacturers of said equipment a minimum of three (3) years and, if so directed by the Engineer, be able to furnish proof of their ability to deliver this equipment by submitting affidavits supporting their claim. Comply with Division I requirements for exposure or visual display limitations against trademarks and manufacturer's names. Provide each product complete with trim, accessories, finish, guards, safety devices and similar components specified or recognized as integral parts of the product, or required by governing regulations.

F. Uniformity: Where multiple units of a generic product are required for the mechanical work (as specified in Division 23), provide identical products by the same manufacturer, without variations except for sizes and similar variations as indicated.

G. Limitations: Product/manufacturer uniformity does not apply to raw materials, bulk materials, pipe, tube, fittings (except flanges and grooved type), insulation, sheet metal, wire, steel bar stock, welding rods, solder, paint, fasteners, motors for unlike equipment units, and similar items used in the work, and except as otherwise indicated.

H. Product Compatibility Options: Where more than one product selection is specified, either generically, or proprietarily, selection is Purchaser's or Installer's option, except do not provide products which are not compatible with previously purchased or installed products which must interface with the adjacent selections. Provide mechanical adaptations as needed for the interfacing of selected products in the work.

I. Equipment Nameplates: Provide a permanent operational data nameplate on each item of power operated mechanical equipment, indicating the manufacturer's name and address, product name, model number, serial number, speed, capacity, power characteristics, labels of tested compliance, and similar essential operating data. Locate nameplates in easily-read locations; except where product is visually exposed in occupied areas of the building, locate nameplate in a concealed position (where possible) which is accessible for reading by service personnel. UL or other label, or other data that is die-stamped into the surface of the equipment shall be stamped in a location easily visible. The generic nameplate of a distributing agent will not be acceptable.

J. Except where more stringent requirements are indicated, comply with the product manufacturer's installation instructions and recommendations, including handling, anchorage, assembly, connections, cleaning, testing, charging, lubrication, adjustment, start-up test operation, and shut-down of operating equipment. Provide a copy of such instructions at the equipment during work on the equipment. Consult with manufacturer's technical representatives, who are recognized as the technical experts, for specific instructions on unique project conditions and unforeseen problems.

K. Statically and dynamically balance rotating equipment for minimum vibration and low operating noise level after installation is complete.

L. Pressure vessels and relief valves shall be selected, built and labeled in accordance with ASME. Obtain a certificate from the Inspector having jurisdiction showing such acceptance, and mount this certificate in a black frame under glass or laminated plastic adjacent to each pressure vessel and relief valves.
M. Where factory testing of equipment is required to ascertain performance and attendance by the Owner's representative is required to witness such test, associated travel costs and subsistence shall be borne by the Contractor.

N. No product containing any amount of any form of asbestos shall be installed on this project. Asbestos includes but is not limited to asbestiform varieties of chrysotile, crocidolite, anthophyllite, tremolite or actinolite. The contractor shall furnish a letter to the Owner certifying that this requirement has been complied with prior to final payment.

PART 3 - EXECUTION

3.1 COORDINATION OF MECHANICAL WORK:

A. The HVAC contractor shall coordinate the HVAC work with the work of other trades to avoid installation conflicts. Conflicts arising from failure to coordinate shall be rectified by the contractors at no additional cost to the contract.

B. The mechanical drawings show the general arrangement of equipment, ductwork, piping and appurtenances. Follow these drawings as closely as the actual construction and the work of other trades will permit. Provide offsets, fittings, and accessories that may be required but not shown on the drawings. Investigate the site, structural and finish ground conditions affecting the work, and arrange the work accordingly. Provide such work and accessories as may be required to meet such conditions.

C. Examine and compare the contract drawings and specifications with the drawings and specifications of other trades and work furnished by others not in contract (NIC), and report any discrepancies between them to the Professional and obtain from him written instructions for changes necessary in the mechanical work. Install and coordinate the mechanical work in cooperation with other related trades and work furnished by others (NIC). Before installation, make proper provisions to avoid interference.

D. Wherever the work is of sufficient complexity, prepare additional detail drawings to scale similar to that of the design drawings, prepared on medium of the same size as contract drawings. With these layouts, coordinate the work with the work of other trades. Such detailed work to be clearly identified on the drawings as to the area to which it applies. Submit these drawings to the Professional for approval. At completion include a set of such drawings with each set of as-built drawings.

E. Shut Downs: Any shut down schedules shall be coordinated with the Owner, the department user groups and the other trades involved in the construction. The contractor shall provide a minimum of five (5) days (weekdays) written notice to the Owner’s Facility Operations Department and the other trades involved in the construction, whenever a utility outage is required.

F. Certain materials will be provided by other trades. Coordinate the affected work with other trades. Examine the Contract Documents to ascertain these requirements. Consult with other trades regarding equipment so that, wherever possible, motors, motor controls, pumps and valves are of the same manufacturer.

G. Wherever work interconnects with work of other trades, coordinate with other trades to insure that they have the information necessary so that they may properly install the necessary connections and equipment. Identify items (valves, dampers, coils, etc.) requiring access in order that the ceiling...
trade will know where to install access doors and panels.

H. Coordination of Options and Substitutions: Where the contract documents permit the selection from several product options, and where it becomes necessary to authorize a substitution, do not proceed with purchasing until coordination of interface requirements has been checked and satisfactorily established.

I. Chases and Holes: Unless otherwise indicated, all piping and ductwork shall be run in concealed spaces between floor and ceilings or in chases. Ductwork and piping areas without ceilings shall be installed exposed and as high as practical. This Contractor shall be responsible for the location and size of holes required for pipe, ducts and other equipment and shall advise of chase spaces and holes required as building progresses. Failure to do so shall require this Contractor to provide or cut same.

J. Carefully check space requirements with other trades prior to installation to insure that material can be installed in the spaces allotted including finished suspended ceilings.

K. Structural Limitations: Do not cut structural framing, walls, floors, decks and other members, except with the Architect's or Engineer's written authorization. Authorization will be granted only where there is not another reasonable method of completing the mechanical work, and where the proposed cutting clearly does not materially weaken the structure. Provide required supports and hangers for ductwork, piping and equipment, designed so as not to exceed allowable loading of structures.

L. Slots, chases, openings and recesses through floors, walls, ceilings, and roofs shall be provided by the various trades in their respective materials. Contractor shall properly locate such openings and be responsible for cutting and patching caused by the failure to do so.

M. All cutting and patching required for installation of Division 23 work shall be the responsibility of the associated Contractor(s), performed in accordance with all requirements indicated in Division 1.

1. Cutting Concrete: Where authorized, cut openings through concrete (for pipe penetrations and similar services) by core drilling or sawing. Do not cut by hammer driven chisel or drill, unless receiving special permission for specific cases.

2. Other Work: Do not endanger or damage other work through the procedures and processes of cutting to accommodate mechanical work. Review the proposed cutting with the Installer of the work to be cut, and comply with his recommendations to minimize damage. Where necessary, engage the original Installer or other specialists to execute the cutting in the recommended manner.

3. Patching: Where patching is required to restore other work, because of either cutting or damage inflicted during the installation of mechanical work, execute the patching in the manner recommended by the original Installer. Restore the other work in every respect, including the elimination of visual defects in exposed finishes, as judged by the Architect/Engineer and Owner.

N. Furnish and set sleeves for passage of pipes, ducts and conduits through structural masonry and concrete walls and floors and elsewhere as required for the proper protection of each pipe and duct passing through building surfaces. Coordinate locations of sleeves with General Contractor for proper scheduling and installation.

O. Install mechanical work to permit removal (without damage to other parts) of coils, heat exchanger plates and tube bundles, fan shafts and wheels, filters, belt guards, sheaves and drives, and other
parts requiring periodic replacement or maintenance. Arrange pipes, ducts, and equipment to permit access to valves, gauges, starters, motors, and control components, and to clear the opening of swinging doors and access panels.

P. Sequence, coordinate and integrate the various elements of mechanical work so that the mechanical plant will perform as indicated and be in harmony with other work of the building. The Architect/Engineer will not supervise the coordination, which is the exclusive responsibility of the Contractor. Comply with the following requirements:

1. Install piping, ductwork and similar services straight and true, aligned with other work, close to walls and overhead structure (allowing for insulation), concealed where possible in occupied spaces, and out-of-the-way with maximum passageway and headroom remaining in each space.

2. Arrange work to facilitate maintenance and repair or replacement of equipment without removal of relatively fixed building elements or other equipment. Locate services requiring maintenance on valves and similar units in front of services requiring less maintenance. Connect equipment for ease of disconnecting, with minimum of interference with other work.

3. Locate operating and control equipment and devices for easy access. Install access panels where units are concealed by finishes and similar work.

4. Integrate mechanical work with light fixtures and other work, so that required performances of each will be achieved.

5. Adjust location of pipes, ducts, panels, equipment, etc., to accommodate the work to prevent interference, both anticipated and encountered. Determine the exact route and location of each pipe and duct prior to fabrication.

6. Right-of-Way: Piping systems that pitch have the right-of-way over those which do not pitch (e.g. drainage systems normally have right-of-way). Service lines whose elevations cannot be changed have right-of-way over lines whose elevations can be changed.

7. Make offsets, transitions and changes in direction in pipes and ducts as required to maintain proper head room and pitch on sloping lines. Furnish and install air vents, drains, etc., as required to affect these offsets, transitions and changes in direction.

8. Obtain from Others furnishing products, materials or services not in contract, all necessary catalog cut sheets, rough-in requirements or any other such information as required to fully coordinate the services to support all such work by others. Costs that arise from not performing this coordination shall be borne by the Contractor.

Q. Protective Drip Pans: Where indicated, and where mechanical work piping carrying liquids pass over electrical or electronic equipment which might be damaged by dripping liquids (leakage or condensation), install drip pans 2" deep, 16 gauge copper with rolled edges of adequate width and length to protect the electrical equipment. Pipe drainage from pan to nearest floor drain or similar suitable point of discharge, and terminate pipe as an open-sight drainage connection. Provide permanent support and anchorage to prevent displacement of drip pans. Drains shall be 3/4" copper unless noted otherwise. Locate drip pans as close to underside of piping as possible. Extend edges not less than 6" each side of piping and extend ends not less than 18": beyond equipment being protected.
R. Electrical Work: Coordinate the mechanical work with electrical work, and interface properly with electrical service to mechanical equipment. In general, and except as otherwise indicated, install mechanical equipment ready for electrical connection.

1. Refer to Division 26 sections for electrical power connection of mechanical equipment, including disconnect switches.

2. Power Characteristics: Refer to the appropriate sections of Division 26 and the electrical drawings for the power characteristics available for the operation of each power driven item of mechanical equipment. Coordinate purchases to ensure uniform interface with electrical work.

S. Utility Coordination: Coordinate the connection of mechanical systems with exterior underground and overhead utilities and services. Comply with the requirements of governing regulations, franchised service companies and controlling agencies. It is the construction contractor’s responsibility to mark and trace the lines using appropriate/suitable devices; i.e., metal detectors, pipe locators, etc.; or by having the appropriate utility company stake the lines. The contractor shall repair all utility systems he damages at no charge to the Owner. All repairs shall be performed to Owner’s or the affected utilities’ satisfaction. The contractor is responsible for all utility hook ups, disconnects and coordination with the appropriate agencies.

T. Seasonal Requirements: Adjust and coordinate the timing of mechanical system start-ups with seasonal variations, so that demonstration and testing of specified performance can be observed and recorded. Exercise proper care in off-season start-ups, to ensure that systems and equipment will not be damaged by the operation.

U. The HVAC Contractor shall be responsible to coordinate their work with the TAB and commissioning Agencies and notify the Agencies when each phase of the project is at 30, 60 and 90 percent complete, in order for the Agencies to provide the required field inspections.

V. The HVAC Contractor shall be responsible for ensuring that the HVAC systems, wiring, and controls are complete and operational and for providing written documentation as such to the Professional and the TAB and commissioning Agencies prior to TAB and commissioning services being performed. The HVAC Contractor shall be responsible for any costs associated with additional services required to reschedule and/or redo TAB or commissioning Services and punch list inspections resulting from the failure to perform said completed services.

W. Painting and Air Distribution: Coordinate with initial cleaning and start-up of HVAC air distribution system, to occur prior to preparatory cleaning and general interior painting and decorating on the project.

3.2 CUTTING & PATCHING:

A. See Division 1 for Cutting and Patching requirements.

B. This Contractor must have an experienced Mechanic on the job before concrete floors, concrete or masonry walls are set in place, whose duty it shall be to locate the exact position of any and all sleeves and holes for the future installation of his pipe or duct work. This Contractor shall locate and size all openings required for his equipment in time to not delay the building construction.

C. If it becomes necessary to cut holes in concrete floors or concrete or other masonry walls, each subcontractor shall call the Prime Contractor or his superintendent of Construction, and inform him
of the position and size of the hole or other opening to be provided and the Prime Contractor shall
determine how this will be done. Under no condition shall this Contractor make any cuts without
permission from the Prime Contractor, nor shall he cut any green floors or walls.

D. This Contractor shall arrange proper openings in the building to admit his equipment. If it becomes
necessary to cut any portion of the building to admit any equipment or install mechanical systems,
this Contractor shall be responsible for cutting and patching. The portions cut must be restored to
their former condition by this Contractor.

E. All cutting of structure shall be done using best method to minimize noise and cracking of structure.
The method of cutting shall be approved by the Prime Contractor before work if started.

F. All drilled holes required for equipment or supports shall be done by this Contractor. Holes for
piping shall be core drilled only.

3.3 STORAGE AND INSTALLATION OF EQUIPMENT AND MATERIALS:

A. Move and store products and materials in a manner that will protect them from damage, weather and
entry of debris. The Contractor shall fully protect finished parts of the materials and equipment
against damage from whatever cause during the progress of the work until final acceptance.
Materials and equipment in storage and during construction shall be stored on elevated supports and
covered on all sides with securely fastened protective rigid or flexible waterproof coverings in such
a manner that nothing will be damaged or marred, and kept clean and dry. If items are damaged, do
not install, but take immediate steps to obtain replacement or repair at no cost to Owner.

B. Piping shall be protected by storing it on elevated supports and capping the ends with suitable
closure material to prevent dirt accumulation in the piping.

C. During construction cap all ductwork openings that could be exposed to dust, dirt and debris. Cap
all piping installed vertically.

D. Periodically during construction and prior to Owner acceptance of the building, Contractor shall
remove from the premises and dispose of all packing material and debris. All adjacent occupied
areas shall be cleaned daily to remove dirt and debris resulting from this work.

E. If products and materials are specified or indicated on the drawings for a specific item or system, the
Contractor shall use those products or materials. If products and materials are not listed in either of
the above, use first class products and materials, subject to approval of shop drawings.

F. Install materials and equipment with qualified trades people. Install all equipment and appurtenances
in strict accordance with the manufacturer’s instructions and recommendations.

G. Replace materials less than specified quality or as designated by Professional and relocate work
incorrectly installed as determined by Professional.

H. Do not operate air systems until ductwork is complete, temporary filters are in place and
construction debris is removed. Provide one-inch thick fiberglass filter media across the face of
each return air opening prior to start of each air system during temporary system operation. HVAC
Contractor shall bear the responsibility to thoroughly clean all air handling equipment, interior
surfaces of ductwork, terminal devices, air distribution devices and any other related mechanical
equipment if permanent systems are ever used for temporary heat.
I. Do not operate water systems until piping has been cleaned and startup strainers are in place.

J. Secure equipment with bolts, washers and locknuts of ample size to support equipment. Embedded anchor bolts to have bottom plate and pipe sleeves. Grout all machinery set in concrete under the entire bearing surface. After grout has set, remove all wedges, shims and jack bolts and fill space with grout.

K. Valves, dampers operators, and access doors, shall be easily accessible, either in mechanical spaces or through access panels specified.

L. All equipment shall be thoroughly cleaned. All excess materials and all debris shall be removed from the site.

3.4 REVIEW OF WORK PROGRESS:

A. Prior to performing work, the Contractor shall carefully review and assess the installed Work of all other Trades and verify that all such Work is complete to the point where his installation may properly commence.

B. Verify that all equipment may be installed in accordance with all pertinent codes and regulations, the original design and the referenced standards. Schedule and obtain inspections of the AHJ, and contact Professional for site observations at appropriate times.

C. In the event of discrepancy, immediately notify the Architect/Engineer.

D. Do not proceed with installation in areas of discrepancy until such discrepancies have been fully resolved.

3.5 WELDING:

A. All welded piping shall be installed by Contractor using NCPWB or ASME Certified Welding Procedures. Welding shall comply with ANSI/ASME B31.1 and Section IX of the ASME Boiler and Pressure Code.

B. All welded piping shall be hydrostatically tested for pressure of 1-1/2 times the working pressure of the line, but not less than 150 psig. This hydrostatic test shall be witnessed by the Engineer.

C. Ten days before any welded work is to start, the Contractor shall furnish the Engineer copies of the welding procedures approved for the Contractor.

D. Before any welder is put to work in welding any piping for this job, the Engineer shall be furnished with duplicate copies of the certification of each welder. If, in the opinion of the Engineer, the welding is not done properly, a coupon shall be cut from field welds for inspection and/or the welder may be required to pass a recertification test. Costs of cutting the coupon shall be the responsibility of the Contractor. Also all welds shall be subject to non-destructive x-ray examination by Owner. In the event that defective work is found the Contractor will be responsible for all costs of non-destructive x-ray examination, including all remedial repair work and retesting of welding that is determined to be unsatisfactory.

E. No welding is to be covered with insulation or concealed until the welding has been approved by the Engineer as outlined above.
F. All welding operations shall be approved by the Engineer prior to beginning work. Extreme care shall be exercised to prevent damage to the existing buildings or building or surrounding contents during welding operations.

G. During welding of all piping, contractor shall use fire resistant or equal pad protection to prevent scorching or burning of existing floor and wall finishes, etc. Also, care shall be taken to eliminate sparks from dropping on existing furniture, equipment and flooring material. All damages created by welding flame or sparks shall be repaired to owner’s satisfaction at contractor’s expense.

3.6 PAINTING REQUIREMENTS:

A. Work buried in soil or encased in concrete or insulation need not be painted (except for protective coatings specified with the piping system).

B. Painting of work in finished areas will be done by others. However, this Contractor shall leave his work in proper condition and ready for painting by removing all dirt, grease, pipe dope and scale or other foreign material by wire-brushing or as required.

C. Before insulating, all black steel piping in equipment rooms shall be given one (1) heavy coat of Sherwin-Williams B-68-AZ, Rustoleum or Koppers black stack paint. Miscellaneous metal in unfinished areas and in the equipment rooms shall be given two (2) coats of Sherwin-Williams, Rustoleum, Koppers or equal "B" asphaltum.

D. All insulation of piping and ductwork/insulation in equipment rooms shall be painted. After sizing pipe and insulation, it shall be painted with two (2) coats of chlorinated rubber base paint or other material as approved by the Architect. Exterior metal shall have two (2) coats of protective finish paint.

E. Except as indicated specifically otherwise herein, paint material shall be selected from materials for work under the Architectural Specifications.

F. Painting on all pipe and pipe insulation in equipment rooms shall be done by the Mechanical Contractor. Colors shall be selected from the Industry Standard for colors or those approved by the owner.

G. All equipment having factory applied finish shall have its surface restored to its original condition if the finish is marred during installation.

H. All exposed pipe and equipment in the equipment rooms which do not have factory finish, shall be painted two (2) coats of enamel, using material approved for work under the Architectural Specifications.

I. Paint flat black inside of ductwork, where it can be seen from occupied spaces through grilles or louvers (under any lighting condition). Galvanized steel shall be painted with two (2) coats of Dernsto Gal-va-grip (or equal) before final coat of paint is applied.

J. Paint accessible ferrous metal (does not include stainless steel), regardless of whether exposed or to be concealed behind ceilings, shaft enclosures or similar finish construction; exclusive of cast iron which is either concealed or set flush with floors or decks.
3.7 MANUAlS, REPORTS AND FORMS SUBMITTAL:

A. Submit specified number of operating and maintenance manuals, reports and forms (minimum of three) to the A/E for review. Submittals shall be in strict compliance with specifications.

B. Submittals not approved or not submitted in proper format may be rejected and returned to Contractor. Contractor shall make necessary changes and resubmit until approved.

C. Submittals shall include all reports, forms and manuals referenced in these specifications.

3.8 GENERAL COMPLETION AND DEMONSTRATION:

A. All aspects of the work shall be completed and demonstrated to be operating correctly before project will be considered complete. The following results are expected:

1. All systems and controls shall be complete, tested and operational.
2. All start-up and testing and balancing shall be complete.
3. All equipment shall be thoroughly cleaned. All excess materials and all debris shall be removed from the site.
4. All walls, floors, ceilings and other surfaces marred or otherwise damaged as a result of execution of this contract shall be cleaned and repaired to the satisfaction of the Architect/Engineer and Owner.

3.9 MAINTENANCE OF LOCAL SERVICE ORGANIZATION:

A. The Contractor shall maintain sufficient forces to respond promptly to any system problems that occur during construction and during the warranty period. The Contractor shall provide the Owner and the Engineer with reliable and prompt means of contacting the Contractor. In the event that after an attempt to contact the Contractor, the Contractor does not respond appropriately to any problem, the Owner and/or Engineer will without further notice address the problem. All costs associated with addressing the problem will be borne by the Contractor including all risk of damage to equipment except that caused by gross negligence of others.

END OF SECTION 230000
SECTION 230001 - CLOSEOUT DOCUMENTATION & PROCEDURES

PART 1 - GENERAL REQUIREMENTS

1.1 SCOPE OF WORK:

A. Refer to Division 1 Specifications for documentation and close-out requirements. When conflicts exist; the more stringent shall apply.

PART 2 - PRODUCTS

2.1 RECORD DOCUMENT SUBMITTALS:

A. General: Specific requirements for record documents are indicated in the individual sections of these specifications. Other requirements are indicated in the General Conditions.

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

B. Record Drawings: Maintain a record set of blue or black line white-prints of contract drawings and shop drawings in a clean, undamaged condition for concurrent mark-up of actual installations which vary substantially from the work as 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 cross-reference at the corresponding location on the working drawings.

1. Mark with red ink, and where feasible use multiple colors to aid in the distinction between work of separate mechanical systems. Give particular attention to concealed work that would be difficult to measure and record at a later date. In general, record every installation of mechanical work which previously is either not shown or shown inaccurately, but in any case record the following:

   a. Mark-up new information which is known to be important to the Owner, but for some reason was not shown on either contract drawings or shop drawings. Record drawings shall identify location of fire dampers, major control lines, access doors, tagged valves, systems concealed in walls or ceilings.
   b. Work concealed behind or within other work, in a non-accessible arrangement. All such work shall be identified with field measured dimensions to locate in the future and shall be inspected by Owner’s representative prior to completing enclosure.
   c. Mains and branches of piping systems, with valves and control devices located and numbered, with concealed unions located, and with items requiring maintenance located (traps, strainers, expansion compensators, tanks, etc.).
   d. Note related change-order and numbers where applicable. When construction clarification or change order sketches are issued by the Professional and approved to be used for construction, a copy of each sketch shall be securely taped to the back of the preceding sheet and properly referenced on the original drawing.
   e. Ductwork layouts, including locations of coils, dampers, filters, boxes, and similar units.
   f. Concealed control system devices and sensors.
   g. Cross out work that has been moved or changed.
   h. Qualified draftsmen shall perform this task.
2. 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. Upon completion of the work, submit record drawings to the Professional for review.

3. Once drawings are approved by the Professional, the Contractor shall obtain a minimum of 3 full size reproduced sets (2) for Owner’s use and (1) is the Architect's/Engineer's records.

C. 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.

1. Upon completion of the Work, submit record specifications to the Professional for the Owner's records.

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

1. Upon completion of mark-up, submit complete set of record product data as part of the Operation and Maintenance Manuals.

E. 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 dates of substantial completion, complete miscellaneous records and place in good order, properly identified and bound or filed, ready for continued use and reference. Submit to the Professional for the Owner's records.

2.2 OPERATING AND MAINTENANCE MANUALS:

A. General: The Contractor shall develop or acquire the necessary documents describing the operation and maintenance of equipment, assembled in the form of an instructional manual for use by Owner's personnel. In addition to the general requirements listed in Division 1, comply with the following requirements. Failure to comply with this organizational format and/or content will result in rejection of manual until conditions are met.

B. Binders: Organize and bind operating and maintenance data into fully identified and indexed binder sets of manageable size. Binders shall be heavy-duty 3-inch maximum, 3-ring vinyl type sized to handle 82”x11” paper. Each binder shall include clear plastic sleeves on front and spine to insert labels.

1. Identify each binder on the front and spine, with the typed or printed title "OPERATING
AND MAINTENANCE MANUAL", project title or name, and subject matter covered. Indicate the volume number for multiple volumes.

2. Dividers: The binders shall be divided according to the format described under "Manual Content".
   a. Tabbed Dividers: 3-hole, reinforced, punched, heavy paper dividers with plastic tabs and typewritten inserts. Provide a typed description of the product(s) included in the subdivision on each divider. Clear plastic tabs shall be minimum 2-inches and inserts shall be assembled to prevent them from falling out.

3. Text Material: Where written material is required as part of the manual, use the manufacturer's standard printed material. If it is not available, specially prepared data, neatly typewritten, on 8½"x11", 20 pound white bond paper.

4. Drawings: Where drawings or diagrams are required as part of the manual, insert them in top-loading plastic sheet protectors and bind in with the text.
   a. Where oversize drawings are necessary, fold the drawings to the same size as the text pages and insert into large capacity sheet protectors. Insert a cover sheet to describe the contents of the drawing(s).

C. Manual Content: Organize each manual according to the outline listed below. Manuals that are submitted incomplete or not in accordance with the following format will not be acceptable.

1. Title Page: Provide a title page in a transparent plastic sheet protector as the first sheet of each manual. Provide the following information:
   b. Name and address of the Project.
   c. Date of submittal.
   d. Name, address, and telephone number of the Contractor.
   e. Name and address of the Professional.

2. Table of Contents: Provide a typewritten table of contents for each volume in a transparent plastic sheet protector.
   a. Where more than one volume is required, provide a comprehensive table of contents in each volume of the set.

3. List of Products and Suppliers: Provide a list of products and suppliers in transparent plastic sheet protectors. List each product included in the manual, identified by product name. Under each product, list the name, address, and telephone number of the Subcontractor or installer, and the local vendor. Clearly delineate the extent of responsibility of each of these entities.

4. Product and System Information: Provide all pertinent information to properly locate, identify, operate and maintain each product or system. Assemble the submittal information required by the individual specification section and the requirements listed below. Organize information in the same sequence as the specification sections listed in the Project Manual Table of Contents. Identify each divider tab with the specification number and name.
a. General Description: Provide a complete description of each product or system and related equipment parts including the specification section listed in the Project Manual Table of Contents. Identify each divider tab with specification section number and name:

(1) Name, identification tag (where applicable), location and function of product or system.
(2) Final record copies of Shop Drawings and Product Data, including Professional's comments and approval stamp.
(3) All engineering data including Performance Curves: For fans, pumps, balance valves and similar equipment at the operating conditions, certifications, and test reports for all products or systems required by the specifications, professional or the authorities having jurisdiction.

b. Manufacturer's Information: Provide manufacturer's standard printed data for equipment. May be standard instruction booklets but shall be clearly marked to indicate applicable equipment and characteristics. Mark each sheet to identify each part or product included in the installation. Where more than one item in a tabular format is included, identify each item, using appropriate references from the Contract Documents. Identify data that is applicable to the installation and delete references to information that is not applicable. In general, the manufacturer's information shall include:

(1) Printed operating and maintenance instructions.
(2) Inspection and test procedures.
(3) Alignment, adjusting, lubrication and checking procedures.
(4) Assembly drawings and diagrams including complete nomenclature and number of replacement parts, and instruction for disassembly, repair and reassembly.
(5) Trouble-shooting guide.
(6) Safety precautions.
(7) Copies of warranties, bonds and service contracts.

c. Supplemental Information: Where manufacturer's standard printed data is not available, and information is necessary for proper operation and maintenance of equipment or systems, or it is necessary to provide additional information to supplement data included in the manual, prepare written text to provide necessary information. Organize the text in a consistent format under separate headings for different procedure. Where necessary, provide a logical sequence of instruction for each operating or maintenance procedure. Also, provide specially prepared drawings where necessary to supplement manufacturer's printed data to illustrate the relationship of component parts of equipment or systems, or to provide control or flow diagrams. Coordinate these drawings with information contained in Project Record Drawings to assure correct illustration of the completed installation. Do not use original Project Record Documents as part of the Operating and Maintenance Manuals.

d. System Operating Instructions: Provide typewritten instructions to assist the owner in proper building systems operation. These instructions shall include the following.
(1) Start-up procedure.
(2) Equipment or system break-in.
(3) Routine operating instructions or systems, special valves, dampers or controls.
(4) Lubrication Schedule: Indicating type and frequency of lubrication required.
(5) Shut-down and emergency instructions.
(6) Summer and winter operating and change over instructions.
(7) Any other special operating or maintenance instructions.
(8) List of items recommended to stocked as spare parts.

e. Servicing Schedule: Provide a summary schedule of routine servicing and lubrication requirements.

f. Filter schedule: Identifying filter type, size efficiency, manufacturer and equipment number

g. Valve Charts: Provide copies of charts of valve tag numbers, with the location and function of each valve.

h. Ceiling marker schedule.

i. Material Safety Data Sheets: Where applicable, include standard safety data sheets for hazardous or toxic materials such as refrigerants and water treatment chemicals. These sheets shall clearly indicate the level of hazard or toxicity, the proper use, storage and disposal of such material and what to do in case of an emergency as well as any other information listed by the material manufacturer.

j. Wiring Diagrams: Generalized diagrams are not acceptable, submittal shall be specifically prepared for this Project.

k. Automatic Controls: Diagrams and functional descriptions. The following diagrams, schematics and lists shall be framed under glass and hung adjacent to equipment, in mechanical room.

   (1) Automatic control diagram and points list.
   (2) Sequence of operation.

l. Test and Balance Reports.

m. Certifications of welders and brazers.

n. Certificate of Completion: Provide standardized form sheets for each subcontractors own final review, punchlist and sign-off that work is complete,

5. Submit a draft copy of operating and maintenance manual for review and approval prior to final issuance and at least one month prior to turnover seminar.

6. Once draft copy is approved by the Professional, submit final copies per the requirements of Division 1.
PART 3  EXECUTION

3.1  SUBSTANTIAL COMPLETION AND FINAL INSPECTIONS

   A. Prior to substantial completion inspection, confirm in writing, that the following work is
completed. The Professional will not perform substantial completion inspection without this
confirmation.

      1. Heating, ventilation and air conditioning systems are capable of operation with alarm
conditions functional and automatic controls in operation generally, but not finally
calibrated.
      2. Tests performed on equipment including those required by authorities and approval
certificates obtained.
      3. Rough balance of air and water systems are complete and draft copy of report issued to
Engineer.
      4. Valve tagging is complete, equipment is identified and escutcheons installed. Equipment
and piping is painted.
      5. Equipment is lubricated per manufacturer's instructions.
      6. Systems are chemically cleaned, flushed, strainers are cleaned and water treatment initiated.
Obtain report from manufacturer's representative to confirm acceptability of treatment
      7. Sample of Operating/Maintenance Manuals submitted. Arrange Operating and Maintenance
Instruction Seminar and submit schedule for approval provided.
      8. Ensure access doors are suitably located and equipment accessible.
      9. Noise and vibration control devices including flexible connections inspected by
manufacturer's representative and written report submitted.
     10. Equipment aligned by qualified millwright are complete.
     11. Ensure electrical connections to mechanical equipment are complete.
     12. Air handling units and fan plenums cleaned, permanent filters installed.

   B. Prior to substantial completion inspection, the contractor shall provide complete punch list of items
which are not finished or deficient at the time of the scheduled inspection.

   C. Prior to final inspection, provide declaration in writing that previously identified deficiencies and
the following items have been completed.

      1. Equipment cleaned inside, outside and lubricated.
      2. Final balancing completed and balance reports submitted.
      3. Final calibration of controls completed and control system report submitted.

3.2  CLOSEOUT PROCEDURES:

   A. General Coordination: Refer to Division 1 sections and the 23-Series sections for coordination of
mechanical closeout work with seasonal heating and cooling loads on mechanical system.
Sequence closeout procedures properly, so that work will not be endangered or damaged, and so
that every required performance will be fully tested and demonstrated.

   B. Basic Requirements: Contractor shall be sure to perform all basic functions to ensure proper
system functions, including but not necessarily limited to:

      1. Check rotation on each motor.
2. Have representatives of each manufacturer present when hereinafter specified, so that equipment will be started up by manufacturer.

C. Cleaning and Lubrication: After final performance test run of each mechanical system, clean system both externally and internally. Clean dirt and debris from air handling systems and clean or replace dirty filters. Flush piping systems by operating drains and similar means, and clean strainers and traps. Remove any start up screens in strainers and suction diffusers at pumps. Lubricate both power and hand operated equipment and remove excess lubrication. Touch-up minor damage to factory painted finishes and other painting specified as mechanical work; refinish work where damage is noticeable.

D. System Performance: Test Run: Following Testing, Adjusting and Balancing Work, at the time of mechanical work closeout, check each item in each system to determine that it is set for proper operation. With Owner's Representative, Equipment Manufacturers' Representatives, and Architect/Engineer present, operate each system in a test run of appropriate duration to demonstrate compliance with performance requirements. During or following test runs, make final corrections or adjustments of systems to refine and improve performances wherever possible, including noise and vibration reduction, elimination of hazards, best response of controls, signals and alarms, and similar system performance improvements. Provide testing or inspection devices as may be requested for Architect's/Engineer's observation of actual system performances. Demonstrate that controls and items requiring service or maintenance are accessible.

E. Construction Equipment Removal: After completion of performance testing and Owner's operating instructions and demonstrations, remove installers' tools, test facilities, construction equipment and similar devices and materials used in execution of the work but not incorporated in the work.

3.3 GENERAL OPERATIONAL AND MAINTENANCE INSTRUCTION:

A. General Operating Instructions: In addition to specific training of Owner operating personnel specified in individual Division 23 work sections, and in addition to preparation of written operating instructions and compiled maintenance manuals specified in 23-Series sections and elsewhere in these specifications, provide general operating instructions for total mechanical plant. Conduct a walk-through explanation and demonstration for orientation and education to Owner's personnel to be involved in continued operation of building and its mechanical plant. Make arrangements to record this seminar on videotape and turnover the completed tapes to the owner at the conclusion of the project.

1. After all final tests and adjustments have been complete, a competent employee of the Contractor, and equipment vendor if necessary, shall be provided to instruct the Owner's Representative in all details of operation and maintenance for equipment installed. Supply qualified personnel to operate equipment for sufficient length of time after instructions to assure that Owner's Representative is qualified to take over operation and maintenance procedures. Instruction periods shall be as designated by the Owner and shall not necessarily be consecutive.

2. Instruction period shall be performed during the 12 months following substantial completion at time periods as requested by Owner. Fifty percent of instruction shall be in a formal classroom setting. Use the Product and System Information division of the final operation and maintenance manual as the basis of instruction.
3. Describe each basic mechanical system and how its control system functions, including flow diagrams, signals, alarms, intercom system (if any), and similar audiovisual provisions of the work.

4. Describe basic sequencing requirements and interlock provisions for system start-up, phasing, coast-down, shut-down, seasonal operations, and emergency procedures.

5. Emphasize emergency procedures and safety provisions for protection of plant and safety of occupants during equipment malfunction, disasters, power failures and similar unusual circumstances, and describe system limitations and precautions including weather adjustments.

6. Outline basic maintenance procedures and major equipment turnaround requirements.

7. Point out operational security provisions, safety, unavoidable hazards and similar operator limitations.

8. Display and conduct a "thumb-through" explanation of maintenance manuals, record drawings, spare parts inventory, storage of extra materials and similar service items.

B. Submit agenda schedule and list of representatives to the Professional for approval thirty (20) days prior to seminar. Confirm attendance of seminar by written notification to participants.

C. Submit a written record of the seminar, complete with an attendance list to the Professional.

3.4 CONTROLS OPERATION AND MAINTENANCE INSTRUCTIONS

A. Upon completion of Operation and Maintenance instructions, competent employees of the Control Contractor shall be provided to instruct the Owner’s representative in all details of operation and maintenance for the controls installed. Supply qualified personnel to operate system for sufficient length of time after instructions to assure the Owner’s Representative is qualified to take over operation and maintenance procedures.

B. Controls Operation and Maintenance Instruction shall include the entire control system including control sequences that are inherent to equipment provided by the Equipment Manufacturer including economizer cycles, low ambient operation, freezestats and similar sequences. Contractor shall provide sufficient personnel equipment walkie-talkies, gauges, and other accessories for this work.

3.5 INSTALLATION STATEMENT

A. Contractor shall provide, at contractor’s expense, a “System Installation Statement” in compliance with 503.2.9.3 of the North Carolina Energy Conservation Code. Statement shall include equipment installation and operation and controls installation and operation.

B. This statement is supplemental to the engineer’s inspections and certifications, which are paid for by the owner.

C. Statement shall be sealed by a third party who is a North Carolina licensed engineer.
SECTION 230503 - ELECTRICAL REQUIREMENTS OF MECHANICAL SYSTEMS

PART - 1 GENERAL

1.1 SECTION INCLUDES

A. General: The contents of this section describe the division of work and product requirements for work normally recognized as electrical but required for mechanical work including, but not necessarily limited to:

1. Motors
2. Motor Starters
3. Power and Control Wiring

1.2 DIVISION OF WORK:

A. This section delineates the division of electrical work between Division 23 and 26.

1. The HVAC Contractor shall furnish and install all motors, starters, pushbuttons for local and remote control, controllers, pressure switches, aquastats or similar items together with all appurtenances, accessories and control wiring required to operate the equipment furnished under their respective sections of the contract, which is necessary to perform the operating functions as specified, shown on the drawings or as otherwise required.

   a) Exceptions:

   1) Motor starters for mechanical equipment provided in motor control centers shall be furnished under Division 26.

   2) Duct smoke detectors shall be furnished and wired by Division 28, installed by Division 23. Fire alarm AHU shut down circuits shall be wired from the fire alarm control panel to a termination point, adjacent to the AHU control, under Division 28. AHU control wiring from the termination point to the equipment shall be under Division 23.

2. Under Division 26, power wiring shall be provided up to a termination point consisting of a junction box, trough, starter or disconnect switch. Under Division 26, line side terminations shall be provided. Wiring from the termination point to the mechanical equipment, including final connections and proper rotation, shall be provided under Division 23.

3. The HVAC contractor shall confirm all electrical characteristics of HVAC equipment with the Electrical Contractor prior to ordering. If procurement requirements necessitate a change in the electrical characteristics of any motor or equipment being furnished under the HVAC Contract, the respective contractor shall first obtain approval of such changes from the Professional. This same Contractor shall also be responsible for all necessary arrangements and shall pay all costs, if any, for all required changes to the Electrical Contract.

B. Temperature Control Wiring:

1. All 120V and low voltage interconnecting control wiring in connection with the temperature control system for all heating and air conditioning systems shall be furnished, installed and connected under the HVAC Contract by the ATC vendor. The ATC vendor shall also provide power wiring from spare circuits in electric panels dedicated to mechanical
2. All relays; actuators; timers; timeclocks; alternators, pressure, vacuum, float, flow, pneumatic-electric, and electric-pneumatic switches; aquastats; freezestats; line and low voltage thermostats; therals; remote selector switches; remote push-button stations; emergency break-glass stations; interlocking; disconnect switches beyond termination point, and other appurtenances associated with equipment under Division 23 shall be furnished, installed and wired under Division 23.

3. All wiring required for controls and instrumentation not indicated on the drawings shall be furnished and installed by Division 23.

C. Electrical Work for Roof Ventilators and/or Exhaust Fans:

1. For single-phase units, a motor starting-disconnecting type snap switch shall be furnished as an integral part of the roof ventilator or exhaust fan.

2. Roof exhaust fans with built-in disconnects provided under Division 23 shall be wired under Division 26 to the line side of the disconnect switch. A disconnect switch shall be provided under Division 26 if the fan is not provided with a built-in disconnect switch. In this case, the wiring from the switch to the fan shall be under Division 23.

D. Electrical Equipment by Others:

1. All electrical equipment furnished and installed under contracts other than the Electrical Contract shall be furnished with full complement of control equipment, control wiring, conduit and all other items necessary for satisfactory operation.

1.3 QUALITY ASSURANCE

A. Coordination with Electrical Work: Wherever possible, match manufacturers and types of electrical devices required under mechanical work with similar elements of electrical work specified in Division-26 sections. Comply with applicable requirements of Division-26 sections for electrical work of this section which is not otherwise specified. Refer to Section 23 05 00 on requirements for product uniformity.

B. Standards: For electrical equipment and products, comply with applicable NEMA standards, and refer to NEMA standards for definitions of terminology herein. Comply with National Electrical Code (NFPA 70) for workmanship and installation requirements.

1.4 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for each type of separate motor, starters, and other electrical devices required for mechanical work. Include electrical characteristics, ratings, list of application and general locations.

B. Wiring Diagrams: After the contractor has placed orders for all materials and equipment, he shall prepare complete wiring and control diagrams for all equipment included in this contract.

1. Identity of terminals shall agree with those used by manufacturer of equipment.
2. A minimum number of copies of these wiring diagrams as required by respective contractors shall be submitted to the Professional for approval. One (1) copy shall be retained by Architect and one (1) by Engineer for record purposes.

3. In approving diagrams, the Professional assumes no responsibility for correctness of terminal identification.

C. Maintenance Data: Submit operation and maintenance data for each type of electrical device. Include this data in Maintenance Manual in accordance with requirements of Section 23 05 00.

PART 2 PART - 2 PRODUCTS

2.1 MOTORS

A. General: Provide electric motors for driving the mechanical equipment. Motors shall be of proper power, construction and speed to suit the specified makes of equipment. If other makes of equipment are accepted, the proper adjustment of motor speed and power must be included without additional cost. Submit drawings for review before the equipment is purchased.

B. Motor Characteristics: Except where more stringent requirements are indicated, and except where mechanical equipment cannot be obtained with fully complying motor, comply with the following requirements for motors of mechanical work.

C. Temperature Rating: Rated for 40°C environment with maximum 50°C temperature rise for continuous duty at full load (Class A Insulation). Where normal operating temperature will exceed this rating, provide Class B, F or H insulation as required.

D. Starting Capability: Provide each motor capable of making starts as frequently as indicated by automatic control system, and not less than 5 starts per hours for manually controlled motors.

1. Fan motors shall be capable of accelerating their respective fans from 0 revolutions per minute to design or synchronous revolutions per minute within a maximum of 10 seconds. Submit to the Engineer for review curves which plot time versus revolutions per minute for the particular motor and fan combination.

E. Phases and Current Characteristics: Provide squirrel-cage induction polyphase motors for 1/2 hp and larger, and provide capacitor-start single-phase motors for 1/3 hp and smaller, except 1/6 hp and smaller may, at equipment manufacturer's option, be split-phase type. Coordinate current characteristics with power specified in Division-26 sections, and with individual equipment requirements specified in other Division-23 requirements. For 2-speed motors provide 2 separate windings on polyphase motors. Do not purchase motors until power characteristics available at locations of motors have been confirmed, and until rotation directions have been confirmed.

F. Service Factor: 1.15 for polyphase motors and 1.35 for single-phase motors.

1. Coordinate the NEMA type of each motor with the torque and inertia load of the equipment served, and the inrush characteristics of the motor with the starter selection, so that all items furnished constitute a properly related package. No motor shall operate in the service factor range.
G. Motor Construction: Provide general purpose, continuous duty motors, Design "B" except "C" where required for high starting torque motors and accessories shall comply with NEMA Standards.

1. Frames NEMA No. 48
2. Bearings: Ball or roller bearings with inner and outer shaft seals, regreasable except permanently sealed where motor is normally inaccessible for regular maintenance.
   a. Where belt drives and other drives produce lateral and axial thrust, in motor, provide bearings designed to resist thrust loading. Refer to individual sections of Division 23 for fractional-hp light-duty motors where sleeve-type bearings are permitted.
3. Enclosure Type: Except as otherwise indicated, provide TEFC motors. Provide totally enclosed fan cooled (TEFC) weather-protected Type I for outdoor use, Type II where not housed. Refer to individual sections of Division 23 for other enclosure requirements.
4. Overload Protection: Provide built-in thermal overload protection and, where indicated, provide internal sensing device suitable for signaling and stopping motor at starter.
5. Noise Rating: Provide "Quiet" rating on motors, guaranteed to fulfill the specified requirements without producing any objectionable sound audible outside of machine rooms and which prohibits maintaining room NC levels as specified.
   a. Motors of less than 1 horsepower shall be industry “standard” efficiency motors.
   b. Motors 1 horsepower or greater shall be “Premium Efficiency” as defined by energy efficiency levels mandated by the Energy Policy Act of 1992 in accordance with NEMA Publication MG 1-2006, Table 12-12, Full Load Efficiency for NEMA Premium Efficiency Motors.
      1) Motor nameplates shall be labeled with a Department of Energy approved code including the motor manufacturer’s specific compliance number issued by DOE. Each motor nameplate shall also display the NEMA nominal efficiency.
   c. All motors supplied with variable speed drives shall be inverter duty rated.

H. Name Plate: Provide metal nameplate on each motor, indicating full identification of manufacturer, ratings, characteristics, construction, special features and similar information.

I. Acceptable Manufacturer: Subject to compliance with requirements provide motors for mechanical equipment by one of the following: Except where item of mechanical equipment (which otherwise complies with requirements) must be integrally equipped with motor produced by another manufacturer:

1. Baldor Electric Co.
2. Eaton Corp.
2.2 ELECTRICAL DEVICES AND WIRING

A. Motor Connections: Provide flexible-conduit motor connections except where plug-in electrical cords are specifically indicated. Comply with applicable provisions of Division-26 sections for wiring materials and wiring devices. Refer to individual equipment sections for special high-voltage (600 volts and over) and star-delta connected motor requirements.

2.3 MOTOR STARTERS AND SAFETY DISCONNECT SWITCHES

A. All motor starters and safety switches provided by Mechanical Contractor shall be in accordance with all requirements of Division 26. Provide NEMA-type enclosure consistent with environment in which starters will be mounted. Provide size of starter recommended by motor and/or equipment manufacturer for applicable protection and start-up condition; refer to equipment schedules for basic load requirements. Provide Hand/Off/Auto switch.

1. Manual Switches: Provide molded plastic manual switch with pilot light for motors ½ hp and smaller, except where interlock or automatic operation is indicated. Include overload trip assembly, one per phase.

2. Combination Magnetic Starters: Provide combination magnetic starters with circuit breaker disconnect for motors ¾ hp and larger, and for smaller motors where interlock or automatic operations is indicated.

3. Magnetic motor starters: Same as above without circuit breaker disconnect where disconnecting means is provided by others.

4. Safety Disconnect Switches: Where motor starters are part of the HVAC packaged equipment and a separate safety disconnect is required, furnish in accordance with the requirements of Division 26.

2.4 EQUIPMENT FABRICATION

A. General: Fabricate mechanical equipment for secure mounting of motors and other electrical items included in work. Provide either permanent alignment of motors with equipment, or adjustable mountings as applicable for belt drives, gear drives, special couplings and similar indirect coupling of equipment. Provide safe, secure, durable, and removable guards for motor drives, arranged for lubrication and similar running-maintenance without removal of guards, in accordance with OSHA Standards.

2.5 CONTROL WIRING

A. Digital signal wiring shall be NEC class 2, plenum rated. Analog signal wiring shall be #18 copper wire or control cable.
B. All controls shall be run in metallic raceways.

C. All control conductors shall be color-coded. Where conductors pass through a junction box or connect to a device, the conductor and box shall be tagged to indicate the circuit and terminal number as designated on the controls shop drawings.

D. There shall be no splices in the control system other than at terminal boxes. Wire nuts and crimps are not permitted.

E. All terminal block screws shall have pressure wire connectors of the self-lifting or box lug type.

PART 3 EXECUTION

3.1 INSTALLATION

A. Install motors on motor mounting systems in accordance with motor manufacturer's instructions, securely anchored to resist torque, drive thrusts, and other external forces inherent in mechanical work. Secure sheaves and other drive units to motor shafts with keys and Allen set screws, except motors of 1/3 hp and less may be secured with Allen set screws on flat surface of shaft. Unless otherwise indicated, set motor shafts parallel with machine shafts.

B. Each motor shall be factory wired to a junction box mounted on the motor or on the driven piece of equipment to facilitate single point field power connection under Division 26.

C. The Mechanical Contractor shall install starters and wiring devices at locations indicated, securely supported and anchored, and in accordance with manufacturer's installation instructions and the National Electric Code. Locate for proper operational access, including for visibility and safety.

D. Check overload relay heaters with motor nameplate full load current. Change heaters per manufacturer's recommendation if not correctly rated at no cost to Institution.

E. Investigate and correct cause of motors operating above full load rating instead of increasing overhaul relay trip setting.

3.2 COORDINATION

A. After the contractor receives the architect's and owner's approval, he shall then deliver the required minimum number of copies of the approved wiring diagram to the electrical contractor.

B. The contractor shall render whatever assistance is required by the electrical contractor in making connections to control devices furnished by the contractor.
SECTION 230548 - SEISMIC RESTRAINTS

PART 1 - GENERAL

1.1 SCOPE

A. Mechanical equipment and system components in this project require seismic restraint per section 1613, Volume 1, North Carolina Building Code.

B. The scope of this specification encompasses the necessary product specifications for seismic restraints.

1.2 REQUIREMENTS

A. Responsibilities

1. The Contractor shall cause all seismic restraint systems to be designed by a Manufacturer experienced in this type of work. This provision, however, shall not be construed as relieving the Contractor of his overall responsibility for the work.

2. The Contractor shall provide to the manufacturer of seismic restraint systems a listing of all mechanical equipment and components to be restrained, including areas, total weight, center-of-gravity and all other data required by them.

B. Design – Seismic Restraint Systems

- Seismic Performance Category “C:”
- Provide seismic restraint for all components with an importance factor greater than 1.0.
- Provide seismic restraint for all equipment which uses natural gas.

1.3 SCOPE

A. The following require seismic restraints:

1. All natural gas fired equipment

1.4 SEISMIC CERTIFICATION

A. Seismic Certification and Analysis:

1. Seismic restraint requirements, calculations and Design shall be provided for all Mechanical components. Calculations shall be performed registered professional engineer in the State of North Carolina.

2. Calculations to support seismic restraint designs must be stamped by a registered professional engineer in the State of North Carolina.

3. A seismic design Errors and Omissions insurance certificate must accompany submittals prepared by a licensed independent Consulting Engineer in the state of North Carolina.
4. The licensed professional engineer responsible for the design of the restraints shall review the seismic restraint installation, and a sealed certificate of compliance shall be issued.

1.5 CODE AND STANDARDS REQUIREMENTS

A. Applicable Codes
   1. International Building Code as adopted by the state of North Carolina with Amendments.
   2. SMACNA guidelines for seismic restraint of HVAC systems.

B. Where conflicts between these documents exist, the more stringent requirement shall apply.

1.6 MANUFACTURER’S RESPONSIBILITY

A. Manufacturer of restraint equipment shall have the following responsibilities:
   1. Determine restraint sizes and locations.
   2. Provide equipment and component restraints as scheduled or specified.
   3. Provide installation instructions, drawings and field supervision to the contractor to insure proper installation and performance of systems.

1.7 RELATED WORK

A. Housekeeping Pads:
   1. Anchoring of and attachment of pads poured separately, from the building structure.

B. Attachments:
   1. Restraint attachment plates cast into housekeeping pads, concrete inserts, beam clamps, etc. are required to be certified under this section.

PART 2 - PRODUCTS

2.1 DESCRIPTION

A. All seismic restraint devices described in this section shall be products of a single manufacturer.

PART 3 - EXECUTION

3.1 General

A. All restraint systems must be installed in strict accordance with the manufacturers written instructions.
B. Installation of restraints must not cause any change of position of equipment, piping or ductwork resulting in stresses or misalignment.

C. No rigid connections between equipment and the building structure shall be made that degrade the noise and vibration control integrity.

D. The contractor shall not install any rotating equipment which makes rigid connection to the building unless isolation is not specified. “Building” includes, but is not limited to, slabs, beams, columns, studs and walls.

E. Any conflicts with other trades which will result in rigid contact with equipment or piping due to inadequate space or other unforeseen conditions should be brought to the architects/engineers attention prior to installation. Corrective work necessitated by conflicts after installation shall be at the responsible contractors expense.

F. Bring to the architects/engineers attention any discrepancies between the specifications and the field conditions or changes required due to specific equipment selection, prior to installation. Corrective work necessitated by discrepancies after installation shall be at the responsible contractors expense.

G. Overstressing of the building structure must not occur because of overhead support of equipment. Contractor must submit loads to the structural engineer of record for approval.

END OF SECTION - 230548
SECTION 230593 - TESTING, ADJUSTING AND BALANCING

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. This section specifies the requirements and procedures for total mechanical systems testing, adjusting, and balancing. Requirements include measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.

B. Test, adjust, and balance the following mechanical systems:
   1. Exhaust air systems.
   2. Outside air systems.
   3. Supply air systems.
   4. Return air systems.

C. Verify and measure final operating conditions of HVAC systems.

D. This section does not include:
   1. Specifications for materials for patching mechanical systems.
   2. Specifications for materials and installation of adjusting and balancing devices. If devices must be added to achieve proper adjusting and balancing, refer to the respective system sections for materials and installation requirements.

E. Additional related work which may be provided by Test and Balance Agent
   1. Attention of T&B Agent is directed to 23 00 01, 3.5. The System Installation Statement required by this section may be provided by the Test and Balance Agent, provided it is sealed by a North Carolina licensed engineer as required by 3.5, C or it may be supplied by another qualified party.

1.2 DEFINITIONS

A. System testing, adjusting, and balancing is the process of checking and adjusting all the building environmental systems to produce the design objectives. It includes:
   1. The balance of air distribution.
   2. Adjustment of total system to provide design quantities.
   3. Electrical measurement.
   4. Verification of performance of all equipment.

B. Test: To determine quantitative performance of equipment.
C. Adjust: To regulate the specified fluid flow rate and air patterns at the terminal equipment (e.g., reduce fan speed, throttling).

D. Balance: To proportion flows within the distribution system (submains, branches, and terminals) according to specified design quantities.

E. Procedure: Standardized approach and execution of sequence of work operations to yield reproducible results.

F. Report Forms: Test data sheets arranged for collecting test data in logical order for submission and review. These data should also form the permanent record to be used as the basis for required future testing, adjusting, and balancing.

G. Terminal: The point where the controlled fluid enters or leaves the distribution system. These are supply inlets on water terminals, supply outlets on air terminals, return outlets on water terminals, and exhaust or return inlets on air terminals such as registers, grilles, diffusers, louvers, and hoods.

H. Main: Duct or pipe containing the system's major or entire fluid flow.

I. Submain: Duct or pipe containing part of the systems' capacity and serving two or more branch mains.

J. Branch Main: Duct or pipe serving two or more terminals.

K. Branch: Duct or pipe serving a single terminal.

1.3 QUALITY ASSURANCE

A. Agency Qualifications:

1. Employ the services of an independent testing, adjusting, and balancing agency meeting the qualifications specified below, to be the single source of responsibility to test, adjust, and balance the building mechanical systems identified above, to produce the design objectives. Services shall include checking installations for conformity to design, measurement and establishment of the fluid quantities of the mechanical systems as required to meet design specifications, and recording and reporting the results.

2. The independent testing, adjusting and balancing agency shall be certified by the Associated Air Balance Council (AABC) or the National Environmental Balancing Bureau (NEBB) in those testing and balancing disciplines required for this project and shall have at least one individual on staff certified by AABC or NEBB as a Test and Balance Engineer (TBE).
B. Codes and Standards: Comply with the following:
   1. AABC - National Standards for Total System Balance.
   2. SMACNA - HVAC Systems Testing, Adjusting, and Balancing.

C. Supplemental Requirements

   1. The T&B contractor shall maintain logs, in a form acceptable to the engineer, to demonstrate that at least 50% of the measurements used in the Test and Balance procedures were made while an individual certified by AABC or NEBB as a Test and Balance Engineer was on the job site.

1.4 SCHEDULE

   A. Final Test and Balance reports for both air and water systems are considered life safety items by the Office of State Construction. Final T & B Reports shall be completed, reviewed and approved by the Engineer prior to scheduling a Final Inspection. Any pre-final draft is not acceptable.

1.5 SUBMITTALS

   A. Agency Data: Submit name of and proof that the proposed testing, adjusting, and balancing agency meets the qualifications specified.

   B. Engineer and Technicians Data: Submit proof that the Test and Balance Engineer assigned to supervise the procedures, and the technicians proposed to perform the procedures meet the qualifications specified.

   C. Procedures and Agenda: Prior to commencing work, submit a synopsis of the testing, adjusting, and balancing procedures equipment and agenda proposed to be used for this project.

   D. Field Reports: Indicate deficiencies in systems that would prevent proper testing, adjusting, and balancing of systems and equipment to achieve specified performance.

   E. Calibration Reports: Submit proof that all required instrumentation has been calibrated to tolerances specified in the referenced standards, within a period of six months prior to starting the project.

   F. Maintenance Data: Submit maintenance and operating data that include how to test, adjust, and balance the building systems. Include this information in maintenance data specified in Section 23 05 00.

   G. Sample Forms: Submit sample forms, if other than those standard forms prepared by the AABC or NEBB are proposed.

   H. Certified Reports: Submit testing, adjusting, and balancing reports bearing the seal and signature of the Test and Balance Engineer. The reports shall be certified proof that the systems have been tested, adjusted, and balanced in accordance with the referenced standards; are an accurate representation of how the systems have been installed; are a true representation of how the system are operating at the completion of the testing, adjusting, and balancing procedures; and are an
accurate record of all final quantities measured, to establish normal operating values of the systems. Follow the procedures and format specified below:

1. Draft Reports: Upon completion of testing, adjusting, and balancing procedures, prepare draft reports on the approved forms. Draft reports may be hand written, but must be complete, factual, accurate, and legible. Organize and format draft reports in the same manner specified for the final reports. Submit 2 complete sets of draft reports. Only 1 complete set of draft reports will be returned.

2. Final Report: Upon verification and approval of draft reports, prepare final reports, type written, and organized and formatted as specified below. Submit [2] complete sets of final reports to be included in the project O & M manuals. Coordinate with requirements of Section 23 05 03.

3. Report Format: Report forms shall be those standard forms prepared by the referenced standard for each respective item and system to be tested, adjusted, and balanced. Bind report forms complete with schematic systems diagrams and other data in reinforced, vinyl, three-ring binders. Provide binding edge labels with the project identification and a title descriptive of the contents. Divide the contents of the binder into the below listed divisions, separated by divider tabs:

   a. Index
   b. General Information and Summary
   c. Air Systems
   d. Temperature Control Systems
   e. Special Systems
   f. Sound and Vibration Systems

4. Report Contents: Provide the following minimum information, forms and data:

   a. General Information and Summary: Inside cover sheet to identify testing, adjusting, and balancing agency, Contractor, Owner, Professional, and Project. Include addresses, and contact names and telephone numbers. Also include a certification sheet containing the seal and name address, telephone number, and signature of the Certified Test and Balance Engineer. Include in this division a listing of the instrumentations used for the procedures along with the proof of calibration.

   b. The remainder of the report shall contain the appropriate forms containing as a minimum, the information indicated on the standard report forms prepared by the AABC or NEBB, for each respective item and system. Prepare a schematic diagram for each item of equipment and system to accompany each respective report form. Include set of reduced drawings with air outlets and equipment identified to correspond with data sheets. Indicate final thermostat locations.

1.6 PROJECT RECORD DOCUMENTS

A. Record actual locations of flow measuring stations, balancing valves, and rough setting.

B. Pre-Balancing Conference:
C. Prior to beginning of the testing, adjusting, and balancing procedures, schedule and conduct a
conference with the Professional and representatives of installers of the mechanical systems. The
objective of the conference is final coordination and verification of system operation and readiness
for testing, adjusting, and balancing.

1.7 SEQUENCING AND SCHEDULING
A. Sequence work to commence after completion of systems and schedule completion of work before
Substantial Completion of Project.

B. Test, adjust, and balance the air systems before hydronic systems.

PART 2 - PRODUCTS - This application not used.

PART 3 - EXECUTION

3.1 CONTRACTOR COOPERATION
A. Mechanical contractor shall cooperate with the balancing firm to:

1. Provide sufficient time before completion date so that balancing can be accomplished.
2. Provide immediate labor and tools to make corrections without delay.
3. Place heating, ventilating and air conditioning systems and equipment into full operation and
continue the operation for each working day of testing and balancing.
4. Provide approved shop drawings to testing and balancing firm, and advise them of changes
made to the system during construction.
5. Install required test holes complete with removable and replaceable plugs.
6. Make necessary revisions to controls, dampers, fan and pump drives and consult with
equipment manufacturers as required to achieve the specified system's performance.
7. Supply and install dampers as shown and where required to obtain final system balance.
8. Provide ladders, scaffolds, tools and labor to assist the work of the balancing firm, including
removing ceiling tiles, guards, adjusting pulleys, belts; replace when finished.
9. Control manufacturer shall work with the balancing firm when setting damper linkages and
minimum outside air dampers. The control manufacturer shall be available for readjusting
dampers or controls that are not properly calibrated.
10. Set pressure regulating, automatic fill and reducing valves to operating and code conditions.
11. Check and set relief and safety valves to code requirements.
12. Clean strainers. Check air filters immediately prior to air balancing.
13. Open fire dampers.
14. Variable pitch pulleys supplied on 20 HP motors and larger shall be changed to fixed pulleys
after the air balance is completed. Provide such pulleys.
15. Lubricate all motors and bearings.

3.2 EXAMINATION
A. The TAB agency shall review contract documents in detail within 30 days of notice to proceed and
advise the professional and mechanical contractor where additional balancing devices or other
modification are required.

B. Verify that systems are complete and operable before commencing work. Ensure the following
conditions:
1. Systems are started and operating in a safe and normal condition.
2. Temperature control systems are installed complete and operable.
3. Proper thermal overload protection is in place for electrical equipment.
4. Final filters are clean and in place. If required, install temporary media in addition to final filters.
5. Duct systems are clean of debris.
6. Fans are rotating correctly.
7. Fire and volume dampers are in place and open.
8. Air coil fins are cleaned and combed.
9. Access doors are closed and duct end caps are in place.
10. Air outlets are installed and connected.
11. Duct system leakage is minimized.

C. Submit field reports. Report defects and deficiencies noted during performance of services which prevent system balance.

D. Beginning of work means acceptance of existing conditions.

3.3 PREPARATION

A. Provide instruments required for testing, adjusting, and balancing operations.
   1. Make instruments available to Professional to facilitate spot checks during testing.

B. Coordinate with Mechanical Contractor to provide additional balancing devices as required.

3.4 PRELIMINARY PROCEDURES FOR AIR SYSTEM BALANCING

A. Before operating the system, perform these steps:
   1. Obtain design drawings and specifications and become thoroughly acquainted with the design intent.
   2. Obtain copies of approved shop drawings of all air handling equipment, outlets (supply, return, and exhaust) and temperature control diagrams.
   3. Compare design to installed equipment and field installations.
   4. Walk the system from the system air handling equipment to terminal units to determine variations of installation from design.
   5. Prepare report test sheets for both fans and outlets. Obtain manufacturer's outlet factors and recommended procedures for testing. Prepare a summation of required outlet volumes to permit a cross check with required fan volumes.
   6. Determine best locations in main and branch ductwork for most accurate duct traverses.
   7. Place outlet dampers in the full open position.
8. Prepare schematic diagrams of system "as-built" ductwork and piping layouts to facilitate reporting.

9. Check fan belt tension.

3.5 INSTALLATION TOLERANCES

A. Air Handling Systems: Adjust to within plus or minus 5% of design for supply systems and plus or minus 10% of design for return and exhaust systems.

B. Air Outlets and Inlets: Adjust total to within plus 10% and minus 5% of design to space. Adjust outlets and inlets in space to within plus or minus 10 percent of design.

3.6 MEASUREMENTS

A. Provide all required instrumentation to obtain proper measurements, calibrated to the tolerances specified in the referenced standards. Instruments shall be properly maintained and protected against damage.

B. Provide instruments meeting the specifications of the referenced standards.

C. Use only those instruments which have the maximum field measuring accuracy and are best suited to the function being measured.

D. Apply instrument as recommended by the manufacturer.

E. Use instruments with minimum scale and maximum subdivisions and with scale ranges proper for the value being measured.

F. When averaging values, take a sufficient quantity of readings which will result in a repeatability error of less than 5%. When measuring a single point, repeat readings until 2 consecutive identical values are obtained.

G. Take all reading with the eye at the level of the indicated value to prevent parallax.

H. Use pulsation dampeners where necessary to eliminate error involved in estimating average of rapidly fluctuation readings.

I. Take measurements in the system where best suited to the task.

3.7 PERFORMING TESTING, ADJUSTING, AND BALANCING

A. General: Perform testing and balancing procedures on each system identified, in accordance with the detailed procedures outlined in the referenced standards.

1. Cut insulation, ductwork, and piping for installation of test probes to the minimum extent necessary to allow adequate performance of procedures.

2. Patch insulation, ductwork, and housings, using materials identical to those removed.

3. Seal holes in ducts and piping, relating to TAB procedures, and test for and repair leaks.
4. Seal insulation to re-establish integrity of the vapor barrier.

5. Mark equipment settings, including damper control positions, valve indicators, fan speed control levers, and similar controls and devices, to show final settings. Mark with paint or other suitable, permanent identification materials.

6. Retest, adjust, and balance systems subsequent to significant system modifications, and resubmit test results.

B. Adjusting:

1. Ensure recorded data represents actual measured or observed conditions.

2. Permanently mark settings of valves, dampers, and other adjustment devices allowing settings to be restored. Set and lock memory stops.

3. After adjustment, take measurements to verify balance has not been disrupted or that such disruption has been rectified.

4. Leave systems in proper working order, replacing belt guards, closing access doors, closing doors to electrical switch boxes, and restoring thermostats to specified settings.

5. At final inspection, recheck random selections of data recorded in report. Recheck points or areas as selected and witnessed by the Owner.

6. Check and adjust systems approximately six months after final acceptance and submit report.

C. Air System Procedure:

1. Adjust air handling and distribution systems to provide required or design supply, return, and exhaust air quantities.

2. Make air quantity measurements in ducts by Pitot tube traverse of entire cross sectional area of duct.

3. Measure air quantities at air inlets and outlets.

4. Adjust distribution system to obtain uniform space temperatures free from objectionable drafts and noise.

5. Use volume control devices to regulate air quantities only to extent that adjustments do not create objectionable air motion or sound levels. Effect volume control by duct internal devices such as dampers and splitters.

6. Vary total system air quantities by adjustment of fan speeds. Provide drive changes required. Vary branch air quantities by damper regulation.

7. Provide system schematic with required and actual air quantities recorded at each outlet or inlet.
8. Measure static air pressure conditions on air supply units, including filter and coil pressure drops, and total pressure across the fan. Make allowances for 50% loading of filters.

9. Adjust outside air automatic dampers, outside air, return air, and exhaust dampers for design conditions.

10. Measure temperature conditions across outside air, return air, and exhaust dampers to check leakage.

11. Where modulating dampers are provided, take measurements and balance at extreme conditions. (Balance variable volume systems at maximum air flow rate, full cooling, and at minimum air flow rate, full heating.)

   a. The TAB Agency shall be responsible for setting and recording the set points for maximum and minimum air flows and for providing the necessary equipment, computers, instrumentation and qualified technicians for providing these services.

12. Measure building static pressure and adjust supply, return, and exhaust air systems to provide required relationship between each to maintain approximately 0.03 inches (12.5 Pa) positive static pressure near the building entries.

   Review with the Professional the actual measured building static pressure after the systems have been totally balanced. The Professional shall determine if it is advisable to change the outdoor air quantities due to the possibility of overloading the heating or cooling equipment.

3.8 RECORD AND REPORT DATA

   A. Record all data obtained during testing, adjusting, and balancing in accordance with, and on the forms recommended by the referenced standards, and as approved on the sample report forms.

   B. Prepare report of recommendations for correcting unsatisfactory mechanical performances when system cannot be successfully balanced.

3.9 ACCEPTANCE

   A. At the completion of balancing procedures, allow for a minimum of two days for the Professional to witness test procedures and conduct operational tests.

   B. Mechanical systems shall not be considered ready for final inspection until balancing results acceptable to the Professional are obtained.

   C. If it is found that the specified air flows cannot be achieved on portions of the system, the actual conditions shall be reported to the Professional for consideration of corrective action before continuing the balancing procedure.

   D. If measured flow at final inspection shows deviation of 10% or more from the certified report listings for more than 10% of selected areas, the report shall be rejected.

   E. If report is rejected, systems shall be rebalanced and a new certified report submitted.
3.10 SCHEDULES

A. Equipment Requiring Testing, Adjusting, and Balancing:
   1. Exhaust Fans
   2. Rooftop Units
   3. Air Inlets and Outlets

B. Report Forms
   1. Title Page:
      a. Name of Testing, Adjusting, and Balancing Agency
      b. Address of Testing, Adjusting, and Balancing Agency
      c. Telephone number of Testing, Adjusting, and Balancing Agency
      d. Project name
      e. Project location
      f. Project Architect
      g. Project Engineer
      h. Project Contractor
      i. Report Date
   2. Summary Comments:
      a. Design versus final performance
      b. Notable characteristics of system
      c. Description of systems operation sequence
      d. Summary of outdoor and exhaust flow to indicate amount of building pressurization
      e. Nomenclature used throughout report
      f. Test conditions
   3. Instrument List:
      a. Instrument
      b. Manufacturer
      c. Model Number
      d. Serial Number
      e. Range
      f. Calibration Date
   4. V-Belt Drive:
      a. Identification/Location
      b. Required drive RPM
      c. Driven sheave, diameter and RPM
      d. Belt, size and quantity
      e. Motor sheave diameter and RPM
      f. Center to distance, maximum, minimum, and actual
11. **Exhaust Fan Data:**
   - a. Location
   - b. Manufacturer
   - c. Model number
   - d. Serial number
   - e. Air flow, specified and actual
   - f. Total static pressure (total external), specified and actual
   - g. Inlet pressure
   - h. Discharge pressure
   - i. Sheave Make/Size/Bore
   - j. Number of Belts/Make/Size
   - k. Fan RPM

12. **Duct Traverse:**
   - a. System zone/branch
   - b. Duct size
   - c. Area
   - d. Design velocity
   - e. Design air flow
   - f. Test velocity
   - g. Test air flow
   - h. Duct static pressure
   - i. Air temperature
   - j. Air correction factor

13. **Air Distribution Test Sheet:**
   - a. Air terminal number
   - b. Room number/Location
   - c. Terminal type
   - d. Terminal size
   - e. Area factor
   - f. Design velocity
   - g. Design air flow
   - h. Test (final) velocity
   - i. Test (final) air flow
   - j. Percent of design air flow

3.13 **DEMONSTRATION**

   A. At the request of the design Professional, the TAB Contractor shall repeat the balancing procedure for any system or portion of a system in the presence of the Professional and Owner's representative.

**END OF SECTION 230593**
SECTION 230700 - MECHANICAL INSULATION

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. The work covered by this specification consists of furnishing all labor, equipment, materials and accessories, and performing all operations required, for the correct fabrication and installation of thermal insulation applied to the piping, equipment, and duct systems indicated on the Drawings and specified herein.

B. Types of mechanical insulation specified in this section include the following for piping and ductwork:

1. Fiberglass.
2. Flexible Unicellular.

C. Certain equipment and/or systems to be factory insulated by manufacturer. Factory insulation materials are to be as specified in applicable sections of the specifications.

1.2 QUALITY ASSURANCE

A. Insulation materials, including all weather and vapor barrier materials, closures, hangers, supports, fitting covers, and other accessories, shall be furnished and installed in strict accordance with project drawings and specifications by skilled workers who have at least five years of successful experience in commercial insulation work.

B. All insulation work shall comply with the following codes and standards:

1. Certify that all insulation meets the minimum requirements of the current State Energy Code for New Building Construction.
2. NAIMA Insulation Standards
3. ASTM E-84
4. NFPA 255
5. UL 723
6. NFPA 90A
7. NFPA96

C. Thermal insulation materials shall meet the property requirements of the following specifications as applicable to the specific product or use:

1. American Society for Testing of Materials Specifications:
   b) ASTM C 585, "Recommended Practice for Inner and Outer Diameters of Rigid Pipe Insulation for Nominal Sizes of Pipe and Tubing (NPS System)"

e) ASTM C1136, "Standard Specification for Barrier Material, Vapor", Type 1 or 2 (jacket only)


D. Flame/Smoke Ratings: Provide composite mechanical insulation (insulation, jackets, coverings, sealers, mastics and adhesives) with flame-spread index of 25 or less, and smoke-developed index of 50 or less, as tested by ASTM E84 method.

1. Exception: Mechanical insulation where specifically called out in this specification may have flame spread index of 75 and smoke developed index of 450.

2. Insulation jacket for duct, pipe, and equipment exposed to weather to be certified as self-extinguishing in less than 53 seconds when tested in accordance with ASTM D1692.

E. Insulation exposed to view shall have a well-tailored appearance.

1.3 REFERENCE STANDARDS:

A. The following industry standards form a part of these specifications by mention herein.


11. NAIMA National Insulation Standards.


1.4 DEFINITIONS

A. Thermal resistance “R” values are expressed in units of “Hour-Degrees F-sq. ft./Btu per inch of Thickness” on a flat surface at a mean temperature of 75 degrees F unless noted otherwise.

B. Thermal conductivity (K), the reciprocal of “R”, btu/hr/ft²/degree.
C. Insulation to consist of insulating material, jacket, mastic, and adhesive, either as a “system” or as an individual component when used separately.

1.5 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for each type of mechanical insulation. Submit schedule showing manufacturer's product number, k-value, thickness, and furnished accessories for each mechanical system requiring insulation.

1.6 DELIVERY AND STORAGE OF MATERIALS

A. All of the insulation materials and accessories covered by this specification shall be delivered to the job site and stored in a safe, dry place with appropriate labels and/or other product identification.

B. The contractor shall use whatever means are necessary to protect the insulation materials and accessories before, during, and after installation. No insulation material shall be installed that has become damaged in any way. The contractor shall also use all means necessary to protect work and materials installed by other trades.

C. If any insulation material has become wet because of transit or job site exposure to moisture or water, the contractor shall not install such material, and shall remove it from the job site. An exception may be allowed in cases where the contractor is able to demonstrate that wet insulation when fully dried out (either before installation, or afterward following exposure to system operating temperatures) will provide installed performance that is equivalent in all respects to new, completely dry insulation. In such cases, consult the insulation manufacturer for technical assistance.

PART 2 - PRODUCTS

2.1 INTERIOR DUCTWORK INSULATION MATERIALS

A. General: Ductwork operating at temperatures up to +450°F shall be insulated with fiberglass insulation in blanket, batt, or board form. The insulation shall be selected to conform readily to the surface to which it will be applied. Observe manufacturer's recommendations on maximum temperature/thickness combinations. Before installing insulation, inspect to make sure that all seams and joints in the ductwork have been sealed by the responsible contractor.

B. Flexible Fiberglass Ductwrap: For indoor service at operating temperatures to +250°F on round or rectangular ductwork provide 0.75 lb/ft³ glass fiber insulation in roll form, faced with a reinforced foil/kraft laminate, meeting the requirements of ASTM C 553. Thickness specified is based on an out of package k-value of 0.27 BTU-in/hr-sq. ft.-degree F.

C. Jackets for Ductwork Insulation: ASTM C 921, Vapor Barrier type for ductwork with temperatures below ambient; water permeable type for ductwork with temperatures above ambient.

D. Ductwork Insulation Accessories: Provide staples, bands, wires, tape, anchors, corner angles and similar accessories as recommended by insulating manufacturer for applications indicated.
E. Ductwork Insulation Compounds: Provide cements, adhesives, coatings, sealers, protective finishes and similar compounds as recommended by insulation manufacturer for applications indicated.

2.2 PIPING INSULATION MATERIALS

A. General: Molded pipe insulation shall be manufactured to meet ASTM C 585 for sizes required in the particular system. It shall be of a type suitable for installation on piping systems, including fittings and valves. Fitting insulation to be of same thickness and material as adjoining pipe insulation.

B. TYPE E-FLEXIBLE UNICELLULAR FOAM PIPING INSULATION

1. Insulation: ASTM C534; flexible, unicellular elastomeric, molded slit tubing, or sheet.
2. 25 flame spread and 50 smoke development ratings.
3. 'K' value: ASTM C177; 0.27 at 75 degrees F.
4. Minimum service temperature: -40 degrees F.
5. Maximum service temperature: 220 degrees F.
7. Moisture vapor transmission: ASTM E96; 0.17 perm-inches.
8. Butt joints: Neoprene contact adhesive.
9. Provide all insulation exposed to weather with two coats of water based latex enamel as recommended by insulation manufacturer.
10. Subject to compliance with requirements, acceptable manufacturers include:
   a) Armstrong Armaflex
   b) Rubatex

C. Jackets for Piping Insulation:

1. Aluminum Jacket: ASTM B209 or ASTM B209M.
   a) Thickness: 0.016 inch.
   b) Finish: Embossed.
   c) Joining: Longitudinal slip joints and 2 inch.
   d) Fittings: 0.016 inch thick die shaped fitting covers with factory attached protective liner.
   e) Metal Jacket Bands: 3/8 inch wide; 0.015 inch thick aluminum or 0.010 thick stainless steel.
   f) Subject to compliance with requirements, acceptable manufacturers include: Proto, Ceel-Co, Pabco, RPR Products, Childers.

D. Staples, Bands, Wires: As recommended by insulation manufacturer for applications indicated.
E. Adhesives, Sealers, Cement and Protective Finishes: As recommended by insulation manufacturer for
applications indicated.

1. Subject to compliance with requirements, acceptable manufacturers include: Foster, Childers, 3M,
Marathon, Pittsburgh Corning, Vimasco.

PART 3 - EXECUTION

3.1 INSPECTION

A. Examine areas and conditions under which mechanical insulation is to be installed. Do not proceed
withwork until unsatisfactory conditions have been corrected in manner acceptable to Installer.

B. Verify that all materials and accessories can be installed in accordance with project drawings and
specifications and material manufacturer's recommendations.

C. Verify by inspecting product labeling, submittal, data, and/or certifications which may accompany the
shipments that all materials and accessories to be installed on the project comply with applicable
specifications and standards and meet specified thermal and physical properties.

3.2 PREPARATION

A. All pipe, ductwork and equipment surfaces over which insulation is to be installed shall be clean and dry
when insulation is applied.

B. Ensure that insulation is clean, dry, and in good mechanical condition with all factory-applied vapor or
weather barriers intact and undamaged. Wet, dirty, or damaged insulation shall not be acceptable for
installation.

C. Ensure that pressure testing of piping or duct systems has been completed prior to installing insulation.
Ensure that all seams and joints in ductwork have been sealed by the contractor responsible for the
ductwork.

D. All adhesives, cements and mastics to be compatible with materials applied without attacking materials in
either wet or dry state.

3.3 INSTALLATION OF PIPE INSULATION

A. General: Install insulation products in accordance with manufacturer's written instructions and NAIMA
National Insulation Standards to ensure that insulation serves its intended purpose.

B. Install insulation on systems subsequent to installation of heat tracing, painting, testing and acceptance of
tests.

C. Install insulation materials with smooth and even surfaces. Insulate each continuous run of piping with
full-length units of insulation, with single cut piece to complete run. Do no use cut pieces or scraps
abutting each other. In exposed areas, orient and cover seams in least visible locations.

D. Clean and dry surfaces prior to insulating. Butt insulation joints firmly together to ensure complete and
tight fit over surfaces to be covered.
E. For insulated pipes conveying fluids below ambient temperature:

1. Provide vapor barrier jackets, factory-applied or field-applied. Secure with self-sealing longitudinal laps and butt strips with pressure sensitive adhesive. Secure with outward clinch expanding staples and vapor barrier mastic.
2. Insulate fittings, joints, and valves with molded insulation of like material and thickness as adjacent pipe and and cover with PVC fitting covers.
3. Maintain integrity of vapor-barrier jackets on insulation, and protect to prevent puncture, tears, or other damage.
4. All valve stems must be sealed with caulking that allows free movement of the stem but provides a seal against moisture incursion.

F. Insulate entire system including fittings, valves, unions, flanges, strainers, flexible connections, pump bodies, and expansion joints.

1. Exception: Do not insulate valves in systems operating above 60 degrees F and where installed in valve boxes outdoors. Paint valves with a rust-resistant product equivalent to Rustoleum.

G. Fittings and valves shall be insulated with pre-formed fittings, fabricated sections of pipe insulation of same material as pipe insulation. Thickness shall be equal to adjacent pipe insulation. Finish shall be with pre-formed PVC fitting covers or as otherwise specified on contract drawings.

1. Flanges, couplings and valve bonnets shall be covered with an oversized pipe insulation section sized to provide the same insulation thickness as on the main pipe section. An oversized insulation section shall be used to form a collar between the two insulation sections with low density blanket insulation being used to fill gaps. Jacketing shall match that used on straight pipe sections. Rough cut ends shall be coated with a suitable weather or vapor resistant mastic as dictated by the system location and service.

2. On hot systems where fittings are to be left exposed, insulation ends should be beveled away from bolts for easy access.

3. On cold systems (below ambient temperature), particular care must be given to vapor sealing the fitting cover or finish to the pipe insulation vapor barrier.

H. Extend insulation without interruption through walls, floors and similar piping penetrations, except where otherwise indicated.

I. All final pipe insulation ends shall be tapered and sealed regardless of service.

J. All piping shall be supported in such a manner that neither the insulation or the vapor/weather barrier is compromised by the hanger or the effects of the hanger. In all cases, hanger spacing must be such that the circumferential joint may be made outside the hanger. On cold systems, vapor barrier must be continuous, including material covered by the hanger saddle.

1. Piping systems 1-1/2” in diameter or less, insulated with low density insulation, may be supported by placing galvanized steel shields of the proper length and spacing located between pipe hangers or pipe hanger rolls and insulation.

2. For hot or cold piping systems larger than 1-1/2” in diameter, operating at temperatures less than +200°F and insulated with low density insulation, shields as above and high density inserts such as
cellular glass foam with sufficient compressive strength shall be used to support the weight of the piping system. At temperatures exceeding +200°F, Calcium Silicate pipe insulation shall be used for high density inserts.

a. Insert location: Between support shield and piping and under the finish jacket.
b. Insert configuration: Minimum 6 inches long, of same thickness and contour as adjoining insulation; may be factory fabricated.
c. Butt pipe insulation against pipe hanger insulation inserts. For hot pipes, apply 3" wide vapor barrier tape or band over the butt joints. For cold piping apply wet coat of vapor barrier lap cement on butt joints and seal joints with 3" wide vapor barrier tape or band.

3. Where pipe shoes and roller supports are required, insulation shall be inserted in the pipe shoe to minimize pipe heat loss. Where possible, the pipe shoe shall be sized to be flush with the outer pipe insulation diameter.

4. Thermal expansion and contraction of the piping and insulation system can generally be taken care of by utilizing double layers of insulation and staggering both longitudinal and circumferential joints. Where long runs are encountered, expansion joints may be required where single layers of insulation are being used and should be so noted on the contract drawings.

5. On vertical runs, insulation support rings shall be used.

K. Exterior Applications: Provide vapor barrier jacket. Insulate fittings, joints, and valves with insulation of like material and thickness as adjoining pipe, and finish with glass mesh reinforced vapor barrier cement. Cover with 0.016" aluminum jacket equivalent to Childers and cover fittings with factory formed covers equivalent to Elljacs.

3.4 INSTALLATION OF DUCT SYSTEM INSULATION

A. General: Install insulation products in accordance with manufacturer's written instructions and NAIMA National Insulation Standards to ensure that insulation serves its intended purpose.

B. Ductwrap Insulation: Duct wrap insulation shall be applied with all joints butted firmly together using manufacturer’s recommended stretch-out tables to prevent excessive compression. All joints in the insulation covering shall be sealed with adhesive. Ductwrap insulation shall be secured to bottom and sides of rectangular or oval ducts with mechanical fasteners on 16" (max) centers to prevent sagging. Vapor barrier shall be legibly printed by the manufacturer to show nominal thickness, R-value, and type of insulation.

1. All joints and seams shall be stapled with outward clinching staples at 6" (approx.) centers.
2. Use insulation having 2-inch tab, or cut insulation long enough to allow for “peel-off” of insulation form jacket to effect a minimum overlap tab of 2-inch.
3. Where a vapor barrier is required (ductwork conveying air below ambient temperature) all joints, seams, tears, punctures, and other penetrations shall be closed with 3” pressure-sensitive tape matching the facing or with a vapor barrier mastic reinforced with 3” glass scrim tape.
4. Apply jacketed blanket type glass fiber pulled snug to ducts but not more than 1/2-inch compression at corners.
5. Cover standing seams, stiffeners, and braces with an insulation blanket, using 2-inch jacket lap and staple lap.
6. Insulate fittings and joints. Where service access is required, bevel and seal ends of insulation.
C. Insulated ductwork or equipment operating below ambient temperature:
   1. Provide insulation with vapor barrier jacket and seal all edges, seams, joints, punctures or any other breaks in vapor barrier with commercial grade, aluminum vapor barrier tape.
   2. Insulate entire system including fittings, joints, flanges, fire dampers, flexible connections, and expansion joints.
   3. Continue insulation through walls, sleeves, hangers, and other duct penetrations, except as noted otherwise for rated assemblies.

D. Air Distribution Devices: Where ductwork is specified to be insulated, pan of air distribution device shall be insulated also.

3.5 PENETRATION OF RATED WALLS, PARTITIONS & FLOORS

A. Refer to other Sections on Firestopping. Do not pass pipe insulation through fire rated partitions or floors unless firestopping system is listed for insulated pipe. Stop and properly terminate insulation at each side of partition.

B. Install foamglass insulation on chilled water, domestic cold water, or horizontal runs of rainwater leaders in wall cavity, where lines pass through rated partitions.

C. Stop all duct coverings, including jacket and insulation, at fire damper penetrations of walls, floors above grade and roofs.

D. Stop all duct coverings including jacket and insulation at all penetrations of rated walls and smoke partitions. Flare-out or extend insulation jacket at least 2-inches beyond angle frames of fire dampers and seal to structure.

E. Maintain vapor barrier.

F. Install covering over damper and smoke detector access doors readily removable and identifiable.

3.6 PROTECTION AND REPLACEMENT

A. Replace damaged insulation which cannot be repaired satisfactorily, including units with vapor barrier damage and moisture saturated units.

B. Protection: Insulation Installer shall advise Contractor of required protection for insulation work during remainder of construction period, to avoid damage and deterioration.

3.7 SAFETY PRECAUTIONS

A. Insulation Contractor's employees shall be properly protected during installation of all insulation. Protection shall include proper attire when handling and applying insulation materials, and shall include (but not be limited to) disposable dust respirators, gloves, hard hats, and eye protection.

B. The insulation contractor shall conduct all job site operations in compliance with applicable provisions of the Occupational Safety and Health Act, as well as with all state and/or local safety and health codes and regulations that may apply to the work.
3.8 FIELD QUALITY ASSURANCE

A. Upon completion of all insulation work covered by this specification, visually inspect the work and verify that it has been correctly installed. This may be done while work is in progress, to assure compliance with requirements herein to cover and protect insulation materials during installation.

3.9 INSULATION REPAIR

A. Repair damaged sections of mechanical insulation damaged during this construction period, including that damaged during installation of new devices or controls. Use insulation of same thickness as existing insulation, install new jacket lapping and sealed over existing.

3.10 DUCTWORK SYSTEM INSULATION SCHEDULE

A. Insulate the following ductwork application with material and thickness as scheduled below:

<table>
<thead>
<tr>
<th>Service</th>
<th>Material</th>
<th>Thickness</th>
</tr>
</thead>
<tbody>
<tr>
<td>Concealed Supply Air In Attic</td>
<td>Fiberglass</td>
<td>3” (min. R-8)</td>
</tr>
<tr>
<td></td>
<td>Ductwrap</td>
<td></td>
</tr>
<tr>
<td>Concealed Return Air In Attic</td>
<td>Fiberglass</td>
<td>3” (min. R-8)</td>
</tr>
<tr>
<td></td>
<td>Ductwrap</td>
<td></td>
</tr>
</tbody>
</table>

3.11 PIPING SYSTEM INSULATION SCHEDULE

A. Insulate the following piping systems with material and thickness as scheduled below:

<table>
<thead>
<tr>
<th>PIPING SYSTEM TYPES</th>
<th>FLUID TEMP RANGE, °F</th>
<th>INSULATION SPEC. TYPE</th>
<th>PIPE SIZES a</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Runouts up to 2” b</td>
<td>&lt;1”</td>
</tr>
<tr>
<td>Refrigerant</td>
<td>40-110</td>
<td>E</td>
<td>1</td>
</tr>
<tr>
<td>Cooling coil Condensate drain (inside building or in attic)</td>
<td>55</td>
<td>E</td>
<td>¼</td>
</tr>
</tbody>
</table>

END OF SECTION 230700
SECTION 232300 - REFRIGERANT PIPING AND SPECIALTIES

PART 1 - GENERAL

1.1 SECTION INCLUDES

A. Extent of refrigerant piping work is indicated on drawings and by requirements of this section.

B. Insulation of refrigerant piping is specified in other Division-23 sections, and is included as work of this section.

1.2 QUALITY ASSURANCE

A. Manufacturer's Qualifications: Firms regularly engaged in manufacturer of refrigerant piping products, of types, materials, and sizes required, whose products have been in satisfactory use in similar service for not less than 5 years.

B. Codes and Standards:

C. ANSI Compliance: Fabricate and install refrigerant piping in accordance with ANSI B31.5 "Refrigeration Piping", and extend applicable lower pressure limits to pressures below 15 psig.

D. ASHRAE Compliance: Fabricate and install refrigerant piping in accordance with ASHRAE 15 "Safety Code for Mechanical Refrigerant".

1.3 SUBMITTALS

A. Product Data: Submit manufacturer's technical product data for refrigerant piping materials and products.

B. Brazing Certification: Certify brazing procedures, brazers and operators in accordance with ASME standards (ANSI B31.5).

C. Record Drawings: At project closeout, submit record drawings of installed refrigerant piping and piping products, in accordance with requirements of Division 1.

D. Maintenance Data: Submit maintenance data and parts lists for refrigerant piping materials and products. Include this data, product data, shop drawings, and record drawings in maintenance manual.

PART 2 – PRODUCTS

2.1 MATERIALS AND PRODUCTS

A. General: Provide piping materials and factory-fabricated piping products of sizes, types, pressure ratings, temperature ratings, and capacities as determined by Installer to comply with installation requirements. Provide materials and products complying with ANSI B31.5 Code for Refrigeration Piping where applicable, base pressure rating on refrigerant piping system maximum design pressures. Provide sizes and types matching piping and equipment connections; provide fittings of materials which match pipe materials used in refrigerant piping systems. Where more than one type of materials or products are indicated, selection is Installer's option.
2.2 BASIC PIPES AND PIPE FITTINGS

A. Tube Size 1" through 4": Copper tube; Type ACR, hard-drawn temper; wrought-copper, solderjoint fittings; brazed joints.

B. Tube Size ¾" and Smaller: Copper tube; Type ACR, soft annealed temper fittings; cast copper-alloy fittings for flared copper tubes; flared joints.


2.3 BASIC PIPING SPECIALTIES

A. General: Provide specialties complying with Section 23 26 00 "Piping Specialties", in accordance with the following listing:
   1. Pipe escutcheons.
   2. Drip pans.
   3. Sleeves.
   4. Sleeve seals.

2.4 BASIC SUPPORTS AND ANCHORS

A. General: Provide supports and anchors complying with Division-23 Basic Mechanical Materials and Methods section "Supports and Anchors", in accordance with the following listing:
   1. Adjustable steel clevises, adjustable roller hangers, and adjustable pipe roll stands for horizontal piping hangers and supports.
   2. Two-bolted riser clamps for vertical piping supports.
   3. Concrete inserts, C-clamps, and steel brackets for building attachments.
   4. Protection shields for insulated piping support in hangers.
   5. Copper flashings for piping penetrations.

2.5 REFRIGERANT SPECIALTIES

A. Refrigerant Strainers: Brass shell and end connections, brazed joints, monel screen, 100 mesh, UL-listed, 350 psi working pressure.

B. Moisture-Liquid Indicators: Forged brass, single port, removable cap, polished optical glass, solder connections, UL-listed, 200 °F (93°C) temperature rating, 500 psi working pressure.

C. Refrigerant Filter-Driers: Steel shell, ceramic fired desiccant core, solder connections, UL-listed, 500 psi working pressure.

D. Refrigerant Filter-Driers: Corrosion-resistant steel shell, steel flange ring and spring, wrought copper fittings, ductile iron cover plate with steel cap screws, replaceable filter-drier core, 500 psi working pressure.

E. Refrigerant Discharge Line Mufflers: Provide discharge line mufflers as recommended by equipment manufacturer for use in service indicated, UL-listed.
F. Acceptable Manufacturers: Subject to compliance with requirements, provide solenoid valves of one of the following:

1. Alco Control Div.; Emerson Electric Co.
2. Henry Valve Co.
4. Sporlan Valve Co.

2.6 BASIC VIBRATION CONTROL:

A. General: Provide vibration control products in accordance with the following listing:

1. Riser isolators.
2. Riser support isolators.
3. Flexible pipe connectors.

PART 3 – EXECUTION

3.1 INSPECTION

A. General: Examine areas and conditions under which refrigerant piping system materials and products are to be installed. Do not proceed with work until unsatisfactory conditions have been corrected in manner acceptable to Installer.

3.2 INSTALLATION OF REFRIGERANT PIPING

A. General: Install refrigerant piping in accordance with equipment manufacturer's recommendations.

B. Clean refrigerant piping by swabbing with dry lintless (linen) cloth, followed by refrigerant oil soaked swab. Remove excess oil by swabbing with cloth soaked in high flash point petroleum solvent, squeezed dry.

C. Bleed dry nitrogen through refrigerant piping during brazing operations.

3.3 INSTALLATION OF SPECIAL REFRIGERANT VALVES

A. General: Install refrigerant valves where indicated, and in accordance with manufacturer's instructions. Remove accessible internal parts before brazing, replace after joints are completed.

B. Solenoid Valves: Install in refrigerant piping as indicated with stem pointing upwards.

1. Wiring of solenoid valves is specified in applicable Division-26 sections, and is included as work of this section.

2. Wiring of solenoid valves is specified in applicable Division-26 sections, not work of this section.
3.4 INSTALLATION OF REFRIGERANT ACCESSORIES

A. Refrigerant Strainers: Install in refrigerant lines as required, and in accessible location for service.

B. Moisture-Liquid Indicators: Install as required on refrigerant liquid lines, in accessible location.

C. Refrigerant Filter-Dryers: Install in refrigerant lines as required, and in accessible location for service.

D. Evaporator Pressure Regulators: Install in refrigerant suction lines or evaporator outlets as required. Adjust, if required, for proper evaporator pressure.

E. Refrigerant Discharge Line Mufflers: Install as required, in horizontal or downflow portion of hot-gas lines, immediately after leaving compressor; not in riser.

3.5 EQUIPMENT CONNECTIONS

A. General: Connect refrigerant piping to mechanical equipment and comply with equipment manufacturer's instructions.

3.6 FIELD QUALITY CONTROL

A. Refrigerant Piping Leak Test: Prior to initial operation, clean and test refrigerant piping in accordance with ANSI B31.5, "Refrigeration Piping". Perform initial test with dry nitrogen, using soap solution to test all joints. Perform final test with 27" vacuum, and then 200 psi using halide torch. System must be entirely leak-free.

B. Repair or replace refrigerant piping as required to eliminate leaks, and retest as specified to demonstrate compliance.

3.7 DEHYDRATION AND CHARGING SYSTEM

A. Install core in filter dryer after leak test but before evacuation.

B. Evacuate refrigerant system with vacuum pump; until temperature of 35 °F (2 °C) is indicated on vacuum dehydration indicator.

C. During evacuation, apply heat to pockets, elbows, and low spots in piping.

D. Maintain vacuum on system for minimum of 5 hours after closing valve between vacuum pump and system.

E. Break vacuum with refrigerant gas, allow pressure to build up to 2 psi.

F. Complete charging of system, using new filter dryer core in charging line. Provide full operating charge.

3.8 ADJUSTING AND CLEANING

A. Cleaning and Inspecting: Clean and inspect refrigerant piping system in accordance with requirements of applicable section.

END OF SECTION 232300
PART 1 - GENERAL

1.1 DESCRIPTION OF WORK:

A. The extent of the sheet metal work is indicated on the drawings and in the schedules, and by the requirements of this section. The types of ductwork and accessories specified in this section include but are not necessarily limited to the following:

1. Supply and return air systems. (low pressure).
2. Outside air systems.
3. General exhaust systems.
4. Kitchen range hood exhaust systems.
5. Turning vanes.
6. Access doors.
7. Flexible duct.
8. Flexible duct connections.
9. Duct test holes.
10. Volume control dampers.

1.2 QUALITY ASSURANCE:

A. Manufacturers: Firm regularly engaged in the manufacture of duct accessories, of types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.

1. Acceptable manufacturers include:
   a. Semco
   b. United McGill
   c. United Sheet Metal
   d. Thermaflex (flexible ducts)

B. When the system is in operation, the ductwork shall be free from rattles and air noises caused by poor duct construction.

1.3 REFERENCES:

A. UL Labels: Provide flexible metal ducts and fiberglass ductwork and connectors which comply with the applicable portions of UL 181 and bear the label of Underwriters Laboratories.

B. Industry Standards: Comply with SMACNA (Sheet Metal and Air Conditioning Contractor's National Association) recommendations for fabrication, construction and details, and installation procedures, except as otherwise indicated.


D. Comply with ASHRAE (American Society of Heating, Refrigerating and Air Conditioning Engineers) recommendations, except as otherwise indicated.

E. NFPA 90A – Installation of Air Conditioning and Ventilating Systems.
1.4 SUBMITTALS:

A. Product Data, Metal Ductwork: Submit manufacturer's data on duct lining insulation and ductwork accessories.

B. Shop Drawings, Ductwork Accessories: Submit dimensioned drawings of ductwork with accessories showing both accurately scaled accessories and their relationship to ductwork and space enclosure. Show modifications, of indicated requirements, if applicable, made to conform to local shop practice, and show how these modifications ensure that materials and weights are not reduced, and that the fabricated units are equivalent to the specified requirements.

1.5 PRODUCT HANDLING:

A. Protect shop fabricated ductwork, accessories and purchased products from damage during shipping, storage and handling. Prevent end damage and prevent dirt and moisture from entering ducts and fittings.

B. Where possible, store ductwork inside and protect from weather. Where necessary store outside, store above grade and enclosed with waterproof wrapping.

PART 2 - PRODUCTS

2.1 DUCTWORK:

A. General: Fabricate and support in accordance with SMACNA HVAC Duct Construction Standards – Metal and Flexible, and as indicated. Provide duct material, gages, reinforcing, and sealing for operating pressures indicated. Unless otherwise noted, pressure class shall be determined by fan rating.

B. Materials:

1. Sheet Metal: Except as otherwise indicated, fabricate ductwork from galvanized sheet steel complying with ASTM A 527, lockforming quality; with G 90 zinc coating in accordance with ASTM A 525; and mill phosphatized for exposed locations.


C. Low Velocity Ductwork: Shall be constructed of the sheet metal gauge and with end joints and reinforcing as per Table 1, "Duct Manual and Sheet Metal Construction", SMACNA Section 1.

D. Ductwork shall be constructed as indicated below:

1. Low Pressure Ductwork: Outside air intake, return air, relief air and exhaust air ducts having a semi-perimeter (height plus width) of 96 inches or less; supply ductwork downstream of pressure reducing dampers or air terminal units, to the air distribution devices, and supply ductwork on air handling systems having a total fan pressure of 2 inches W.G. or less shall be low pressure. Low pressure duct shall be constructed to meet SMACNA Pressure Class 2” and Seal Class “B”.

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E. Duct Sealant: Use non-hardening, water resistant, fire resistive, non-migrating mastic or liquid elastic sealant as compounded and recommended by manufacturer specifically for sealing joints and seams in ductwork. Tape is not acceptable for use as duct sealant. Sealant shall be less than 30 g/L VOC content. Ductwork shall be constructed and sealed to comply with the following seal classes per SMACNA standards: Low Pressure Ductwork – Seal Class B.

F. Duct Fabrication: Duct sections shall be fabricated in maximum lengths of 8'-0" and shall conform to the sizes and routings shown, except that routing shall be changed and offsets provided by the contractor to avoid conflicts and/or obstructions encountered. Sizes indicated for internally insulated duct are net clear, and must be increased to allow for the liner thickness. Longitudinal seams in all ductwork shall be Pittsburgh locks. Ducts 12" wide and larger shall be cross broken. Duct fittings, connections, damper locations and construction, etc., shall be as indicated on the drawings. Details of construction not specifically shown or specified shall be as indicated on the SMACNA "Duct Manual and Sheet Metal Construction" Sections 1 and 2.

1. Change in the cross-sectional dimensions of ductwork is permissible when required to meet job conditions. Maintain at least the same equivalent cross-sectional duct area in accordance with the latest edition of the ASHRAE Guide. Secure the approval of the Professional prior to fabrication of ductwork requiring such changes.

2. Fabricate duct fittings to match adjoining ducts, and to comply with duct requirements as applicable to fittings. Change duct sizes gradually, not exceeding 15 degrees wherever possible. Limit angular tapers to 45 degrees for contracting tapers and 30 degrees for expanding tapers.

3. Where space permits, construct elbows with a minimum centerline radius to duct width ratio (r/W) of 1.5. Where space is limited, use curved elbows with splitter vanes spaced per SMACNA standards. Where r/W ratio can be between 0.75 and 1.0, 1 splitter vane may be used. Where r/W ratio must be between 0.70 and 0.60, 2 splitter vanes shall be used. If r/W ratio must be less than 0.60, then use 3 splitter vanes. Mitered elbows with turning vanes shall not be permitted.

4. If connection size equals or exceeds 25% of main size, use SMACNA Figure 2-7 "Parallel Flow Branches."

5. For small branch connections other than above, use either low-loss rectangular 45 degree entry, conical or bellmouth fittings per SMACNA Figure 2-8, "Branch Connections." Straight spin-in fittings are not acceptable. Where above "accessible" ceiling construction, the connection fittings shall contain the branch balancing damper.

6. All ductwork must present a smooth interior and joints must be airtight.

7. Fabricate continuously welded round and oval duct fittings two gages heavier than duct gages indicated in SMACNA Standard. Prime coat welded joints with zinc-rich paint.

2.2 FLEXIBLE RUNOUTS:

A. Non-Insulated Low Pressure Flexible Ducts: Shall be UL-181 Class 1 flexible air duct, complying with NFPA Standards 90A and 90B. Duct shall be factory fabricated of a coated spring wire helix permanently bonded to a coated woven fiberglass cover.

1. Operating Pressure Rating: Minimum 10” positive (2-14 inch diameter), 1” negative (2-14 inch diameter).

2. Maximum Velocity: 2500 fpm

3. Operating Temperature: 0 to 180

4. Maximum Flame Spread/Smoke Developed ratings: 25/50
B. Insulated Low Pressure Flexible Ducts: Shall be UL-181 Class 1 flexible air duct, complying with NFPA Standards 90A and 90B. Duct shall be factory made and composed of a CPE liner duct permanently bonded to a coated spring wire helix supporting a fiberglass scrim and fiberglass insulating blanket with a low permeability outer vapor barrier jacket.

1. Operating Pressure Rating: Minimum 4” positive (3-20 inch diameter), 1” negative (3-12 inch diameter), 0.5” negative (14-20 inch diameter)
2. Maximum Velocity: 2500 fpm
3. Operating Temperature: -0 to 180
4. Minimum R value: 4.2
5. Maximum Flame Spread/Smoke Developed ratings: 25/50

E. Flexible connectors (with SMACNA label indicating compliance with UL 181 or not) are not acceptable as substitution for flexible duct.

2.3 DAMPERS:

A. Shall be substantially constructed and installed to provide proper operation and structural rigidity under the velocity and full static pressures to which the damper is subject. Multi-section dampers shall be assembled into a structural angle or channel iron frame welded together and securely anchored to the structure and arranged so that each damper section bolts to a structural framing member rather than to an adjacent damper section. Detailed drawings of the assembly shall be submitted for review prior to installation. Motors and motor linkage to damper for motor operated dampers and damper assemblies shall be provided under the Automatic Controls Section and shall be submitted for review prior to installation.

B. Two-Position Dampers: Shall be parallel or opposed blade type with solid continuous stops on all sides and with blades fabricated of 16 gauge galvanized steel and with angle or channel steel frames. Blades shall be interlocking type not less than 6 inches in width and shall be provided with zinc plated steel bearing pins, bronze oilite bearings, and with required ball joint linkages. Damper and frame to be furnished in rust resistant coating or shall be hot-dipped galvanized.

C. Proportioning and Mixing Dampers: Shall be of the opposed blade type with "low leakage" construction, similar or equal to Johnson Service Co. Series D 1300.

D. Outside Air Intake, Metering Type, Pressure Reducing Dampers (not specified or scheduled on the drawings as part of manufactured product): Shall be opposed blade type with 6-inch blades formed from two thicknesses of 22 gauge galvanized steel spot welded together. Damper frames shall be channel type and frames and blades shall be provided with a tight seal consisting of a continuous, replaceable, butyl rubber seal on top, bottom, sides and along each blade edge. Bearings shall be nylon with stainless steel bushings. Linkage shall be galvanized steel located within the damper frame. Motor linkage to damper shall be equal percentage type. Air loss or leakage when dampers are fully closed shall not exceed 2% of the total flow at 6 inches W. G. Published data certifying performance shall be submitted.

E. Manual Volume Dampers: Up through 12 inches in height shall be shop fabricated single blade "butterfly dampers". The blade shall be fabricated of 18 gauge galvanized steel reinforced to make rigid. Manual volume dampers exceeding 12 inches in height shall be opposed blade dampers, as specified for automatic dampers, with manual operator. Provide a locking quadrant and set screw for all manual dampers.
1. Manual volume and splitter dampers shall be furnished where shown and where necessary for proper regulation of the air distribution. No grille dampers shall be used for balancing.

2.4 TURNING VANES:
   A. Provide turning vanes in the size and type indicated with the following additional construction features:
      1. Blades: 2" galvanized steel for up to and including 18" ducts, 4 1/2" galvanized steel for ducts over 18".
      3. Types: Fixed blades for 90 degree elbows.

2.5 EXTRACTORS:
   A. Provide extractors in size and type indicated, with hex-key operated adjustable blades, with the following additional construction features:
      1. Blades: Gang-operated galvanized steel on 1" centers.

2.6 DUCT ACCESS DOORS:
   A. General: Provide access doors at all locations of duct systems requiring service access including but not necessarily limited to: smoke dampers, fire dampers, smoke detectors, humidifiers, control accessories, tops and bottoms of risers for cleaning. Access doors shall close with air pressure. All access doors are to be fully accessible without obstruction.
   B. Fabricate in accordance with SMACNA HVAC Duct Construction Standards - Metal and Flexible, and as indicated.
   C. Fabrication: Rigid and close-fitting of galvanized steel with sealing gaskets and quick fastening locking devices. For insulated ductwork, use double-wall construction with insulation between.
   D. Access doors smaller than 12 inches square may be secured with sash locks.
   E. Provide two hinges and two sash licks for sizes up to 18 inches square, three hinges and two compression latches with outside and inside handles for sizes up to 24 x 48 inches. Provide an additional hinge for larger sizes.
   F. Access doors with sheet metal screw fasteners are not acceptable.

2.7 DUCT TEST HOLES:
   A. Temporary Test Holes: Cut or drill in ducts as required. Cap with neat patches, neoprene plugs, threaded plugs, or threaded or twist-on metal caps.
   B. Permanent Test Holes: Factory fabricated, air tight flanged fittings with screw cap. Provide extended neck fittings to clear insulation.

2.8 FLEXIBLE DUCT CONNECTIONS
   A. Fabricate in accordance with SMACNA Duct Construction Standards, and as indicated.
B. UL listed fire-retardant neoprene coated woven glass fiber fabric to NFPA 90A, minimum density 20 oz. per sq. yd., approximately 2 inches wide, crimped into metal edging strip.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION:

A. General: Assemble and install ductwork in accordance with recognized industry practices which will be in accordance with the leakage rates allowable for specified seal class, with no objectionable noise, capable of performing each indicated service. Install each run with minimum number of joints. Align ductwork accurately at connections, within 1/8" misalignment tolerance. Support ducts rigidly with suitable ties, braces, hangers and anchors of type which will hold ducts true-to-shape and to prevent buckling. Support vertical ducts at every floor. The internal surfaces of all ductwork shall be smooth. No sheet metal parts, tabs, angles, etc. may project into ducts unless specified to do so. All seams and joints shall be external.

B. Installation of flexible runouts shall comply with Section 303 (a) of NFPA 90A.

1. Limit length to 5’, unless otherwise specifically shown otherwise on drawings.
2. Supply air systems: Use insulated flexible ducts of applicable pressure ratings.
4. Connect flexible ducts to metal ducts with adhesive and draw bands. On systems with positive pressure over 2”, secure tightened bands in place with sheet metal screws.

C. Field Fabrication: Complete fabrication of work at project as necessary to match shop-fabricated work and accommodate installation requirements. Where possible, ductwork shall be fabricated in such a manner that seams and/or joints will not be cut for the installation of grilles, registers, or ceiling outlets. If cutting of seams or joints is unavoidable, the cut portion shall be properly reinforced to original strength.

D. Routing: Locate ductwork runs, except as otherwise indicated, vertically and horizontally and avoid diagonal runs wherever possible. Locate runs as indicated by diagrams, details and notations or, if not otherwise indicated, run ductwork in shortest route which does not obstruct useable space or block access for servicing building and its equipment. Hold ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building. Limit clearance to ½” where furring is shown for enclosure or concealment of ducts, but allow for insulation thickness, if any. Where possible, locate insulated ductwork for 1” clearance outside of insulation. Wherever possible in finished and occupied spaces, conceal ductwork from view, by locating in mechanical shafts, hollow wall construction or above suspended ceilings. Do not encase horizontal runs in solid partitions, except as specifically shown. Coordinate layout with suspended ceiling and lighting layouts and similar finished work.

E. Coordination: Coordinate duct installations with installation of accessories, dampers, coil frames, equipment, controls and other associated work of ductwork system.

1. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal cam with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.
2. Locate ducts with sufficient space around equipment to allow normal operating and maintenance activities.

F. Installation: Install metal ductwork in accordance with SMACNA HVAC Duct Construction Standards.

1. All ductwork shall be properly suspended or supported from the building structure. The duct hanging system is composed of three elements; the upper attachment to the building structure, the hanger itself and the lower attachment to the duct. The attachments, hangers and supports for all ductwork shall be in accordance with Section IV of the SMACNA Manual. Ductwork shall be seismically restrained as required by Code.

   a. Except as otherwise indicated, provide hot-dipped galvanized steel fasteners, anchors, rods, straps, trim and angles for support of ductwork.

2. Do not suspend any device or allow work installed by any trade to be suspended from ductwork, unless supports such as trapeze hangers are specifically designed to handle additional static loads.

3. Provide supplementary steel as required to support ductwork with a maximum deflection of 0.08 inch.

4. Range hood exhaust ductwork shall be installed with longitudinal joints on top.

3.2 DUCT SUPPORTS:

   A. Horizontal rigid ductwork shall be supported at not more than 8 feet o.c. and at each change of direction. Hangers shall be 1/4 inch all thread rod and angle iron securely attached to ductwork and to the structure. Ductwork shall be "sway-braced" to prevent longitudinal movement. Vertical duct risers shall be supported at each floor by angles or channels secured to the duct at the floor arranged to prevent conflicts with fire damper access. All exposed angles and metal surfaces less than ten (10) feet above the floor shall be beveled, flattened or ground smooth to prevent injury to pedestrians.

   B. Support flexible ductwork with threaded galvanized steel rods secured to the structure above and connected at the duct by 1-1/4" wide (min.) X 20 Ga. galvanized steel bands double-hemmed at threaded rod attachment. Thru-bolt the band at the threaded hanger rod, with locknuts. Provide insulation shield between the duct insulation and the band of a length adequate to prevent compressing the insulation more than 1/4".

   C. Provide hangers as required to prevent sagging of the duct.

3.3 DUCTWORK LEAKAGE TESTS:

   A. It is essential that all air ductwork be practically air tight. There will be no requirement for formal duct leakage tests with apparatus. However, before being insulated or concealed, all ducts, shall be checked for leakage. Any deficiencies causing noticeable leakage (noise or detected air movement) shall be corrected.
3.4 FLOOR/WALL PENETRATIONS:

A. Where ducts pass through non fire-rated interior partitions and exterior walls, and are exposed to view, conceal space between construction opening and duct or duct insulation with sheet metal flanges of same gage as duct. Overlap opening on 4 sides by at least 1½". Fasten to duct and substrate.

B. Where ducts pass through sound rated interior partitions, provide 16 gauge sheet metal sleeve in wall allowing 1" clearance all around. Pack annular space with fibrous material and seal all around both sides with a sealant that will remain flexible. In areas where exposed to view, provide flanges as described above.

C. Where ducts pass through fire-rated floor, walls, or partitions, provide fire dampers in accordance with requirements of Section 15910. The space between the duct and wall shall be packed with Dow Corning 3-6548 Silicone RTV foam and secured with a sheet metal closure collar or not less than 2-inch width the same gage metal as the duct. Hinged access panels shall be provided at each fire damper and automatic damper, and at each elbow with turning vanes and splitter damper. Panels shall be 18" x 18" (min.) unless indicated otherwise. Where size of duct will not accommodate this size, the panels shall be as large as practical, but not less than 12" x 12". Panels in insulated duct shall be insulated type. Flexible connections in ductwork shall be accordance with Section 15070.

D. Where ducts pass through non-fire-related, designated smoke partitions, completely seal penetration against the passage of smoke in accordance with the requirements of the authority having jurisdiction.

E. Seal penetrations of the building surfaces, including the vapor barrier, with materials compatible with both the building materials and the ductwork outer surface.

3.5 ACCESSORIES INSTALLATION:

A. Install accessories in accordance with manufacturer’s instructions, NFPA 90A, and follow SMACNA HVAC Duct Construction Standards - Metal and Flexible.

B. Provide flexible connections immediately adjacent to equipment in ducts associated with fans and motorized equipment.

C. Provide duct access doors for inspection and cleaning before and after filters, coils, fans, automatic dampers, at fire dampers, and elsewhere as indicated. Provide minimum 8 x 8 inch size for hand access, 18 x 18 inch size for shoulder access, and as indicated. Where access door is for a smoke detector, access door shall be upstream of device to facilitate testing.

D. Provide duct test holes where indicated and required for testing and balancing purposes. Seal with neoprene plugs.

E. Provide balancing dampers at points on supply, return, and exhaust systems where branches are taken from larger ducts as required for air balancing. Install minimum 2 duct widths from duct take-off.

F. Provide balancing dampers on duct take-off to diffusers, grilles, and registers, regardless of whether dampers are specified as part of the diffuser, grille, or register assembly.
G. Provide openings in ductwork where required to accommodate thermometers and controllers. Provide pitot tube openings where required for testing of systems, complete with metal can with spring device or screw to ensure against air leakage. Where openings are provided in insulated ductwork, install insulation material inside a metal ring.

H. Coordinate installation so that all operable devices are accessible.

I. All penetrations of a return air duct in the vicinity of smoke detectors installed on or in an air duct shall be sealed to prevent entrance of outside air and possible dilution or redirection of smoke within the duct.

3.6 TEMPORARY CLOSURE:

A. Temporary Closure: At all ends of ducts provide temporary closure of polyethylene film or other covering which will prevent entrance of dust, paint overspray and debris until time connections are to be completed. Maintain closures until dust producing activities have ceased and building has been cleaned. Contractor is responsible for means and methods to deliver a clean, like new air system. Should project conditions require measures beyond what is specifically called for to achieve this, contractor is responsible for identifying and providing same at no additional cost to the owner.

END OF SECTION 233100
SECTION 233700 - AIR DISTRIBUTION DEVICES

PART 1 - GENERAL

1.1 SECTION INCLUDES:

A. The extent of air distribution devices is indicated on the drawings and by the requirements of this section for supply, return and exhaust diffusers, grilles and registers.

1.2 REFERENCES:

A. ARI 650 – Air Inlets and Outlets.
C. SMACNA – HVAC Duct Construction Standard – Metal and Flexible.

1.3 QUALITY ASSURANCE:

A. Test and rate air outlet and inlet performance in accordance with ADC Equipment Test Code 1062 and ASHRAE 70.
B. Manufacturers: Firms regularly engaged in the manufacture of air distribution devices of the types and sizes required, whose products have been in satisfactory use in similar service for not less than 3 years.
C. Manufacturers: Provide products produced by one of the following:
   1. Krueger
   2. Metalaire
   3. Titus
   4. Price
   5. Nailor
D. NFPA Compliance: Comply with the National Fire Protection Association Standard No. 90, as applicable to air distribution device construction and installation.

1.4 SUBMITTALS:

A. Product Data: Submit manufacturer's technical product data for air outlets and inlets in a manner to facilitate convenient review including the following:
   1. Schedule of air outlets and inlets indicating drawing designation, room location, number furnished, model number, size, and accessories furnished.
   2. Data sheet for each type of air outlet and inlet, and accessory furnished; indicating construction, finish, and mounting details.
B. Maintenance Data: Submit maintenance data, including cleaning instructions for finishes, and spare parts lists. Include this data, product data, and shop drawings in maintenance manuals.

1.5 PRODUCT DELIVERY, STORAGE AND HANDLING:

A. Deliver air units wrapped with waterproof wrapping in factory-fabricated fiberboard type containers. Store air units in original cartons and protect from weather and construction work traffic.
B. Avoid crushing or bending diffusers, and prevent dirt and debris from entering and settling in diffusers.

PART 2 - PRODUCTS

2.1 REGISTERS, GRILLES AND DIFFUSERS:

A. General: Except as otherwise indicated, provide manufacturer's standard air distribution devices where shown; of size, shape, capacity and type indicated; constructed of materials and components as indicated, and as required for complete installation.

B. Performance: Provide devices that have, as minimum, temperature and velocity traverses, throw and drop, and noise criteria ratings for each size device as listed in manufacturer's current data.

C. Compatibility: Provide air distribution devices with border styles that are compatible with adjacent systems, and that are specifically manufactured to fit into construction with accurate fit and adequate support. Refer to general construction drawings and specifications for types of construction that will contain each type air distribution device.

D. Types: Provide air distribution devices of type, capacity, and with accessories and finishes as listed on schedule.

E. Mounting: Provide as scheduled on the drawings. Manufacturer's air outlet data shall be based on Air Diffusion Council (ADC) standards. All screw holes in flanges shall be countersunk and secured with flathead screws. All air outlets shall be provided with sponge rubber gaskets. All parts of air distributing outlets and inlets shall be securely held to the ceiling, wall, and/or ducts. Exercise all possible care to prevent outlets and inlets from disengaging. Provide any additional angles and braces that are required to make a “fall proof” installation.

PART 3 - EXECUTION

3.1 INSTALLATION:

A. General: Install devices in accordance with manufacturer's written instructions and in accordance with recognized industry practices to insure that products serve the intended function.

B. Coordinate with other work, including ductwork and ductwork accessories, as necessary to interface installation of air distribution devices properly with other work.

C. Connect air devices to ductwork with air-tight connection.

D. Provide air balancing dampers in duct take-off to diffusers, registers and grilles despite whether or not dampers are specified as part of the air device assembly.

E. Locate ceiling devices where indicated on architectural reflected ceiling plans. Center devices within acoustical tile ceiling modules.

3.2 FIELD QUALITY CONTROL:

A. Test operation of installed air distribution devices to demonstrate compliance with the requirements.

END OF SECTION 233700
DIVISION 26 - ELECTRICAL SPECIFICATIONS

DODD MEADOWS COMMUNITY CENTER
HENDERSON COUNTY
CREST ROAD & EAST BLUE RIDGE ROAD
EAST FLAT ROCK, NORTH CAROLINA 28726

CLARK NEXSEN PROJECT #5917

ESE PROJECT NO.: 7526

ESSENTIAL SYSTEMS ENGINEERING, P.A.
LICENSE NUMBER: C-0516
109 CENTRAL AVENUE
ASHEVILLE, NORTH CAROLINA 28801
(828) 232-1695

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PRELIMINARY
NOT FOR CONSTRUCTION

MARCH 9, 2015
SECTION 260500 - BASIC ELECTRICAL REQUIREMENTS

PART 1   GENERAL

1.1  REQUIREMENTS

A. General Conditions of the Contract, Special Conditions, Instructions to Bidders, and other General Requirements contained in Division 01 and 02 are a part of these Specifications.

1.2  EXTENT OF THE WORK

A. This Contractor shall furnish all labor, materials, and equipment, and perform all operations necessary for installation of complete electrical work within the intent of, and as indicated on, the drawings and as herein specified.

B. Where discrepancies are noted in the drawings and specifications, the more stringent method shall prevail.

1.3  REGULATIONS AND COMPLIANCE

A. Latest editions of the National Electrical Code and the North Carolina State Building Code govern this work; all their requirements shall be satisfied. All work shall comply with current governing codes, ordinances, and regulations of all National, State, and Local authorities having jurisdiction. Any discrepancies should be brought to the attention of the Engineer for resolution.

B. Include all items or labor and material required to comply with such standards and codes. Where quantity, sizes, or other requirements on the drawings or called forth in these specifications are in excess of the standard or code requirements, the specifications or drawings, shall govern.

C. Should any change in plans or specifications be required to comply with the governing regulations, the Contractor shall notify the Professional at the time of submitting his bid.

D. This Contractor shall secure and pay for all permits, fees, inspections by Authority Having Jurisdiction, and licenses required. Upon completion of the job he shall present to the Engineer a certificate of inspection and approval from the inspection authorities.

1.4  DEFINITIONS:

A. By other Trades: Shall mean by persons or parties who are not anticipated to be the contractor for this trade working together with the Prime Contractor. In this context the words “by other trades” shall be interpreted to mean not included in the overall contract, unless it is shown to be by another subcontractor.

B. Concealed: Embedded in masonry or other construction, installed behind wall furring, above ceilings, in crawl spaces, in shafts or otherwise not visible.

C. Contractor: As used in this Division of the specification refers to the Electrical Contractor unless specifically noted otherwise.

D. Exposed: Not concealed.
E. Furnish: Purchase and deliver to the project site complete with every necessary appurtenance and for installation.

F. Install: Unload at the delivery point and perform every operation necessary to establish secure mounting and correct operation at the proper location in the project.

G. Raceway: Conduit, fittings, hangers, supports, couplings, and items customarily required in connection with the installation and protection of wiring.

H. Provide: Furnish and install complete ready for use.

PART 2 PRODUCTS

2.1 MATERIALS

A. All materials shall be new, with third party approved testing label, as recognized by NCBCC, and with manufacturer's label or nameplate giving complete electrical data.

B. Where a manufacturer's catalog number is used, all parts shall be furnished to make it complete and to fit the construction intended.

C. Within ten days after award, Contractor shall submit to Engineer a complete list in triplicate of all materials he proposes to use. List shall show a single manufacturer with not only major materials and equipment, but also such items as conduit fittings, raceway supports, conductive pipe thread compound, asphaltum, sealing material, clamps, anchors, outlet boxes, gutters, terminal cabinets, wire-pulling compound, splice connectors, tape, wire markers, lamps, etc.

D. Material shall be the make and number given in these Specifications or shown on Drawings, or equivalent where specifically stated as being allowed. Equivalent items or materials will be subject to acceptance by the Engineer at submittal stage. If Contractor wishes to furnish a make or number other than that specified (or equivalent where allowed), he shall furnish complete, detailed data and obtain approval of the substitution in writing from the Engineer no later than 10 days prior to bid. In some cases, at the request of the Engineer, samples of the substitute items shall be submitted for review. Data (and sample if required) shall be submitted in a timely manner such that approval by Engineer can be returned to Contractor no later than 10 days prior to bid date. Data or sample not submitted in sufficient time to allow evaluation by Engineer will be automatically rejected.

E. Engineer's review of samples, cut sheets, shop drawings, and other matter submitted by the Contractor shall not relieve the Contractor of responsibility for full compliance with the Drawings and Specifications. If a submitted item does not comply in any way (color, style, quality, function, or performance), Contractor shall call the specific non-compliance to the attention of the Engineer in writing in a cover letter to the submittals requesting a deviation from specifications. This does not imply that approval of requested deviation will be given, only that it will be reviewed.

F. The following equipment shall be submitted for review:

26 05 19 W I R E S A N D C A B L E S
26 05 23 C O N T R O L A N D S I G N A L W I R I N G
26 05 26 G R O U N D I N G A N D B O N D I N G
26 05 33 R A C E W A Y , B O X E S , A N D S U P P O R T S
26 05 48 S E I S M I C R E Q U I R E M E N T S F O R E L E C T R I C A L E Q U I P M E N T
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26 51 00 LIGHTING – INTERIOR
26 56 00 LIGHTING – EXTERIOR
27 14 00 COMPUTER AND TELEPHONE WIRING SYSTEMS
27 51 16 PUBLIC ADDRESS SYSTEMS

G. Engineer's review of submittals is not intended to confirm quantity counts of materials and equipment made by Contractor. Contractor is required to provide quantities of items as necessary for systems to function as described and shown on the plans and in these specifications.

H. Specialty systems such as fire alarm systems, etc., that are included as part of the Electrical Contract shall be furnished and installed by an authorized representative of the manufacturer of the equipment supplied. This includes use of factory trained and authorized installers where required to fulfill manufacturer's warranty provisions.

I. Submit cuts, shop drawings, and other descriptive materials requested of equipment, as required by the General Requirements section. Submittals will not be accepted or reviewed by the Engineer unless the electrical contractor's stamp signifying his review and approval is evident on the submittals.

J. Materials should be inspected upon their arrival at the site to be sure they are correct. No extension of time for completion will be allowed because materials received are wrong. Completely adequate housing shall be provided on the site for orderly and careful storage of all materials and equipment. Nothing shall be stored outside except conduit, which may be stored in racks so it is at least 12 inches above ground and not subject to mud being spattered on it.

K. Manufacturer or Vendor terms and conditions of sale are strictly between Vendor and Contractor. Approval of submittal data shall not be construed as approval of terms and conditions.

L. By providing submittals to the contractor to be forwarded to the engineer for review, the equipment vendor is acknowledging review of the contract documents and installation details, and that the submitted product is suitable for application in the manner indicated in the contract documents. Upon request, and at no additional charge, the equipment vendor will provide to the engineer a letter from the manufacturer stating the product has been applied in accordance with manufacturer’s recommendations.

2.2 PAINTING

A. Suitable finish coatings shall be provided under this section of the Specifications on all items of electrical equipment and wiring which are exposed. This shall consist of either an approved factory applied finish or an acceptable finish applied during or after installation. Equipment, which is furnished in, finishes such as stainless steel or satin aluminum are not to be painted. Exposed equipment and/or wiring in finished areas such as panel covers or surface raceway shall be supplied with factory applied prime coat and shall be professionally painted or
enameled as directed to result in a completely coated and attractively finished manner. All such finishing shall be as directed by and shall be satisfactory to the Engineer.

PART 3 EXECUTION

3.1 GENERAL INSTALLATION

A. The electrical drawings are diagrammatic only, and are intended to explain system function and define quality of materials and installation. They are not intended to define construction methods.

B. Contractor shall keep on the site at all times one set of electrical drawings and specifications, and one set of drawings and specifications on the work of other trades. In addition, electrical contractor shall maintain one complete set of all electrical submittals and shop drawings at the site.

C. The electrician shall check other trades' drawings, specifications, and shop drawings to see if there are any conflicts. If so, he shall contact the Engineer for instructions.

D. The Contractor shall properly protect his work against damage by weather or other trades. All work shall be left well cleaned, and damaged finishes shall be restored to original condition.

E. The Contractor shall place his own sleeves and notify other trades of chases and openings far enough ahead so they can be properly built in. Where any raceways, supports, etc., installed under the contract pierce the roof, suitable pitch pockets shall be provided and coordinated with the roofing contractor as necessary to be acceptable to the Engineer. Provide suitable fittings where any raceways or equipment cross expansion joints.

F. See Supplementary General Conditions for definition of responsibility and work for trenching, backfilling, cutting, core drilling, and patching.

G. Contractor should not scale drawings for outlet and equipment locations. Unless specifically dimensioned on drawings or defined in specifications, outlets and equipment shall be located as evidently intended or as detailed on Architectural drawings. Lighting outlets are to be centered or spaced symmetrically unless they are dimensioned. Any dimensions shown on the drawings shall be field verified by the contractor prior to rough in. All outlet and equipment locations shall be coordinated with the other trades. If any doubt arises, contact the Engineer prior to roughing.

H. Contractor shall keep premises free of debris resulting from this work.

3.2 TESTS AND GUARANTEES

A. All current-carrying phase conductors and neutrals shall be tested as installed, and before connections are made, for insulation resistance and accidental grounds. Each fixture and item of equipment for connection under the Contract shall be tested for insulation resistance from its conductors to its grounded surface or contact. These tests shall be done with a 500 volt (minimum) high voltage "megger."

1. Minimum readings shall be one million (1,000,000) or more ohms for #6 AWG and smaller wire, 250,000 ohms or more for #4 AWG and larger wire, between conductors and between conductor and the grounding conductor.
2. The contractor shall send a letter to the engineer and the AHJ certifying that the above has been done and showing the tabulation of the megger readings for each panel or feeder. This shall be done at least four (4) days prior to final inspection by the AHJ.

3. At final inspection, the contractor shall furnish a megger and show the engineers and AHJ representatives that the panels comply with the above requirements. He shall also furnish a clamp-on type ammeter and a voltmeter to take current and voltage readings as directed by AHJ representatives.

B. Validity of the ground path shall be assured by constant and careful attention to the thorough tightening of all couplings, connectors, locknuts, screws, bolts, etc., and by frequent checking of the path resistance with a quality low-range ohmmeter. Resistance of the path should not exceed one ohm between any two points. If a reading in excess of this is observed, it shall be discussed with the Engineer for an appraisal of the condition.

C. Contractor shall guarantee that the work is done in accordance with drawings and specifications, and that it is free of imperfect materials or defective workmanship. Anything unsatisfactory shall be corrected immediately and at Contractor's expense.

D. For the period of one year after acceptance by the Owner, the Contractor shall replace, without any expense to the Owner, any imperfect materials or defective workmanship.

3.3 RECORD DRAWINGS/MANUALS

A. Upon completion of the installation, Contractor shall submit to the Engineer marked prints of Drawings showing any changes made in circuits, location of equipment, panel boards, or any other revision in the Contract Drawings, for the Owner's use in maintenance work and for future additions and expansions. Marked changes shall also include changes due to change orders unless already recorded by revised drawing or bulletin drawing.

B. These record drawings shall be submitted in one of two formats: either a clean, legible, marked set of black on white prints with all markings in distinguishable colored pencil such as red; or a set of reverse-run reproducible sepia prints marked in soft pencil so that black on white prints can be reproduced as required. The format to be used shall be as defined in the General Requirements section of the contract documents. If no format is defined, the marked black on white prints shall be submitted.

C. Operation and Maintenance manuals shall be submitted to the Engineer at the end of the project prior to closeout of the project. Information included shall be a copy of all submittal data, shop drawings, and necessary operating and maintenance instructions and wiring diagrams on all major items of equipment and all special systems (fire alarm, intercom, etc.). Manual to include copy of letter to the engineer and owner certifying that the ground resistance test has been performed and stating the resistance measured. Submit these manuals in the quantities and format described in the General Requirements Section.

END OF SECTION 260500
SECTION 260519 - WIRES AND CABLES

PART 1 GENERAL

1.1 REQUIREMENTS

A. All materials shall be U.L listed/labeled and shall be installed in conformance with the current National Electrical Code.

PART 2 PRODUCTS

2.1 MATERIALS

A. Wires and cables shall be manufactured by American/Leviton, Hi-tech, Rome, Southwire, or Triangle.

B. Normal trade standard "building wire" shall be copper. All wires and cables shall have copper conductors.

C. Number 10 and smaller shall be solid; number 8 and larger shall be stranded.

D. All sizes shall bear easily readable size and insulation grade marking along entire length.

E. Insulation on #6 and smaller shall be suitably colored in manufacturing. Conductors #4 and larger may be identified with bands of proper color plastic tape near each termination and in each junction box.

F. Insulation on service and feeders for shall be 600 volt Type XHHW or THHN/THWN unless shown otherwise on the drawings.

G. Branch circuits shall be a minimum of #12, with 600 volt THHN/THWN insulation unless Code requires another type. Circuit wires carried through rows of fluorescent fixtures shall be at least Type RHH or THHN.

H. Conductors in any location subject to temperatures higher than 60°C shall have insulation of a type approved by NEC for temperature encountered.

I. Corrugated, or smooth aluminum Type MC cable may be used where necessary to fish into existing hollow masonry wall spaces with prior approval for each specific instance by the engineer.

J. Control and signal conductors shall be type and size indicated in those sections of the Specifications, or as indicated on drawings.

K. Type "NM" or "Romex" may be used as branch circuits in wood stud construction but only in accordance with NEC permitted uses and approved methods.

PART 3 EXECUTION

3.1 INSTALLATION

A. All wiring shall be color coded:
1. On 240/120 Volt, single phase, 4 wire systems - phase A, black; phase B, red; neutral, white. Ground conductor on all systems shall be green. Equipment grounding conductor on all systems shall be green.

2. Unless noted or accepted otherwise, busses in panels and switchgear shall be considered "A", "B", and "C" from left to right, top to bottom, or front to back when facing equipment.

3. Control wiring shall not use black, red, or blue; but shall use white for neutrals and green for grounding. Any other colors may be used but the coding shall provide same color between any two terminals being joined.

4. Switch-legs, including "travelers" in 3-way and 4-way switching systems, shall be same color as phase leg.

B. Joints in #10 and smaller wire may be either made with approved twist-type connectors such as Ideal, Buchanan, T&B, Scotch, etc. “Stakon” or other permanent type crimp connectors shall not be used for branch circuit wiring.

C. Joints in #8 and larger wire shall be made with approved Burndy, T&B, or O.Z. Manufacturing Co., mechanical pressure type connectors or lugs along with their UL approved insulating covers.

D. Manufactured insulators for connectors may be used, provided they cover completely and securely all exposed metal. If joints and splices are taped, they shall be carefully covered with top-grade Okonite, Scotch Brand, or approved equivalent plastic or rubber and friction, laid on with half laps to result in a joint insulation equivalent to that of the conductor insulation.

E. Circuit joints shall not be made on twin screws of convenience receptacles. Make joints as described above and run single leads to receptacle.

F. All wiring lugs throughout the project, including, but not limited to, breakers, panelboard/switchboard lugs, safety switch lugs, and transformers lugs, shall be rated for use with 75 °C conductors sized in accordance with NEC Table 310-16.

G. Where connected under screw or bolt heads, stranded wire shall be fitted with a lug of proper size. Make solid conductor loops clockwise so as to be forced closed as screw is tightened. Only one solid wire loop may be held under a single screw.

H. All connections shall be made tight.

I. Wires within panelboards, terminal cabinets, and similar equipment shall be neatly radiused (squared), loosely "bunched" together, and held so with lacing or plastic ties at several places.

J. Where paralleling of conductors is shown for feeders or service entrance, it is absolutely required they be exactly the same length between points of bonding together. Lay out side by side and cut to same length before drawing into raceways. Provide for each end of run a Burndy Q2A or W3A lug, or approved equal, and terminate parallel conductors at these lugs without cutting.

END OF SECTION 260519
SECTION 260523 - CONTROL AND SIGNAL WIRING

PART 1 GENERAL

1.1 REQUIREMENTS

A. Shall conform with Article 725 of NEC.

PART 2 PRODUCTS

2.1 MATERIALS

A. Shall also conform with the following unless noted otherwise on drawings or in other sections of these Specifications:

1. Conductors shall be run in metal conduit, unless specifically stated otherwise. These shall be complete with outlet boxes, junction boxes, fittings, etc., conforming in all respects with Section 26 05 33.

2. Conductors shall be #14 AWG minimum, stranded, and insulated with type THHN thermoplastic insulation rated for 600 volts.

3. Conductors shall be colored in manufacture. Black, red, and blue shall be used only for connections of these wiring systems to proper phase in main wiring system. Color code throughout remainder of system shall be other colors selected by This Contractor, but same color shall be used between points of connection. In other words - do not change color at splices, in junction boxes, etc. White shall be reserved for neutral and green for grounding.

4. In lieu of color coding, or in conjunction with, this Contractor shall identify each conductor using a label system, such as Brady labels, or equal. Each conductor shall be individually labeled with a distinctive number or number/letter combination at each termination point, including wire nut connections. A table shall be made identifying each conductor, its function, its origin, its final termination, etc. This table shall be typewritten and included in the final Operation and Maintenance Manuals and with a copy left in the main point of origin cabinet (such as fire alarm panel).

5. Joints and connections shall be made as specified in Section 26 05 19.

PART 3 EXECUTION

3.1 THIS SECTION NOT USED

END OF SECTION 260523
SECTION 260526 - GROUNDING AND BONDING

PART 1 GENERAL

1.1 REQUIREMENTS

A. All systems and equipment shall be grounded in accordance with NEC Article 250.

PART 2 PRODUCTS

2.1 MATERIALS

A. Manufactured by Thomas & Betts, or approved equivalent.

B. Bonding shall be done with insulated bonding bushings, (malleable iron-zinc plated, similar to “Steel City” type BG-800 series), and compression type lugs.

C. Insulated grounding conductor shall be Type THHN/THWN run in heavy wall conduit, and of size shown on drawings or required by NEC.

PART 3 EXECUTION

3.1 INSTALLATION

A. The main service ground clamp shall be attached to the cold water main at an accessible point and before its size is reduced immediately after it enters the building. Clamp shall be accessible after construction is complete. Grounding conductor shall be without splice into the service enclosure where it shall be connected to main service neutral.

B. In addition to the clamp on the water main, a supplemental electrode shall be provided. This supplemental electrode shall consist of one of the following:

1. A concrete encased electrode consisting of 20 feet of bare copper wire sized the same as the service ground (minimum size of #4) placed within and near the bottom of a concrete foundation or footing that is in direct contact with the earth.

2. Two 8 foot minimum copper clad ground rods 1/2” in diameter, driven to a depth so top of rod is below finished grade. Grounding conductor shall be continuous and sized as shown on plans. The grounding conductor conduit shall be fastened to service enclosure with double locknuts and bonding bushing.

C. Other metal piping systems, including gas piping, that are likely to become energized shall be bonded to the service equipment enclosure, the grounded conductor where of sufficient size, or to one or more grounding electrodes used. The bonding jumper(s) shall be sized in accordance with NEC Table 250.122. The minimum bond jumper size shall not be any smaller that No. 12 AWG copper. The points of attachment of the bonding jumper(s) shall be accessible.

D. In addition, the metal frame of the building shall be bonded to the grounding electrode system using a conductor sized the same as the main grounding conductor on the drawings.

E. The ground resistance shall be tested with a ground resistance tester. Resistance to ground shall be less than 25 ohms. If test indicates a greater resistance, appropriate measures shall be taken, including driving additional ground rods, to reduce the resistance to less than 25 ohms.
Contractor shall send a letter to the engineer and owner certifying that the ground resistance test has been performed and stating the resistance measured.

F. All feeders and branch circuits shall contain an insulated green grounding conductor sized per NEC Table 250-122. Grounding conductor shall be routed with circuit conductors in the same raceway, and shall be connected and bonded per NEC and the requirements of these Specifications.

G. Any feeder raceway anywhere in the system, which enters a box or cabinet through part of a concentric knockout shall be fitted with a bonding bushing and jumper. The jumper shall be sized by NEC 1999 Table 250-66 and lugged to the box.

H. Ground all fixed and portable appliances and equipment connected under this Contract with a green grounding conductor. This wire shall be carried inside the raceway and flex from equipment to nearest grounded portion of raceway system. Connect at both ends with suitable lugs.

I. All grounding type receptacles shall have a green wire jumper from their grounding terminal to box in which mounted. Attach jumper to box, not plaster ring, with a bolt or Steel City "G" grounding clip or approved equal. Jumper shall, be sized by NEC with #12 minimum.

PART 3 EXECUTION

3.1 THIS SECTION NOT USED

END OF SECTION 260526
SECTION 260533 - RACEWAY, BOXES, AND SUPPORTS

PART 1 GENERAL

1.1 REQUIREMENTS

A. All material shall be U.L. listed and shall be installed in conformance with the National Electrical Code.

PART 2 PRODUCTS

2.1 RACEWAYS

A. Manufactured by Allied, Triangle, or Wheatland.
   1. Galvanized steel.
   2. Aluminum.

B. Rigid metal conduit (RMC) shall be used for service entrance and panel feeders. RMC shall also be used for feeder or branch circuits run in poured concrete, underground, or exposed to weather unless shown otherwise on plans. RMC shall also be used where indicated on plans.

C. Electric metallic tubing (EMT) may be used for general branch circuits indoors unless indicated otherwise on plans or stated otherwise in these specifications.

D. EMT couplings and connectors shall be compression-gland type of malleable steel, galvanized or sherardized. Connectors shall be insulated-throat type. Set screw, indentor, or cast type fittings are not acceptable.

E. Galvanized "flex" in dry and "sealtite" in wet locations shall be used for connection to mechanical equipment or transformers, or for lighting fixture whips. Flex runs shall be no greater than six feet in length.

F. PVC conduit, labeled for electrical use only, is allowed where noted on plan OR for use below grade outdoors, below slab indoors, encased in concrete and where used for service entrance encased in concrete. All elbows and other conduit fittings used to extend the raceway system to above grade or through the slab shall be RMC. All chemical cleaner (adhesives primer), adhesives (PVC welding), and sealers shall be low emitting materials per requirements of “South Coast Air Quality Management District” (SCAQMD) Rule # 1168, as reproduced in “LEED” Green Building Rating Systems guide lines.

2.2 BOXES

A. Manufactured by Midland Ross/Steel City, T&B, Raco, or Appleton.

B. Galvanized or aluminum of gauge required by NEC.

2.3 FASTENINGS AND SUPPORTS

A. Shall be of good quality, galvanized steel or other non-corroding material.
PART 3 EXECUTION

3.1 RACEWAY INSTALLATION

A. Minimum raceway size shall be 3/4" unless noted otherwise (except underground).

B. All runs of empty conduit only shall have a 100# nylon pull rope installed in the conduit.

C. Rigid metal conduit shall be made up with full threads to which T&B "Kopre-Shield" compound has been applied, and butted in couplings. Utilize Z. Split or "Erickson" couplings where necessary.

D. EMT conduit shall not be used in direct contact with earth (in/below slab on grade or underground), outdoors exposed to elements, where exposed to severe corrosive influence, and/or severe physical damage.

E. Underground raceway runs, except under concrete floor slabs, shall have a minimum of 24" cover. Minimum underground raceway size shall be one (1) inch unless noted otherwise. Branch circuit raceways shall be installed in accordance with the NEC, and approved by the NEC as "suitable for direct burial". Where underground raceways (of any material) turn up to above grade (entry into building cavity, cabinets, equipment, etc.) the elbow required and stub-up out of the slab or earth shall be of rigid steel. Raceways run external to building foundation, except for branch circuit raceways, shall be encased in a minimum of three (3) inches concrete on all sides. Raceway encasement must have eighteen (18) inch minimum cover, except circuits operating at voltages above 600 Volts, which require a minimum cover of thirty (30) inches. Backfill shall be made in 6" layers - tamping each layer to a density of 95% of maximum possible. Install marker tape six (6) to eight (8) inches below finish grade over all underground raceways. All encasement installations are to be approved by engineer before encasement. All underground installations are to be approved by engineer before backfill.

F. Attach rigid metal conduits with double locknuts - one inside and one outside - and fiber bushing.

G. Grounding type insulated bushings shall be used where raceway enters boxes with concentric or oversized knockouts.

H. Provide suitable fittings where raceway crosses building expansion joints.

I. Securely fasten in place using approved strap or hanger within three feet of each termination and not over ten feet apart in runs.

J. Run concealed in finished areas unless otherwise noted.

K. Make all cuts square with hacksaw. Remove any burrs or shoulders by reaming.

L. Installation shall meet seismic requirements of Section 26 05 48 of these specifications.

M. All runs exposed and all runs above accessible ceilings shall be neat and square with building structure such as walls and ceiling/roof structures. Multiple parallel runs shall use trapeze supports where possible.

N. "Flex" and "Sealtite" connections with T&B "Tite-Bite" and "Super-Tite" or approved equivalent fittings and shall have insulated throats.
O. All raceway risers, elbows and other conduit fittings used to extend PVC raceway system to above grade or through slab shall be RMC.

P. Fire alarm conduits shall be Fire Alarm EMT with E-Z PULL Coating, red in color.

3.2 BOX INSTALLATION

A. Attach EMT with connector only.

B. Outlet boxes shall be sized in accordance with NEC Section 370-16. All lighting outlet boxes shall have fixture studs. Device boxes shall be sectional type or 4" square equipped with plaster rings as required to mount the device. Set boxes edge flush with finished surface mounted in. Boxes may be installed at top or bottom of a masonry course. Masonry boxes installed in sawed block shall be galvanized steel. 1-1/4" and deeper plaster rings may be of die-cast aluminum. Provide approved connectors for installing type NM cable assemblies where NM is approved as a wiring method.

C. Where installed in suspended ceilings, outlet boxes shall be supported from the ceiling system using Caddy, or other, hangers specifically designed for such support. In addition, box shall be supported from the structure using 10 gauge steel wire run perpendicular to the ceiling plane. Device boxes installed in suspended ceilings shall be connected to rigid raceway portion of the wiring system with flexible whip not exceeding 6 feet in length.

D. Where installed in metal stud partitions, wall boxes shall be supported from two adjacent studs using a system such as B-Line Box Bracket Hanger Assembly, or equivalent by Steel City, Caddy. Support on a single stud is not acceptable.

E. Fixtures weighing more than six pounds shall be supported from the fixture stud.

F. Where not shown differently on the drawings, mount:

1. Switch boxes 46" from finished floor to center. Boxes beside doors shall be mounted so edge of trim plate is 2" from edge of door trim on strike side.

2. Telephone boxes 18" from finished floor to center and vertical. Boxes for wall phones shall be 46" from finished floor and vertical.

3. Bracket light boxes as indicated on plans or as directed by Engineer.

4. Clock outlet boxes 7'-0" from finished floor, or 6" below finished ceiling, to center.

5. Panel cans 6'-4" (±4" in concrete block construction) from finished floor to top of can.

6. Fire alarm pull stations 46" from finished floor to center.

7. Fire alarm chimes, horns, flashing lights, etc., 80" minimum to 96" maximum above finished floor to bottom, to comply with ADA requirements.

G. Where not shown differently on the drawings, mount boxes for receptacles to receive device in a vertical position and be:

1. Centered 18" above finished floor.
2. Centered 6" above counters, shelves, or cabinets where apparently intended to be so placed.

3. Centered 4" above high edge of backsplashes.

4. Where devices are to be ganged, provide boxes to receive devices trimmed with a gang plate.

H. As soon as installed, all raceway openings shall be closed with plastic inserts to prevent entrance of foreign matter during construction. All enclosures shall be kept clean of any foreign matter. Install Jordan "Kover-All" or equivalent plastic covers over outlet boxes ahead of plastering or painting.

I. Junction and pull boxes for branch circuits and signal or communication systems shall be identified by spray painting the interior, exterior, and covers of the box. In addition, the box cover shall be labeled using a permanent, black marking pen to identify circuits or systems in box. Color code for spray painting of boxes shall be as specified in Section 26 05 53, part 2.1.D as follows:

1. 480/277 power system Black
2. 120/208 power system blue
3. Fire Alarm system Red
4. Security system Dark Red (Burgundy)
5. Emergency system(s) Green
6. Telephone system Orange
7. Computer/Data Brown
8. Paging system White
9. TV system Purple

3.3 FASTENINGS AND SUPPORTS INSTALLATION

A. Inserts in masonry shall be lead, fiber, or plastic types installed in drilled holes. Wooden plugs shall not be used. Lead only shall be used on all exterior masonry or interior masonry subject to permanent moisture. Hung raceways shall be supported from the structure with rod supports at least 5/16" in diameter.

B. All equipment and flat raceways attached to outside wall or interior walls subject to permanent moisture shall be shimmed out with non-corrodible material so as to provide 1/4" air space between wall and equipment or raceway.

C. All materials, whether exposed or concealed, shall be firmly and adequately held in place. Fastening and support shall afford safety factor of three or higher.

D. All fixtures, raceways, and equipment shall be supported from the structure. Nothing may be supported on suspended ceilings, including the hanger wires, unless definitely noted so on the drawings or specifically permitted by the Engineer.

E. Where a recessed fluorescent, high intensity, or downlight fixture replaces a section or part of a ceiling tile, fixture is to be supported at two (2) diagonal (opposite) corners of the fixture (for fire rated ceiling support all four (4) corners or per the ceiling manufactures design criteria) to the steel frame of the building, and one wire for incandescent fixture under 15 lbs. Supports
shall be provided with the same type of wire as used to support the lay-in ceiling track. Attach one end of the wire to one corner of the fixture and the other end to the building’s structural system. The lay-in fixture shall then be screwed to the main runners of the lay-in ceiling track at all four (4) corners using sheet metal screws. Continuous row may use one wire (for 12" wide) or two wires (for 24" wide) each four feet plus row end supports. In addition, on T-grid systems, support clips shall be used to hold fixture firmly in grid.

F. Recessed ceiling speakers, where specified with an enclosure, shall have the enclosure supported directly from the structure with a minimum of two 10 gauge wires run perpendicular to the ceiling and not pulling to one side. If recessed ceiling speaker is specified without an enclosure and is mounted in a suspended ceiling, the speaker shall be supported using T-Bar bridges such as Soundolier No. 81-8, or other device specifically designed for such support. In addition, each of the four corners of the ceiling grid block enclosing the speaker shall be supported from the structure using 10 gauge steel wire run perpendicular to the ceiling plane.

G. Other devices using octagonal or 4" square ceiling boxes, such as smoke detectors, dome lights, exit signs, etc., where installed in suspended ceilings shall be supported from the ceiling system using Caddy, or other, hangers specifically designed for such support. In addition, each of the four corners of the grid block enclosing the box shall be supported from the structure using 10 gauge steel wires run perpendicular to the ceiling plane.

H. Explosive set fastenings using the low-velocity type tool may be used. Extreme caution shall be exercised in their use. The resulting fastening shall be completely secure.

END OF SECTION 260533
SECTION 260553 - EQUIPMENT IDENTIFICATION

PART 1 GENERAL

1.1 NAMEPLATES

A. Furnish and install engraved laminated phenolic nameplates for all safety switches, panelboards, transformers, switchboards, motor control centers and other electrical equipment supplied for the project for identification of equipment controlled or served, phase, voltage, etc.

B. Furnish and install thermal set, self laminating labels for all light switches, receptacles, equipment connections, etc. for identification of panel and circuit from which served.

PART 2 PRODUCTS

2.1 MATERIALS

A. Nameplate material colors shall be:
   1. Blue surface with white core for 120/208 or 120/240 volt equipment.
   2. Black surface with white core for 277/480 volt equipment.
   3. Bright red surface with white core for all equipment related to fire alarm system.
   4. Dark Red (Burgundy) surface with white core for all equipment related to security.
   5. Green surface with white core for all equipment related to “emergency” systems.
   6. Orange surface with white core for all equipment related to telephone systems.
   7. Brown surface with white core for all equipment related to data systems.
   8. Purple surface with white core for all equipment related to television systems.

B. All empty conduit runs and conduit with conductors for future use shall be identified for use and shall indicate where they terminate. Identification shall be by phenolic tags with wire attached to conduit or outlet.

C. All outlet boxes, junction boxes and pull boxes shall have their covers and exterior visible surfaces painted with colors to match surface color scheme outlined above. This includes covers on boxes above all type ceilings.

PART 3 EXECUTION

3.1 INSTALLATION

A. Nameplates shall be securely attached to equipment with self-tapping stainless steel screws, and shall identify equipment controlled, attached, etc. Letters shall be 1/2 inch high minimum. Embossed, self-adhesive plastic tape is NOT acceptable for marking equipment.

END OF SECTION 260553
SECTION 260923.10 - OCCUPANCY SENSORS

PART 1  GENERAL REQUIREMENTS

1.1  SCOPE

A. Contractor's work to include all labor, materials, tools, appliances, control hardware, sensor, wire, junction boxes and equipment necessary for and incidental to the delivery, installation and furnishing of a completely operational occupancy sensor lighting control system, as described herein.

B. Contractor shall examine all general specification provisions and drawings for related electrical work required as work under Division 26.

C. Contractor must submit data sheets on sensors, control units and all junction boxes and mounting accessories, including all wiring diagrams.

1.2  EQUIPMENT QUALIFICATION

A. All components shall meet North Carolina State Building Code, North Carolina Energy Code, shall be U.L. listed and offer a five (5) year warranty.

1.3  OBJECTIVE DESCRIPTION

A. The objective of this section is to ensure the proper installation of the occupancy sensor based lighting control system so that lighting is on upon personal entry into area, and turned off automatically after reasonable time delay when a room or area is vacated by the last person to occupy said room or area.

B. The occupancy sensor based lighting control shall accommodate all conditions of space utilization and all irregular work hours and habits.

C. Contractor shall warrant all equipment furnished in accordance to this specification to be undamaged, free of defects in materials and workmanship, and in conformance with the specifications. The Contractor's obligation shall include repair or replacement, and testing without charge to the Owner, all or any parts of equipment which are found to be damaged, defective or non-conforming and returned to the supplier. Warranty on sensors and controls units will be for a period of five (5) years. The warranty shall commence upon the owner's acceptance of the project. Warranty on labor shall be for a minimum period of one (1) year.

D. The Contractor shall provide, at the owner's facility, the training necessary to familiarize the Owner's personnel with the operation, use, adjustment, and problem solving diagnosis of the occupancy sensing devices and systems.

PART 2  PRODUCTS

2.1  SPECIFIC REQUIREMENTS

A. OCCUPANCY SENSORS
1. Wall switch sensors shall be capable of detection of motion at desk top level up to 300 square feet.

2. Wall switch sensors shall accommodate loads from 0 to 800 watts at 120 volts; 0 to 1000 watts at 277 volts.

3. Bi-level wall switch sensors shall accommodate up to two loads from 50 to 800 watts at 120 volts; 50 to 1000 watts at 277 volts, for each load.

4. Wall switch sensors shall have a 180° coverage capability.

5. Passive Infrared sensors shall have a multiple segmented Lodif Fresnel lens with grooves-in to eliminate dust and residue build-up.

6. Passive Infrared and Dual Technology sensors shall have fully automatic operation, offer daylighting foot-candle adjustment control and be able to accommodate dual level lighting.

7. Ceiling mount sensors shall provide a minor motion coverage range of 150 to 1300 square feet with an overall 1/2 step coverage range from 300 to 2000 square feet.

8. Occupancy sensors shall provide coverage of 90 to 100% of the controlled area.

9. All sensors shall be capable of operating normally with electronic ballasts and PL lamp systems.

10. Coverage of sensors shall remain constant after sensitivity control has been set. No automatic reduction shall occur in coverage due to the cycling of air conditioner or heating fans.

11. All sensors shall have readily accessible, user adjustable controls for time delay and sensitivity. Controls shall be recessed to limit tampering.

12. In the event of failure, a bypass manual "override on" feature shall be provided on each sensor. When bypass is utilized, lighting shall remain on constantly or control shall divert to a wall switch until sensor is replaced. The override feature shall be designed for use by building maintenance personnel and shall not be readily achieved by building occupants.

13. Ultrasonic operating frequency shall be crystal controlled to within plus or minus 0.005% tolerance to assure reliable performance.

14. Ultrasonic microphone receiver frequency shall be 25 KHz or greater and shall be temperature and humidity resistant.

15. All sensors shall provide an LED indication light to verify that motion is being detected and that the unit is working. All sensors shall be equal to Watt Stopper model numbers:


c) Power Packs: A-120E, A-277E, AT-120, AT-277, BZ-100, S-120/277/347E

d) Dual Circuit Ceiling Sensors: Provide Sensorswitch Model CMR-PDT-9-2P

Or as noted on plans.

16. All ultrasonic sensors shall comply with the North Carolina State Building. Decibel levels for ultrasonic sensors shall comply with the following California Energy Commission criteria:

<table>
<thead>
<tr>
<th>Frequency Band (KHz) in dB reference 20 micropascals</th>
<th>Maximum dB level within Third Octave Band</th>
</tr>
</thead>
<tbody>
<tr>
<td>Less than 20</td>
<td>80</td>
</tr>
<tr>
<td>or more to less than 25</td>
<td>105</td>
</tr>
<tr>
<td>or more to less than 31.5</td>
<td>110</td>
</tr>
<tr>
<td>or more</td>
<td>115</td>
</tr>
</tbody>
</table>

17. The Contractor shall certify in writing that installed sensors comply with the specified criteria for ultrasonic sound.

18. All sensors shall have no leakage current in OFF mode and shall have voltage drop protection.

19. All sensors shall have UL rated, 94V-0 plastic enclosures.

20. All sensors shall be code approved and certified.

21. Sensors shall be suitable for N.E.C. 725 Class 2 wiring and use plenum cable when required.

2.2 CIRCUIT CONTROL HARDWARE - CU

A. Control Units - For ease of mounting, installation and future service, control unit(s) shall be able to mount on external J boxes and be integrated self-contained unit consisting internally of load switching control relay and a transformer to provide low-voltage power to a minimum of two (2) sensors. Control units and/or auxiliary power packs shall be provided to accommodate sensors required for the area of service.

B. Relay Contacts shall have ratings of:

1. 10A - 120 VAC Tungsten
2. 20A - 120 VAC Ballast
3. 20A - 277 VAC Ballast

C. Relay contacts shall be isolated.

D. Control units shall be UL listed.
E. Between sensors and controls units shall be three (3) conductors, 18 AWG, stranded UL Classified, PVC insulated or TEFLON jacketed cable approved for use in plenums.

PART 3 EXECUTION

3.1 It shall be the Contractor's responsibility with the supplier's assistance to locate and aim sensory in the correct location required for complete and proper volumetric coverage within the range of coverage(s) of controlled areas. Rooms shall have ninety (90) to one hundred (100) percent coverage to completely cover the controlled area to accommodate all occupancy habits of single or multiple occupants at any location within the room(s). The locations and quantities of sensors shown on the drawings are diagrammatic and indicate only rooms which are to be provided with sensors. The contractor shall provide additional sensors if required to properly and completely cover the respective room. Proper judgment must be exercised in executing the work so as to ensure the best possible installation in the available space and to overcome local difficulties due to space limitations or interference of structural components.

END OF SECTION 260923.10
SECTION 262417 - METERS, PANELBOARDS, AND LOADCENTERS

PART 1  GENERAL

1.1  REQUIREMENTS

A.  Equipment shall be built to NEMA Standards where such standards exist.

PART 2  PRODUCTS

2.1  MATERIALS

A.  Eaton Cutler-Hammer panelboards and loadcenters are specified. Equivalents by Square D, or General Electric Co. may also be quoted.

B.  Types, sizes, capacities and characteristics shall be as shown on riser diagram or in schedules. All panelboards shall be fully rated. UL listed “series rated” equipment is acceptable where indicated on the drawings or where short circuit rating cannot be met by the equipment specified. Service equipment shall be labeled "UL Approved for Service Entrance Use".

C.  Distribution and branch circuit panelboards indicated on plans, shall utilize bolt-on type breakers, equivalent in electrical characteristics to Cutler-Hammer "PRL" types or approved equal.

D.  Residential Loadcenters shall be minimum 40 pole, NEMA 1, 120/240V rated, single phase, 3 wire, have plug-in breakers of the size indicated on the drawings, have a minimum 10kAIC rating and have silver-plated copper bus. Provide arc-fault type breakers where indicated on drawings. Cutler-Hammer Type CH Loadcenters and circuit breakers are specified.

2.2  METER CENTERS

A.  All meter equipment and installations shall comply with Duke/Progress Energy Utility requirements.

B.  All services shall be grounded and bonded in accordance with specification section 260526 NEC 250, and as specified on drawings.

2.3  CONSTRUCTION FEATURES

A.  All panels and breakers shall be fully rated whenever possible, series combination ratings are acceptable where noted on drawings.

B.  Housing shall be constructed of Code gauge galvanized sheet steel and shall be securely fabricated with screws, bolts, rivets or by welding. Housings for branch circuit loadcenters shall be approximately 37” tall, 15” wide and 4” deep. Housings for distribution loadcenters shall be no larger than the loadcenter specified or as shown on the plans. Space is at a premium and oversized loadcenters, in most cases, will not allow for proper Code clearances.

C.  Top or bottom gutter space shall be increased six inches where feeder loops through panel. End plates shall be galvanized Code gauge (minimum) and shall be supplied without knockouts.
D. Covers shall be constructed of high grade flat sheet steel of Code gauge minimum with the following:

1. Door flush with face and closed against a full inside trim stop. Hinges shall be inside type.

2. The manufacturer’s standard metal lock with keyed tumbler lock and spring loaded latching mechanism. All such locks on same job shall be keyed alike. Plastic locks and trims are not acceptable.

3. Finish of manufacturer's standard color of top-grade enamel over a phosphatized or other approved rust inhibitor treatment and prime coat, or as specified in Section 16010.

4. Four or more cover fasteners of a type which will permit mounting plumb on box. Cover shall also have inside support studs to rest on lower edge of can while being fastened.

5. Loadcenters shall be furnished with covers hinged to backbox. Hinge shall be continuous “piano” hinge type permanently spot welded to the loadcenter cover. Hinge in turn shall securely bolt to the backbox.

E. A means of readily adjusting projection of panel interior assembly with all connections in place shall be provided. A method requiring stacking of washers is not acceptable.

F. Interior trim shall fit neatly between interior assembly and cover - leaving no gaps between the two.

G. Loadcenter and breaker interrupting ratings shall be as shown on the drawings and shall be of the frame size and interrupting capacities shown. Breaker frame sizes indicated are to establish a level of construction and features required, even though breaker frame size shown may exceed required interrupting capacities or amperage for the available fault current of the system.

H. Breakers in lighting, branch circuit and power loadcenters shall be physically arranged in locations shown in panel schedules and shall be connected to the phases shown. Any deviation shall be approved by the engineer in advance.

I. Supply lugs shall be installed on busses and neutral bar so they may be readily and securely tightened from the front with panel in place and wired. A suitable arrangement shall limit their movement out of plumb. It shall not be possible to move the lugs so that metal parts between phases are closer than 3/8".

J. All wiring lugs in loadcenters and all breakers shall be rated for use with 75 degree conductors sized in accordance with NEC Table 310-16.

K. All branch circuit panels shall be equipped with copper ground busses.

L. Loadcenters shall be equipped with directory cards mounted behind heavy clear plastic shields in substantial frames attached to inside face of doors. Cards shall be a minimum of three inches wide.

PART 3   EXECUTION

3.1 INSTALLATION
A. Flush-mounted panel housings shall be flush with finished wall.

B. Mount equipment plumb and level.

C. Openings in boxes, cabinets, or gutters shall be cut or sawed. Burning of openings is prohibited.

D. Each lighting or branch circuit panelboard mounted flush in a wall shall have a minimum of five empty 3/4" conduits stubbed out into the ceiling space above panel for future use unless all circuits in a panel are assigned. Seal ends of conduit with caps or with U.L. approved fire stopping material.

E. Only one solid wire is allowable under a screw. Use lug for connecting stranded wire or more than one solid conductor.

F. Loadcenter directory card shall be neatly typed with circuits assigned as shown on schedules. Space typing on card so all is visible when inserted into frame. Use room names and numbers as provided by Owner, not those shown on schedule. Names and numbers on schedule relate to plans only for construction. Indicate spare breakers in pencil (not typed) so that owner can erase and change as necessary in the future.

G. Next to each breaker within main or distribution panelboards, attach a rigid plastic label indicating what it feeds. Wording shall be as shown on its diagram or schedule. Labeling shall also be attached to separately-mounted breakers, switches, transformers, wiring gutters and controllers of all types.

H. Centered above door on panel cover attach a label indicating panel designation - for example, "PANEL A"; voltage - "120/208 VOLTS"; and from where served - "FED FROM PANEL MDP".

I. All labels shall be machine-engraved on rigid plastic plate of the laminated type with 1/4" lettering. They shall be attached with self tapping stainless steel screws.

3.2 SUBMITTALS

A. Submittal shall include complete information which addresses all features specified here-in and indicated on the drawings. Full or series rated interrupting capacities of all breakers, device characteristics, bus ratings, dimensions, etc. shall be clearly shown. Submittal shall include elevations complete with all dimensions, and proposed breaker layout. Incomplete submittals will be rejected.

END OF SECTION 262417
PART 1   GENERAL

1.1 WIRING METHOD FOR BRANCH CIRCUITS

A. Outlets in the same general area are circuited together. Circuit numbers are shown as noted in symbol schedule.

B. In "3 wire" and "4 wire" branch circuits a neutral shall not serve more than one circuit tied to the same phase. The neutral carrying all or any part of the current of any specific load or run shall be contained in the same raceway or enclosure with the phase wire or wires also carrying that current. No split neutrals permitted.

C. Circuits shall be connected to panels as shown in the panel schedule. Any deviation shall be approved in advance by the engineer.

D. Under the above requirements and with required color coding system no feeder or branch circuit raceway will contain more than one wire of the same color, except for switch legs and control circuits.

E. Conductors feeding lighting outlets may be combined in the same raceway with conductors feeding convenience receptacles; but lighting outlets and convenience receptacles shall not be put on the same circuit unless specifically indicated.

PART 2   PRODUCTS

2.1 WIRING DEVICES

A. Switches considered equivalent are as follows:

1. Single Pole:  
   - Hubbell 1221
   - Bryant 4901
   - P & S 20AC1
   - Leviton 1221
   - Eagle 2221

2. Three Way:  
   - Hubbell 1223
   - Bryant 4903
   - P & S 20AC3
   - Leviton 1223
   - Eagle 2223

3. Four Way:  
   - Hubbell 1224
   - Bryant 4904
   - P & S 20AC4
   - Leviton 1224
   - Eagle 2224
B. Duplex receptacles considered equivalent are as follows:

1. Specification Grade:
   - Hubbell 5252
   - Arrow Hart 5252
   - Bryant 5252
   - P & S 5262
   - Leviton 5252
   - Eagle 5252

2. Tamper-Resistant: (Specification Grade)
   - Hubbell BRS_20TR
   - Bryant CBRS__TR
   - Leviton TBR---S
   - P & S  TR__W
   - or equivalent (must be compatible with 2-wire plugs)

3. Ground Fault Interrupt: (Specification Grade)
   - Hubbell GF5262
   - Arrow Hart GF5242
   - Bryant GFR52FT
   - P & S 1591-HG
   - Leviton 6398-HG

   - Hubbell GFR5362__TR
   - Arrow Hart TWRVGF20__
   - Bryant GFTR20__
   - P&S 2095TRWR__
   - Leviton  W7899TR__

5. Transient Voltage Surge Suppressor (TVSS)
   - Hubbell 5350S
   - Bryant SP53-TIGBLU
   - P&S IG6362-BLSP
   - EAGLE IG1210V

6. Isolated Ground: (Orange) (Specification Grade)
   - Hubbell IG 5362
   - Bryant 5362-IG
   - P & S  IG 6300
   - Leviton 5362-IG

Manufactures standard numbers listed, contractor to provide variations (Voltage, current, etc) as note in project requirements.

C. All devices shall have side wired terminals with brass screws and hex head grounding screw.

D. All devices shall be color from manufactures standard selection, as directed by architect. or for areas of renovation match existing adjacent devices. Samples will be required prior to acceptance of any proposed equivalents not specifically mentioned above. All like devices shall be by the same manufacturer (i.e.; all switches, all duplex receptacles, etc.).

E. Unless noted or specified otherwise, device trim plates shall be type 302 stainless steel to suit device. All plates in the job shall be same make and match throughout. No jumbo plates allowed except on case by case approval of engineer.
2.2 FLOOR BOXES

A. Floor boxes shall be cast iron type with leveling screws and a minimum of (4) 3/4” threaded conduit entries. Floor boxes shall be equivalent to Wiremold “Walkerbox” #880CS series, unless noted differently on plan symbol schedule, one, two or three gang as indicated on drawings. Floor boxes shall be complete with brass carpet flanges and brass cover plates. Floor boxes shall be mounted flush and level in floor. Coordinate exact location and placement with furniture plans prior to rough-in or relocate at no additional cost to owner.

PART 3 EXECUTION

3.1 INSTALLATION

A. Devices shall be mounted vertically, unless noted otherwise, tightly to boxes, adjusted plumb and level. Devices shall be mounted, with ground in the up position, when mounted vertically, and neutral (common) in the up position when mounted horizontal.

B. Two or more devices ganged shall be trimmed with gang plate.

END OF SECTION 262726
SECTION 262913 - MOTORS, CONTROLLERS, AND EQUIPMENT CONNECTIONS

PART 1  GENERAL

1.1  REQUIREMENTS

A. Motors, controllers, and other special equipment are provided and installed by other trades. This section specifies typical connections to that equipment.

PART 2  PRODUCTS

2.1  GENERAL

A. All power wiring shall be by the Electrical Contractor. Control wiring shall be by the Mechanical Contractor or Plumbing Contractor.

B. Starters and loose disconnect switches shall be furnished by the Contractor furnishing the equipment. All starters and loose disconnect switches shall be installed and wired by the Electrical Contractor. Although furnished by Mechanical or Plumbing Contractors, starters and loose disconnect switches for each piece of equipment are specified in the electrical symbol schedule. Many controllers require overcurrent protection for feeder taps, and these will be specified by special notes on the drawings. All miscellaneous devices specified on the drawings by note shall be furnished and installed by the Electrical Contractor.

C. Equipment shall be furnished with factory installed integral disconnect switches where specified. Electrical Contractor shall wire to line terminals of all integral disconnect switches.

D. Changes or substitution in equipment resulting in changes in electrical system requirements shall be the responsibility of the contractor furnishing the equipment. Contractor shall bear any additional cost incurred.

2.2  EXHAUST FANS

A. Exhaust fans are indicated by special symbol on plans. Unless otherwise noted, they will be furnished and set by others but connected by the Electrical Contractor. Exhaust fan starters shall be furnished by the Heating, Ventilating, and Air Conditioning Contractor, and installed and wired by the Electrical Contractor. All fans shall be provided with a controller. Exhaust fans are generally to be furnished with integral factory installed disconnect switch, however Electrical contractor shall provide a local disconnect switch if unit is not provided with one. A switch located at the motor shall be installed as disconnect means at each fan.

2.3  UNIT HEATERS

A. Unit heater, ventilator, cooler, or similar outlets - designated by special symbol - are located approximately on drawings. Exact location of outlet shall be obtained from Heating, Ventilating, and Air Conditioning Contractor. Unless indicated otherwise, outlet shall be a 4" box fitted with an oversized blank cover with 1/2" center knockout, mounted in wall or ceiling, and fed on circuit shown beside symbol. These outlets shall be located behind or within equipment cabinets where possible and still be accessible. Provide local disconnect switch if one is not provided with unit. Unless specified otherwise herein or on drawings, power connection from outlet to equipment will be by Electrical Contractor. Control wiring will be done by the Mechanical Contractor.
2.4 TROUGHS

A. Electrical troughs, junction boxes, switches, or breakers for air conditioning, heating, or plumbing equipment are indicated on drawings. Exact locations shall be obtained from Mechanical and Plumbing Contractors but Code clearances shall be maintained. Electrical Contractor shall install power distribution blocks in all troughs. Single, double and three pole distribution blocks, sized for maximum wire input plus five (5) openings minimum capacity. Chase Shawmut catalog number 66000 or 67000 series installed per manufactures instructions. Unless specifically noted otherwise, all power wiring for equipment and controllers beyond these points will be by the Equipment Contractor. Control wiring will be by Mechanical or Plumbing Contractors.

2.5 OTHER

A. Other equipment connections are generally indicated on drawings by a circled black triangle with a letter suffix. These are then defined in the Symbol Schedule. Where catalog numbers, models, or types, and manufacturer’s name are given, these items of equipment shall be furnished and installed by the Electrical Contractor, unless specifically noted otherwise.

B. Junction box – designated as a circled J. Size of such boxes is generally noted on drawings. Where this is not done, they shall be sized in accord with NEC and purpose evidently intended.

C. Where unscheduled junction boxes are used by Contractor to facilitate wiring or to comply with limits of elbows and bends, they shall be concealed if at all possible to do so and still be left accessible. If this is impossible, they shall be recessed in walls or ceilings and provided with an oversized cover which shall be painted out to match adjacent surfaces. If it is necessary to mount such boxes exposed, the location shall be approved by the Engineer.

D. All motor starters and combination type starters specified under this contract shall be equipped with Hand-Off-Automatic switches, red run pilot (run indicating) light, 120 volt control transformer, and two sets of auxiliary contacts. The switch and light shall be located on the unit cover. Combination starters with overcurrent protection shall be thermal magnetic breaker type. Combination starters with integral disconnect switch shall be non-fusible switch type. Starters shall be as manufactured by Square D, Cutler-Hammer, or General Electric Co.

E. All safety switches shall be “heavy-duty” type, NEMA 1 for indoor and NEMA 3 for outdoor use unless specifically stated otherwise. General duty switches are not acceptable. Safety switches shall be third party listed. Switches shall have defeatable door interlocks that prevent the door from opening when the operating handle is in the “on” position. Switches shall have handles whose positions are easily recognizable in the “on” and “off” position. For safety reasons, padlock shall be provided for switches located in public areas. Switches shall have non-disable, positive, make-quick break mechanisms. Switches shall be properly labeled. See section 26 05 53, Electrical Identification. They shall be fused type unless specifically indicated otherwise on plans. Fused type shall be equipped with Bussmann Fusetron type fuses, or approved equivalent. Switches shall be by Square D, Cutler-Hammer, or General Electric Co.

F. Control wiring shall not be installed in the same raceways as power wiring.

PART 3 EXECUTION

3.1 THIS SECTION NOT USED

END OF SECTION 262913
SECTION 264313 - SURGE PROTECTIVE DEVICES (SPD)

PART 1 GENERAL

1.1 REQUIREMENTS

A. This specification describes the requirements for a modular, high-energy surge protective device system (abbreviated SPD). Equipment shall be built to NEMA Standards where such standards exist, and shall provide high-energy surge current diversion, suitable for ANSI/IEEE C62.41 Types 1 and 2 environments, as tested by ANSI/IEEE C62.11, C62.45. Reference Section 26 27 26 for Type 3 devices.

B. Systems shall be designed, manufactured, tested, and installed per the following codes and standards.

- Canadian Standards Association (CSA)
- American National Standards Institute and Institute of Electrical and Electronic Engineers (ANSI/IEEE C62.41, C62.45, C62.62, C62.72)
- National Electrical Manufacturer Association (NEMA)
- National Fire Protection Association (NFPA 20, 70, 75, and 78)
- National Electrical Code (International Series Art 100, 285, 708)
- International Electrotechnical Commission (IEC 801)
- International Standards Organization (ISO 9001 or higher)

The systems shall be UL Listed and labeled under UL 1449, Standard for Surge Protective Devices (SPD) and the surge ratings shall be permanently affixed to the SPD. The units shall also be listed and labeled to UL 1283 Standard for Electromagnetic Interference Filters, and CSA listed.

C. The SPD shall utilize “fail safe” technology. All components in the suppression path (including all current diversion components) maximum continuous operating voltage (MCOV) shall be greater than 115% to 125% of the nominal system operating voltage. UL 1449 performance data listed let-through voltage for a nominal 480/277V system Type 1 location (line side of the service equipment disconnect) shall be 2000 volts L-L; for a Type 2 location (load side of the service equipment disconnect) shall be 2000V L-L. UL 1449 performance data listed let-through voltage for a nominal 120/208V system Type 1 shall be 1200V L-L; for a Type 2 location shall be 1000V L-L. All SPDs shall include an integral fused disconnect (1000A or more) or a surge rated disconnecting device (1000A or less) installed for servicing the protective device. The surge current rating of the system, tested per ANSI/IEEE C62.41 and ANSI/IEEE C62.45, shall be 240 kA per phase/120kA per mode minimum for all Type 1 locations, 160 kA per phase/80kA per mode) minimum for Type 2 locations, and 120kA per phase/60kA per mode) minimum for all Type 3 locations. The operating frequency of the system shall be 47 – 63 HZ, with sine wave tracking for surge or transient attenuation at any point on the sine wave. Total system response time shall be 5 nanoseconds or less.

D. The SPD shall utilize “fail safe” technology. All components in the suppression path (including all current diversion components) maximum continuous operating voltage (MCOV) shall be greater than 115% to 125% of the nominal system operating voltage. UL 1449 performance data listed let-through voltage for a nominal 480/277V system Type 1 location (line side of the service equipment disconnect) shall be 2000 volts L-L; for a Type 2 location (load side of the service equipment disconnect) shall be 2000V L-L. UL 1449 performance data listed let-through voltage for a nominal 120/208V system Type 1 shall be 1200V L-L; for a Type 2 location shall be 1000V L-L. All SPDs shall include an integral fused disconnect (1000A or more) or a surge
rated disconnecting device (1000A or less) installed for servicing the protective device. The surge current rating of the system, tested per ANSI/IEEE C62.41 and ANSI/IEEE C62.45, shall be 240 kA per phase/120kA per mode minimum for all Type 1 locations, 160 kA per phase/80kA per mode) minimum for Type 2 locations, and 120kA per phase/60kA per mode) minimum for all Type 3 locations. The operating frequency of the system shall be 47 – 63 HZ, with sine wave tracking for surge or transient attenuation at any point on the sine wave. Total system response time shall be 5 nanoseconds or less.

E. The SPD system shall be duty life cycle tested to exceed minimum 10kA, 20kV testing, per IEEE C62.41 and IEEE C62.45 at the appropriate level (1 or 2) with less then 10% degradation of clamping voltage. The system shall be rated for a minimum of 2500 occurrences, with supporting third party test documentation.

F. The SPD unit shall be AIC rated equal to or exceeding available short circuit current for location of installation, and shall be marked with this short circuit capacity and not be installed at a point where available fault current is in excess of that rating (per NEC Art 285).

G. The manufacture shall be ISO 9001 certified (or higher as issued), and shall have engaged in the design and manufacture of such products for a minimum of 10 years.

H. The unit shall be UL 1283 listed as an electromagnetic interference filter, and meet MIL Std. 220A (50 ohm insertion test) requirements. System filters shall be individual per mode, and per phase, WYE-configured systems shall have a separate neutral to ground filter. Filters shall be an integral component of the protection module, and replaced with any module exchange.

I. Acceptable manufacturers shall be LIEBERT, CLIPPER POWER SYSTEMS, SCHNEIDER ELECTRIC (SQUARE “D”), Current Technologies, and THOR SYSTEMS INC.. Manufacturer shall warrant for full five (5) years, all parts and labor. Surge Protective Devices provided by the panelboard manufacturer, integral to the panelboard; meeting all other requirements of this section shall be acceptable.

PART 2 - PRODUCTS

2.1 MATERIALS

A. The system shall be constructed using multiple surge current diversion modules, matched and tested for manufacturing defects. The modules shall be designed and constructed in a manner that ensures surge current sharing; unit shall employ no series-connected suppression components. Primary suppression shall employ metal oxide varistor suppression modules or silicon avalanched diode suppression modules. Secondary suppression shall employ metal oxide varistor suppression modules.

B. The surge current diversion modules shall be field serviceable by owner’s qualified electrician (without adversely affecting warranty), or by factory authorized service technician as part of warranty service. Systems requiring in factory service will not be acceptable. If the modules’ cannot be replaced under load, a disconnecting means shall be provided per manufactures recommendations. All clamping voltage ratings listed above shall include this disconnecting device.

C. Where installed in a data center, shunt trip circuit breaker protection shall be provided as required by NEC.
D. The SPD shall provide protection as follows: All modes, L-L, L-N, L-G, and N-G, all phases. System (not component) response time shall be 5 nanoseconds of less. Phase and N-G unit status indicators shall be externally visible, with out opening the enclosure.

Note: L = Line, G=Ground, N=Neutral.

E. The SPD shall have continuous system power indication on the front cover. The SPD monitoring circuitry shall continually verify the protection status during operation and display system integrity information on the front cover. The system shall be equipped with an audible alarm that is activated during a fault condition, and alarm silence switch mounted in the cover. A visible LED will confirm whether alarm is on or disabled. This monitoring system shall be isolated to prevent damage during transients. The SPD must contain a built in test circuit which will cycle all phase banks, and neutral-ground bank with signals to all modules, provide push to test switch mounted on the cover.

F. The SPD shall include electrically isolated Form C dry contacts, one normally open and one normally closed, for remote monitoring.

G. The SPD shall be equipped with under voltage detection (70%), phase loss monitoring, power loss monitoring.

2.2 CONSTRUCTION FEATURES

A. Housing shall be constructed of Code gauge galvanized sheet steel and shall be securely fabricated with screws, bolts, and rivets or by welding. Where installed outdoors or in adverse environments they shall be of weather tight or sealed construction suitable for the environment, per NEMA standards.

1. Finish of manufacturer's standard color of top-grade enamel over a phosphatized or other approved rust inhibitor treatment and prime coat, or as specified in Section 26 05 00.

B. Supply lugs shall be installed on busses and neutral bar so they may be readily and securely tightened from the front with panel in place and wired. A suitable arrangement shall limit their movement out of plumb. It shall not be possible to move the lugs so that metal parts between phases are closer than 3/8".

C. All wiring lugs shall be rated for use with 75 degree conductors sized in accordance with NEC Table 310-16.

PART 3 EXECUTION

3.1 INSTALLATION

A. SPD will be installed in parallel configuration, per manufactures instructions, utilizing short/minimal lead lengths, straight conductors as practically possible. The contractor shall twist the input conductors to reduce conductor inductance, or SPD may be installed integral to circuit distribution panel where noted on plans schedules or as approved by engineer.

B. The contractor shall follow the manufacturer’s recommended installation practices and comply with all applicable codes.

C. SPD primary protection path must be directly, to low resistance ground point, per NEC 250, 280, 285, and/or manufactures installation instructions, which ever is most strenuous. The metal service cabinet shall not be recognized or attempt to function as a low resistance ground.
D. Flush-mounted panel housings shall be flush with finished wall, and furnished with appropriate flush mounting trim

E. Mount equipment plumb and level.

F. Openings in boxes, cabinets, or gutters shall be cut or sawed. Burning of openings is prohibited.

G. Label all equipment: Centered above door on panel cover attach a label indicating voltage - "XXX/XXX VOLTS"; and from where served - "FED FROM PANEL MDP".

H. All labels shall be machine-engraved on rigid plastic plate of the laminated type as described in specification Section 26 05 53.

END OF SECTION 264313
SECTION 265100 - INTERIOR LUMINAIRES

PART 1 GENERAL

1.1 REQUIREMENTS

A. Types and manufacturers are scheduled on the drawings. Equivalent fixtures by others may be submitted only as indicated on the plans and are subject to the conditions in Section 26 01 00.

B. Fixtures shall also meet the requirements of the Lighting Fixture Notes for the Lighting Fixture Schedule shown on the drawings.

C. All fixtures shall be U.L. listed and labeled.

D. Provide new exit and egress fixtures in the existing buildings as indicated on the drawings.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Fluorescent lamps shall be Osram/Sylvania, Phillips, or G.E. All fixtures shall be equipped with lamps.

B. Catalog numbers are for general identification of fixtures only. All related parts, such as plaster rings, junction boxes, louvers, shields, mounting stems, canopies, connectors, straps, nipples, etc., to fit them properly to the construction, shall be furnished and installed.

C. Unless noted otherwise, all fluorescent fixtures shall be provided with high power factor, U.L. Listed, Class "P" ballasts and meets or exceeds ANSI C82.11 requirements. HID fixtures shall be provided with constant wattage high power factor ballasts. Ballast shall be provided for proper voltage based on circuit assignment indicated on plans.

D. Lamps shall be as specified or equivalent. Lamps shall be of the operating characteristics and lumen output specified.

E. Fluorescent ballasts shall be as specified here-in, and as shown in the Lighting Fixture Schedule. Ballasts shall operate two, three or four lamps; single lamp ballasts are not allowed unless specifically scheduled. Internal disconnecting means shall be provided for ballast to be serviced in place per NEC 410.130(G).

F. Pentron type lamps are specified for fluorescent fixtures. Lamps shall be high output, high performance T-5 or T-5HO, rapid start, mini-bipin, 3500K, unless indicated otherwise on plans. Lamps shall be Osram/Sylvania or equivalent.

G. Ballasts for T-5 lamps shall be high-frequency electronic; shall be either rapid start or instant start; shall comply with FCC Rules and Regulations Part 18 and NEMA limits governing electromagnetic and radio frequency interference and shall not interfere with normal operation of other electrical equipment; shall meet all applicable ANSI and IEEE standards. Ballast design shall withstand line transients per IEEE 587, Category A. Ballast case temperature shall not exceed 25 degrees centigrade rise over 40 degrees centigrade ambient. Ballasts shall have a total harmonic distortion (THD) of less than 20%; and input current third harmonics shall not exceed ANSI recommendations with 27.5% of the third triplets. Flicker shall be 15% or less with any lamp suitable for the ballast. Electronic ballasts shall be equipped with surge protection; shall not be affected by lamp failure and shall yield normal lamp life; shall have...
power factor above 90%; lamp current crest factor shall not exceed 1.7; and shall allow remaining lamp(s) to maintain full output if companion lamp(s) fail. Light regulation shall be +/-10% input voltage variation. Ballasts shall have ballast factor, minimum of 1.0 for T-5. Osram/Sylvania, Motorola, Magnetek, EBT, or Advance.

H. A minimum of five (5) years full warranty is required with each electronic ballast.

I. Electronic ballasts UL listed, Class P, with an “A” sound rating. Ballast enclosure size shall be the same as or smaller than magnetic ballast

J. Ballasts containing PCB’s shall not be used.

K. PL fluorescent fixtures shall be furnished with electronic ballasts similar to the above T8 specifications. Furnish matching 4 pin lamps approved by the ballast manufacturer for use with the furnished ballasts.

L. A lighting fixture shall be provided for every lighting outlet indicated. Any omission shall be brought to the attention of the Engineer before submitting proposal; otherwise a unit selected by the Engineer shall be furnished and installed at no additional charge.

M. All fixtures shall be grounded per N.E.C.

N. Fixtures connected with flex to the rigid raceway portion of the wiring system shall carry a green bonding jumper within the flex. The jumper shall be fastened to both the fixture and the raceway system with a Steel City “G” clip or approved equivalent. Phase and ground conductors run in a flex shall be #12 minimum. Flex runs shall be no greater than six feet in length.

O. Surface-mounted fluorescent fixtures being installed on combustible material shall be mounted at least 1-1/2" from the surface of the material; except units which are plainly marked on fixtures as U.L. approved for mounting directly to such surfaces.

P. Outdoor lighting controls shall be provided from Tork, Intermatic, Square D, or equal. Controls include lighting contactors, photocells, timers, and clocks and shall be located in an accessible location as shown on the plans.

Q. Mount all fixtures plumb and square. Keep rows in perfect line.

R. Recessed fixtures shall be supported with 10 gauge steel wire adjusted as necessary to level fixture, minimum of two wires for 18" or less wide by 48" fluorescent, two wires located at opposite end diagonal corner for 24" x 48" and one wire for incandescent fixture under 15 lbs. Continuous row may use one wire (for 12" wide) or two wires (for 24" wide) each four feet plus row end supports. Lay-in fixtures shall be screwed to the main runners of the lay-in ceiling track at all 4 corners of the fixture utilizing sheet metal screws.

S. Lighting Inverters for remote emergency egress and exit lighting (not H.I.D.) shall be provided where indicated on drawings and per specifications. The inverter system shall provide a minimum of 85 Watts full output for 1 ½ hrs of light to an end battery voltage of 87-1/2% of nominal voltage. Dual 120 or 277VAC input, long life lead calcium battery, operates switched and un-switched loads, automatic transfer switching circuit. Push-to-test switch. Surface, recessed, or T-bar mounting. A Guth inverter, model GPCF, or an approved substitute with similar performance characteristics will be considered.
2.2 LED LIGHT FIXTURES

A. General:

1. LED light fixtures shall be in accordance with IES, NFPA, ANSI C78.377, UL, EnergyStar, is listed on the DLC (DesignLights Consortium) Qualified Products List; and as shown on the drawings, and as specified.

2. LED light fixtures shall be Reduction of Hazardous Substances (RoHS)-compliant.

3. LED drivers shall include the following features unless otherwise indicated:
   a. Minimum efficiency: 85% at full load.
   b. Minimum Operating Ambient Temperature: -20°C (-4°F.)
   c. Input Voltage: 120 - 277V (±10%) at 60 Hz.
   d. Integral short circuit, open circuit, and overload protection.
   e. Power Factor: ≥ 0.95.
   f. Total Harmonic Distortion: ≤ 20%.

4. LED modules shall include the following features unless otherwise indicated:
   a. Comply with IES LM-79 and LM-80 requirements.
   b. Minimum CRI 80 and color temperature 4000° K unless otherwise specified in LIGHTING FIXTURE SCHEDULE.
   c. Minimum Rated Life: 50,000 hours per IES L70.
   d. Light output lumens as indicated in the LIGHTING FIXTURE SCHEDULE.
   e. Flicker shall fall below 20% (100 Hertz driver) or 30% (120 Hertz driver.)

B. LED Downlights:

1. Housing, LED driver, and LED module shall be products of the same manufacturer.

C. LED Troffers:

1. LED drivers, modules, and reflector shall be accessible, serviceable, and replaceable from below the ceiling.
2. Housing, LED driver, and LED module shall be products of the same manufacturer.

2.3 EXIT SIGNS AND EMERGENCY LIGHTING

A. Emergency lighting and exit signs are as specified and located on plans.

B. The emergency lighting and exit sign fixtures shall be equipped with integral emergency battery packs of the type specified.

C. Fixtures must be third-party listed as emergency lighting equipment, and meet or exceed the following standards; NEC, N.C. Building Code, Volume X Energy Code, NFPA-101, and NEMA Standards. Units shall meet the requirements of UL 924.

D. Exit signs:

1. Exit signs shall be LED type, with integral nickel cadmium battery or lead calcium. Batteries shall be the high temperature type. Batteries shall be sealed, maintenance-free
type, with minimum of 90 minutes operating endurance. Batteries shall have a normal life expectancy of 10 years. Batteries shall be a high temperature type with an operating range of -10 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive terminal and - negative terminal. The battery shall have high rate charge pilot light, unless self-diagnostic type. A low voltage disconnect switch shall be included to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

2. Charger shall be fully automatic solid state type, full wave rectifying, with temperature compensation and current limiting. It shall be fully automatic solid state type, full wave rectifying, with current limiting features. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load.

3. Units shall have integral test switch and AC power “ON” LED pilot light. Pilot light shall indicate the unit is connected to AC power. The battery shall have high rate charge pilot light, unless self-diagnostic type. A test switch to simulate the operation of the unit upon loss of A.C power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.

4. The unit shall be activated when the voltage drops below 80 percent.

E. Self-contained battery emergency units:

1. Self-contained battery emergency units shall be 12 volt operation with two adjustable lamps/heads. Units shall provide full rated light output for a minimum of 90 minutes. Units shall be fitted with self-diagnostic circuitry that monitors readiness.

2. Batteries shall be nickel cadmium or lead calcium high temperature type with an operating range of -10 degree C to 60 degrees C and contain a resealable pressure vent, a sintered + positive terminal and - negative terminal. Battery shall be sealed, maintenance free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. The battery shall have high rate charge pilot light, unless self-diagnostic type. A low voltage disconnect switch shall be included if LEAD battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

3. Units shall be provided integral battery charger. Charger shall be fully automatic solid state type, full wave rectifying, with current limiting features. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load.

4. A pilot light shall be provided to indicate the unit is connected to A.C. power. A test switch shall be provided to simulate the operation of the unit upon loss of A.C. power by energizing the lamps from the battery. This simulation must also exercise the transfer relay.

5. The unit shall be activated when the voltage drops below 80%.

F. Exit signs and emergency egress fixtures shall be fully warranted for three years. The battery must have an additional two years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

G. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes, contractor shall perform this
battery test 10 days prior to final inspection. Any unit, which fails the test, must be repaired or replaced, and tested again. Copy of the test report shall be sent to the Designer.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Lighting submittals shall include all proposed fixtures, electronic ballasts, and lamps. Any fixture or material not specified or named shall be subject to the requirements of specification section.

B. Exit and egress fixtures shall include complete information, which clearly addresses all the specified features. Provide additional information from the manufacturer as required to address these requirements. Incomplete submittals will be rejected.

3.2 INSTALLATION

A. Installation shall meet the requirements of previous sections of these specifications.

END OF SECTION 265100
SITE AND EXTERIOR LIGHTING

PART 1 GENERAL

1.1 REQUIREMENTS

A. Types and manufacturers are scheduled on the drawings. Equivalent fixtures by others may be submitted only as indicated on the plans and are subject to the conditions in Section 26 01 00.

B. Fixtures shall also meet the requirements of the Luminaire Notes for the Luminaire Schedule shown on the drawings and in specific details shown therein.

C. All fixtures shall be U.L. listed and labeled.

D. Provide new site, exterior, and egress fixtures in and around the existing buildings as indicated on the plans.

PART 2 PRODUCTS

2.1 MATERIALS

A. Lamps shall be Osram/Sylvania, Phillips, or G.E. All fixtures shall be equipped with lamps specified on the drawings. Any discrepancies with lamps and/or fixtures shall be brought to the attention of the designer.

B. Catalog numbers are for general identification of fixtures only. All related parts, such as plaster rings, junction boxes, louvers, shields, mounting stems, canopies, connectors, straps, nipples, etc., to fit them properly to the construction, shall be furnished and installed.

C. Unless noted otherwise, HID fixtures shall be provided with UL listed high power factor ballasts, constant wattage, Class H insulation rated. All Metal Halide luminaires shall have pulse start type ballast. Ballasts shall accept various voltage configurations or be provided with the proper voltage based on circuit assignment indicated on plans.

D. Lamps shall be as specified or equivalent. Lamps shall be of the operating characteristics and lumen output specified.

E. Fluorescent lamps shall comply with the EPA Guidelines regarding Toxicity Characteristic Leaching Procedure (TCLP).

F. Site or egress luminaires using fluorescent electronic ballasts, linear or CFL, shall be as specified here-in, and as shown in the Luminaire Schedule. Ballasts shall operate two, three or four lamps; single lamp ballasts are not allowed unless specifically scheduled. All fluorescent luminaires installed on the exterior of a building shall be equipped with a low temperature ballast rated to 0 deg minimum.

G. All electronic ballasts must be universal voltage and accept various voltage inputs specific to the fixture.

H. Pentron Supersaver lamps are specified for fluorescent fixtures. Lamps shall be T-5, bipin, 3500 deg. K, unless indicated otherwise on plans. Lamps shall be Osram/Sylvania, GE or equivalent.
I. Ballasts for T-5 lamps shall be electronic rapid start for short burning cycles; shall comply with FCC Rules and Regulations Part 18 and NEMA limits governing electromagnetic and radio frequency interference and shall not interfere with normal operation of other electrical equipment; shall meet all applicable ANSI and IEEE standards. Ballast design shall withstand line transients per IEEE 587, Category A. Ballast case temperature shall not exceed 25 degrees centigrade rise over 40 degrees centigrade ambient. Ballasts shall have a total harmonic distortion (THD) of less than 10%; and input current third harmonics shall not exceed ANSI recommendations with 32% total harmonic distortion, 27.5% of the third triplets. Flicker shall be 15% or less with any lamp suitable for the ballast. Electronic ballasts shall be equipped with surge protection; shall not be affected by lamp failure and shall yield normal lamp life; shall have power factor above 98%; lamp current crest factor shall not exceed 1.7; and shall allow remaining lamp(s) to maintain full output if companion lamp(s) fail. Light regulation shall be +/-10% input voltage variation. Ballasts manufactured by Osram/Sylvania, Motorola, Magnetek, EBT, or Advance are acceptable.

J. A minimum of five (5) years full warranty is required with each electronic ballast.

K. Electronic ballasts shall be UL listed, Class P, with an “A” sound rating and meet or exceed ANSI C82.11 requirements. Ballast enclosure size shall be the same as or smaller than magnetic ballast. The electronic ballast shall be provided with an end-of-life shutdown circuit.

L. Ballasts containing PCB’s shall not be used.

M. PL fluorescent fixtures shall be furnished with electronic rapid start ballasts. Furnish matching 4 pin lamps approved by the ballast manufacturer for use with the furnished ballasts.

N. Outdoor luminaires with Light Emitting Diodes (LEDs) shall be provided at locations indicated on the plans and as described in the Luminaire Schedule. LED lamps shall be provided with the specified color temperature and lamp types (spot, flood, or wide flood) specified. LED luminaires shall be supplied with the “IES type” spread distribution indicated (symmetrical or asymmetrical) and installed to take advantage of the proper throw.

O. Pole mounted luminaires shall be UL 1598 listed and CSA certified for outdoor use in wet locations. The luminaire housing must be weatherproof, gasketed, made of smooth construction, predrilled for mounting, and have easily accessible lamp and ballast compartments. The lens shall be tempered, impact resistant, and provide full or semi-cutoff characteristics to meet local lighting ordinances. Mounting arms or bases shall match the type and shape of pole specified. Ballasts shall be multi-tap, HPF, CWA type, rated for -20 deg F. Luminaire finish shall be of the color specified, match the pole specified, be smooth, durable, and ensure a long life.

P. Poles for pole mounted luminaire shall be equipped with a 2”x4” gasketed hand-hole at the bottom of the pole to access the branch circuit wiring. Poles shall be supported by concrete bases or footings as detailed on the plans. Base plates, anchors and/or other structural supports shall be installed per manufacturer’s specifications. Pole mounted ground lugs and a ¾” x 10’ ground rod per pole shall be supplied for grounding connections. Electrical circuits shall be installed in ¾” PVC conduit minimum.

Q. A lighting fixture shall be provided for every lighting outlet indicated. Any omission shall be brought to the attention of the Engineer before submitting proposal; otherwise a unit selected by the Engineer shall be furnished and installed at no additional charge.

R. All fixtures shall be grounded per N.E.C.
S. Fixtures connected with flex to the rigid raceway portion of the wiring system shall carry a green bonding jumper within the flex. The jumper shall be fastened to both the fixture and the raceway system with a Steel City "G" clip or approved equivalent. Phase and ground conductors run in a flex shall be #12 minimum.

T. Outdoor lighting controls (ODLC) shall be provided from Tork, Intermatic, Square D, or equal. Controls include lighting contactors, photo cells, timers, and clocks and shall be located in an accessible location as shown on the plans. Photocells shall be outdoor type and shall be located on the north side of the building or as indicated on the drawings, preferably on or above accessible roof. The photocell shall be adjusted for optimum performance. Integrated lighting control panels by Leviton, Douglas, LC&D and Square D will be acceptable as approved by the engineer.

U. Mount all fixtures plumb and square. Keep rows in perfect line.

V. Provide a 25% spare capacity of lamps and ballasts to the owner for each type scheduled with a minimum of one each.

W. Contractor shall provide a 1 yr warranty for one free adjustment and/or relocation of photocells to ensure reliable operation.

2.2 EXTERIOR EMERGENCY EGRESS LIGHTING

A. Emergency egress lighting is as specified and located on plans.

B. Luminaries shall meet or exceed the following standards; NEC, N.C. Building Code, Volume X Energy Code, NFPA-101, and NEMA Standards.

C. Self-contained battery units: (and remote heads)

1. Self-contained battery emergency units shall be 12 volt operation with two lamps. Units shall provide full rated light output for a minimum of 90 minutes. Units shall have integral/visible voltage meters which indicated battery voltage during emergency operation.

2. Batteries shall be nickel cadmium high temperature type with an operating range of -10 degree C to 60 degrees C and contain a re-sealable pressure vent, a sintered + positive terminal and - negative terminal Battery shall be sealed, maintenance free type, with minimum of 90 minutes operating endurance. Must have a normal life expectancy of 10 years. The battery shall have high rate charge pilot light, unless self-diagnostic type. A low voltage disconnect switch shall be included if LEAD battery is used, to disconnect the battery from the load and prevent damage from a deep discharge during extended power outage.

3. Units shall be provided integral battery charger. Charger shall be fully automatic solid state type, full wave rectifying, with current limiting features. Charger shall restore the battery to its full charge within 24 hours after a discharge of 90 minutes under full rated load.

4. Units shall be provided pilot light to indicate the unit is connected to A.C power. Manual tests switch to simulate the operation of the unit upon loss of A.C power by energizing the lamps from the battery. Integral/visible voltage meters which indicate battery voltage during emergency operation. This simulation must also exercise the transfer relay.
5. The unit shall be connected to the same branch circuit that supplies normal lighting in the area in which it is located.

6. The unit shall be activated when the voltage drops below 80% of normal voltage.

D. Fixtures shall be fully warranted for three years. The battery must have an additional two more years pro-rated warranty. Warranty shall start from the date of project final acceptance. Warranty shall be included in the contract document.

E. Contractor shall perform a test on each unit after it is permanently installed and charged for a minimum of 24 hours. Battery shall be tested for 90 minutes; contractor shall perform this battery test 10 days prior to final inspection. Units tested shall conform to NEC article 700.12F requirements by maintaining not less than 87.5% of nominal battery voltage, or not less than 60% of initial required illumination after operation for time specified. Contractor may utilize either method of measurement for recording/verifying unit performance. Any unit, which fails the test, must be repaired or replaced, and tested again. Copy of the test report shall be sent to the State Construction Office and the Designer.

PART 3 - EXECUTION

3.1 SUBMITTALS

A. Lighting submittals shall include all proposed fixtures, electronic ballasts, poles and lamps. Any fixture or material not specified or named shall be subject to the requirements of specification section.

B. Exit and egress fixtures shall include complete information, which clearly addresses all the specified features. Provide additional information from the manufacturer as required to address these requirements. Incomplete submittals will be rejected.

3.2 INSTALLATION

A. Installation shall meet the requirements of previous sections of these specifications.

B. Setup lighting controls, photocells and timers, for the Outdoor Lighting Controls (ODLC) as specified on the drawings or as required by the Owner for building schedules and optimum energy efficiency.

END OF SECTION 265600
SECTION 313116 - TERMITE CONTROL

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. Soil treatment with termiticide.

1.3 SUBMITTALS

A. Product Data: For each type of termite control product.

1. Include the EPA-Registered Label for termiticide products.

B. Qualification Data: For qualified Installer.

C. Product Certificates: For termite control products, from manufacturer.

D. Soil Treatment Application Report: After application of termiticide is completed, submit report for Owner's records and include the following:

1. Date and time of application.
2. Moisture content of soil before application.
3. Termiticide brand name and manufacturer.
4. Quantity of undiluted termiticide used.
5. Dilutions, methods, volumes used, and rates of application.
6. Areas of application.
7. Water source for application.

E. Warranties: Sample of special warranties.

1.4 QUALITY ASSURANCE

A. Installer Qualifications: A specialist who is licensed according to regulations of authorities having jurisdiction to apply termite control treatment and products in jurisdiction where Project is located.

B. Regulatory Requirements: Formulate and apply termiticides and termiticide devices according to the EPA-Registered Label.

C. Source Limitations: Obtain termite control products from single source from single manufacturer.
1.5  PROJECT CONDITIONS

A.  Environmental Limitations:  To ensure penetration, do not treat soil that is water saturated or frozen. Do not treat soil while precipitation is occurring.  Comply with requirements of the EPA-Registered Label and requirements of authorities having jurisdiction.

B.  Coordinate soil treatment application with excavating, filling, grading, and concreting operations.  Treat soil under footings, grade beams, and ground-supported slabs before construction.

1.6  WARRANTY

A.  Soil Treatment Special Warranty:  Manufacturer's standard form, signed by Applicator and Contractor, certifying that termite control work, consisting of applied soil termiticide treatment, will prevent infestation of subterranean termites.  If subterranean termite activity or damage is discovered during warranty period, re-treat soil and repair or replace damage caused by termite infestation.

1.  Warranty Period:  Five years from date of Substantial Completion.

PART 2 - PRODUCTS

2.1  SOIL TREATMENT

A.  Termiticide:  Provide an EPA-Registered termiticide, complying with requirements of authorities having jurisdiction, in an aqueous solution formulated to prevent termite infestation.  Provide quantity required for application at the label volume and rate for the maximum termiticide concentration allowed for each specific use, according to product's EPA-Registered Label.

1.  Products:  Subject to compliance with requirements, provide one of the following:

   a.  BASF Corporation, Agricultural Products; Termidor.
   b.  Bayer Environmental Science; Premise 75.
   c.  FMC Corporation, Agricultural Products Group; Dragnet FT Talstar Prevail.
   d.  Syngenta; Demon TC Prelude Probuild TC.

2.  Service Life of Treatment:  Soil treatment termiticide that is effective for not less than five years against infestation of subterranean termites.

PART 3 - EXECUTION

3.1  EXAMINATION

A.  Examine substrates, areas, and conditions, with Applicator present, for compliance with requirements for moisture content of soil per termiticide label requirements, interfaces with earthwork, slab and foundation work, landscaping, utility installation, and other conditions affecting performance of termite control.

B.  Proceed with application only after unsatisfactory conditions have been corrected.
3.2 PREPARATION

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer’s written instructions for preparation before beginning application of termite control treatment. Remove all extraneous sources of wood cellulose and other edible materials such as wood debris, tree stumps and roots, stakes, formwork, and construction waste wood from soil within and around foundations.

B. Soil Treatment Preparation: Remove foreign matter and impermeable soil materials that could decrease treatment effectiveness on areas to be treated. Loosen, rake, and level soil to be treated except previously compacted areas under slabs and footings. Termicidaes may be applied before placing compacted fill under slabs if recommended in writing by termiticide manufacturer.
   1. Fit filling hose connected to water source at the site with a backflow preventer, complying with requirements of authorities having jurisdiction.

3.3 APPLICATION, GENERAL

A. General: Comply with the most stringent requirements of authorities having jurisdiction and with manufacturer's EPA-Registered Label for products.

3.4 APPLYING SOIL TREATMENT

A. Application: Mix soil treatment termiticide solution to a uniform consistency. Provide quantity required for application at the label volume and rate for the maximum specified concentration of termiticide, according to manufacturer's EPA-Registered Label, to the following so that a continuous horizontal and vertical termiticidal barrier or treated zone is established around and under building construction. Distribute treatment evenly.
   1. Slabs-on-Grade and Basement Slabs: Under ground-supported slab construction, including footings, building slabs, and attached slabs as an overall treatment. Treat soil materials before concrete footings and slabs are placed.
   2. Foundations: Adjacent soil, including soil along the entire inside perimeter of foundation walls; along both sides of interior partition walls; around plumbing pipes and electric conduit penetrating the slab; around interior column footers, piers, and chimney bases; and along the entire outside perimeter, from grade to bottom of footing. Avoid soil washout around footings.
   3. Crawlspace: Soil under and adjacent to foundations as previously indicated. Treat adjacent areas including around entrance platform, porches, and equipment bases. Apply overall treatment only where attached concrete platform and porches are on fill or ground.
   4. Penetrations: At expansion joints, control joints, and areas where slabs will be penetrated.

B. Avoid disturbance of treated soil after application. Keep off treated areas until completely dry.

C. Protect termiticide solution, dispersed in treated soils and fills, from being diluted until ground-supported slabs are installed. Use waterproof barrier according to EPA-Registered Label instructions.

D. Post warning signs in areas of application.

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