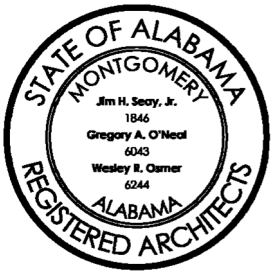
Specifications
for the

TROY UNIVERSITY
WALLACE HALL
FIRST FLOOR RENOVATION

Troy University
Troy, AL

SS&L

ARCHITECTURE & INTERIOR DESIGN
1115 South Court Street | Montgomery, AL 36104
Tel. 334. 263. 5162 | **WWW.SSLARCH.COM**

ELECTRICAL	ARCHITECTURAL	MECHANICAL/PLUMBING
		

Date: SEPTEMBER 2026
SS&L Job No: 22079
DCM Project No: 2026484

TABLE OF CONTENTS FOR PROJECT MANUAL

INTRODUCTORY INFORMATION

.. PROJECT DIRECTORY
.. TABLE OF CONTENTS FOR PROJECT MANUAL

BIDDING REQUIREMENTS:

.. ADVERTISEMENT FOR BIDS
.. INSTRUCTIONS TO BIDDERS
.. PROPOSAL FORM
.. PROPOSAL FORM ATTACHMENT A - ACCOUNTING OF SALES TAX
.. FORM OF BID BOND

CONTRACT FORMS:

.. CONSTRUCTION CONTRACT FORM
.. PERFORMANCE AND PAYMENT BOND FORM

GENERAL CONDITIONS:

.. GENERAL CONDITIONS OF THE CONTRACT (DCM Form C-8)
.. APPLICATION AND CERTIFICATE FOR PAYMENT (DCM Form C-10)
.. INVENTORY OF STORED MATERIALS (DCM Form C-10SM)
.. SCHEDULE OF VALUES (SOV) (DCM Form C-10SOV)
.. PROGRESS SCHEDULE & REPORT (DCM Form C-11)
.. CONTRACT CHANGE ORDER (DCM Form C-12)
.. CERTIFICATE OF SUBSTANTIAL COMPLETION (DCM Form C-13)
.. FORM OF ADVERTISEMENT OF COMPLETION (DCM Form C-14)
.. DETAIL OF PROJECT SIGN (DCM Form C-15)
.. CONTRACTORS AFFIDAVIT OF PAYMENT OF DEBTS AND CLAIMS (DCM Form C-18)
.. CONTRACTOR'S AFFIDAVIT OF RELEASE OF LIENS (DCM Form C-19)
.. CONSENT OF SURETY TO FINAL PAYMENT (DCM Form C-20)
.. E-VERIFY MEMORANDUM OF UNDERSTANDING
.. STATE OF ALABAMA SALES TAX EXEMPTION
.. VENDOR DISCLOSURE STATEMENT
.. PERMIT AND RE-INSPECTION FEE WORKSHEET

TECHNICAL SPECIFICATIONS:

DIVISION 1 - GENERAL REQUIREMENTS:

.. SECTION 01 1000 Summary of Work
.. SECTION 01 2000 Price and Payment Procedures
.. SECTION 01 2100 Allowances
.. SECTION 01 2200 Unit Prices
.. SECTION 01 2300 Alternates
.. SECTION 01 3000 Administrative Requirements
.. SECTION 01 4000 Quality Requirements
.. SECTION 01 4100 Regulatory Requirements
.. SECTION 01 4217 Definitions and Standards
.. SECTION 01 5000 Temporary Facilities and Controls
.. SECTION 01 5100 Temporary Utilities
.. SECTION 01 5500 Vehicular Access and Parking
.. SECTION 01 6000 Product Requirements
.. SECTION 01 6116 Volatile Organic Compound (VOC) Content Restrictions
.. SECTION 01 7000 Execution and Closeout Requirements
.. SECTION 01 7419 Construction Waste Management and Disposal
.. SECTION 01 7800 Closeout Submittals

DIVISION 2 – EXISTING CONDITIONS:

.. SECTION 02 4100 Demolition
.. Hazardous Materials Report by EMC

DIVISION 3 – CONCRETE:

.. SECTION 03 5400 Self-Leveling Cast Underlayment (Laticrete Supercap SC500-Series)

DIVISION 4 – MASONRY:

.. SECTION 04 2000 Unit Masonry

DIVISION 5 - METALS:

.. SECTION 05 4000 Cold-Formed Metal Framing

DIVISION 6 – WOOD, PLASTICS, AND COMPOSITES:

.. SECTION 06 1000 Rough Carpentry
.. SECTION 06 4100 Architectural Plastic Laminate Casework

DIVISION 7 – THERMAL AND MOISTURE PROTECTION:

.. SECTION 07 2100 Thermal Insulation
.. SECTION 07 2118 Thermal Insulation – Open Cell Foamed-In-Place Insulation
.. SECTION 07 9005 Joint Sealers

DIVISION 9 – OPENINGS:

.. SECTION 08 1113 Hollow Metal Doors and Frames
.. SECTION 08 1416 Flush Wood Doors

.. SECTION 08 4113 Fire Rated Aluminum Framed Entrances and Storefronts
.. SECTION 08 4313 Aluminum-Framed Storefronts
.. SECTION 08 7100 Door Hardware
.. SECTION 08 8000 Glazing
.. SECTION 08 8300 Mirrors

DIVISION 9 – FINISHES:

.. SECTION 09 0561 Common Work Results for Flooring Preparation
.. SECTION 09 2116 Gypsum Board Assemblies
.. SECTION 09 3000 Tiling
.. SECTION 09 5100 Acoustical Ceilings
.. SECTION 09 5126 Woodworks Linear Solid Wood Panels for Ceiling
.. SECTION 09 6513 Resilient Flooring Accessories
.. SECTION 09 6519 Resilient Tile Flooring
.. SECTION 09 6714 Tile Carpeting
.. SECTION 09 7000 Architectural Finishes
.. SECTION 09 7200 Wall Coverings
.. SECTION 09 9123 Interior Painting

DIVISION 10 – Specialties:

.. SECTION 10 0660 Plastic Fabrications and Translucent Panel Systems
.. SECTION 10 1200 Display Boards
.. SECTION 10 1423 Signage
.. SECTION 10 2113 Phenolic Toilet Compartments
.. SECTION 10 2800 Toilet, Bath, and Laundry Accessories

DIVISION 12 – Furnishings:

.. SECTION 12 3600 Countertops and Windowsills

DIVISION 22 – Plumbing:

.. SECTION 22 0514 Common Work Results for Plumbing
.. SECTION 22 0519 Meters and Gages for Plumbing Piping
.. SECTION 22 0523 General-Duty Valves for Plumbing Piping
.. SECTION 22 0529 Hangers and Supports for Plumbing Piping and Equipment
.. SECTION 22 0553 Identification for Plumbing and Piping Equipment
.. SECTION 22 1116 Domestic Water Piping
.. SECTION 22 1119 Domestic Water Piping Specialties
.. SECTION 22 1316 Sanitary Waste and Vent Piping
.. SECTION 22 1319 Sanitary Waste Piping Specialties
.. SECTION 22 4000 Plumbing Fixtures

DIVISION 23 – HVAC:

.. SECTION 23 0500 General HVAC Requirements
.. SECTION 23 0523 General Duty Valves for HVAC Piping
.. SECTION 23 0529 Hangers and Supports for HVAC Piping and Equipment
.. SECTION 23 0548.13 Vibration Controls for HVAC Piping and Equipment
.. SECTION 23 0553 Identification for HVAC Piping and Equipment
.. SECTION 23 0593 Testing, Adjusting, and Balancing
.. SECTION 23 0713 Duct Insulation
.. SECTION 23 0719 HVAC Piping Insulation
.. SECTION 23 0923 Direct Digital Control (DDC) System for HVAC
.. SECTION 23 2113 Hydronic Piping
.. SECTION 23 3113 Metal Ducts
.. SECTION 23 3300 Duct Accessories
.. SECTION 23 3433 Air Curtains
.. SECTION 23 3713 Diffusers, Registers, and Grilles
.. Mechanical COMcheck

DIVISION 26 – Electrical:

.. SECTION 26 0000 Electrical
.. Electrical COMcheck

END OF TABLE OF CONTENTS

DCM Form C-1
August 2021

ADVERTISEMENT FOR BIDS

Sealed proposals will be received by Troy University
at the Physical Plant Conference Room, 1 Melton Carter Dr, Troy, AL 36081
until 2:30 PM Central Time October 13, 2026 for

Bid#:

Wallace Hall First Floor Renovation

(Drawings and Specifications Dated AUG 2026)

at which time and place they will be publicly opened and read.

A cashier's check or bid bond payable to Troy University
in an amount not less than five (5) percent of the amount of the bid, but in no event more than $10,000, must accompany the bidder's proposal. Performance and Payment Bonds and evidence of insurance required in the bid documents will be required at the signing of the Contract.

Drawings and specifications may be examined at the office of Seay, Seay & Litchfield Architects, 1115 South Court Street, Montgomery, Alabama 36104 and appropriate plan rooms.

Electronic files of the Bid Documents can be requested free of charge via request of the Architect's office, contact Kaylee Cofer at kcofer@sslarch.com. These documents shall be used only for the purpose of bidding and construction of this project. Anyone requesting files will be logged on the plan holder's list and will be notified of all addenda via email/newforma notification. The architect retains all copyrights and ownership of the documents.

A mandatory pre-bid conference is scheduled for **October 6, 2026 at 11:00 AM** central time, at the Physical Plant Conference Room, 1 Melton Carter Dr, Troy, AL 36081. Interested bidders are required to attend.

Bids must be submitted on proposal forms furnished by the Architect (Engineer) or copies thereof. All bidders bidding in amounts exceeding that established by the State Licensing Board for General Contractors must be licensed under the provisions of Title 34, Chapter 8, Code of Alabama, 1975, and must show evidence of license before bidding or bid will not be received or considered by the Architect (Engineer); the bidder shall show such evidence by clearly displaying his or her current license number on the outside of the sealed envelope in which the proposal is delivered. The Owner reserves the right to reject any or all proposals and to waive technical errors if, in the Owner's judgement, the best interests of the Owner will thereby be promoted.

Troy University
(Awarding Authority)
Troy University
(Local Awarding Authority)
Seay, Seay & Litchfield, P.C.
(Architect)

INSTRUCTIONS TO BIDDERS

CONTENTS **PAGES**

1. BID DOCUMENTS: 1
2. GENERAL CONTRACTOR'S STATE LICENSING REQUIREMENTS: 1
3. QUALIFICATIONS of BIDDERS and PREQUALIFICATION PROCEDURES: 1
4. PREFERENCE to RESIDENT CONTRACTORS: 2
5. EXAMINATION of BID DOCUMENTS and the SITE of the WORK: 2
6. EXPLANATIONS and INTERPRETATIONS: 2
7. SUBSTITUTIONS: 2
8. PREPARATION and DELIVERY of BIDS: 3
9. WITHDRAWAL or REVISION of BIDS: 5
10. OPENING of BIDS: 5
11. INCOMPLETE and IRREGULAR BIDS: 6
12. BID ERRORS: 6
13. DISQUALIFICATION of BIDDERS: 6
14. CONSIDERATION of BIDS: 7
15. DETERMINATION of LOW BIDDER by USE of ALTERNATES: 7
16. UNIT PRICES: 7
17. AWARD of CONTRACT: 8

1. BID DOCUMENTS:

The Bid Documents consist of the Advertisement for Bids, these Instructions to Bidders, any supplements to these Instructions to Bidders, the Proposal Form and the Accounting of Sales Tax, and the proposed Contract Documents. The proposed Contract Documents consist of the Construction Contract, the Performance Bond and Payment Bond, the Conditions of the Contract (General, Supplemental, and other Conditions), Drawings, Specifications and all addenda issued prior to execution of the Construction Contract. Bid Documents may be obtained or examined as set forth in the Advertisement for Bids.

2. GENERAL CONTRACTOR'S STATE LICENSING REQUIREMENTS:

When the amount bid for a contract is $100,000 or more, the bidder must be licensed by the State Licensing Board for General Contractors and must show the Architect evidence of license before bidding or the bid will not be received by the Architect or considered by the Awarding Authority. A bid exceeding the bid limit stipulated in the bidder's license, or which is for work outside of the type or types of work stipulated in the bidder's license, will not be considered. In case of a joint venture of two or more contractors, the amount of the bid shall be within the maximum bid limitation as set by the State Licensing Board for General Contractors of the combined limitations of the partners to the joint venture.

3. QUALIFICATIONS of BIDDERS and PREQUALIFICATION PROCEDURES:

a. Any special qualifications required of general contractors, subcontractors, material suppliers, or fabricators are set forth in the Bid Documents.

b. The Awarding Authority may have elected to prequalify bidders. Parties interested in bidding for this contract are directed to the Advertisement for Bids and Supplemental Instructions to Bidders to determine whether bidders must be prequalified and how they may obtain copies of the Awarding Authority's published prequalification procedures and criteria.

c. Release of Bid Documents by the Architect to a prospective bidder will not constitute any

determination by the Awarding Authority or Architect that the bidder has been found to be qualified, prequalified, or responsible.

4. PREFERENCE to RESIDENT CONTRACTORS:

(If this project is federally funded in whole or in part, this Article shall not apply.)

a. In awarding the Contract, preference will be given to Alabama resident contractors and a nonresident bidder domiciled in a state having laws granting preference to local contractors shall be awarded the Contract only on the same basis as the nonresident bidder's state awards contracts to Alabama contractors bidding under similar circumstances.

b. A nonresident bidder is a contractor which is neither organized and existing under the laws of the State of Alabama, nor maintains its principal place of business in the State of Alabama. A nonresident contractor which has maintained a permanent office within the State of Alabama for at least five continuous years shall not thereafter be deemed to be a non-resident contractor so long as the contractor continues to maintain a branch office within Alabama.

5. EXAMINATION of BID DOCUMENTS and the SITE of the WORK:

Before submitting a bid for the Work, the bidders shall carefully examine the Bid Documents, visit the site, and satisfy themselves as to the nature and location of the Work, and the general and local conditions, including weather, the general character of the site or building, the character and extent of existing work within or adjacent to the site and any other work being performed thereon at the time of submission of their bids. They shall obtain full knowledge as to transportation, disposal, handling, and storage of materials, availability of water, electric power, and all other facilities in the area which will have a bearing on the performance of the Work for which they submit their bids. The submission of a bid shall constitute a representation by the bidder that the bidder has made such examination and visit and has judged for and satisfied himself or herself as to conditions to be encountered regarding the character, difficulties, quality, and quantities of work to be performed and the material and equipment to be furnished, and as to the contract requirements involved.

6. EXPLANATIONS and INTERPRETATIONS:

a. Should any bidder observe any ambiguity, discrepancy, omission, or error in the drawings and specifications, or in any other bid document, or be in doubt as to the intention and meaning of these documents, the bidder should immediately report such to the Architect and request clarification.

b. Clarification will be made only by written Addenda sent to all prospective bidders. Neither the Architect nor the Awarding Authority will be responsible in any manner for verbal answers or instructions regarding intent or meaning of the Bid Documents.

c. In the case of inconsistency between drawings and specifications or within either document, a bidder will be deemed to have included in its bid the better quality or greater quantity of the work involved unless the bidder asked for and obtained the Architect's written clarification of the requirements before submission of a bid.

7. SUBSTITUTIONS:

a. The identification of any product, material, system, item of equipment, or service in the Bid Documents by reference to a trade name, manufacturer's name, model number, etc. (hereinafter referred to as "source"), is intended to establish a required standard of performance, design, and quality and is not intended to limit competition unless the provisions of paragraph "d" below apply.

b. When the Bid Documents identify only one or two sources, or three or more sources followed by

"or approved equal" or similar wording, the bidder's proposal may be based on a source not identified but considered by the bidder to be equal to the standard of performance, design and quality as specified; however, such substitutions must ultimately be approved by the Architect. If the bidder elects to bid on a substitution without "Pre-bid Approval" as described below, then it will be understood that proof of compliance with specified requirements is the exclusive responsibility of the bidder.

c. When the Bid Documents identify three or more sources and the list of sources is not followed by "or approved equal" or similar wording, the bidder's proposal shall be based upon one of the identified sources, unless the bidder obtains "Pre-bid Approval" of another source as described below. Under these conditions it will be expressly understood that no product, material, system, item of equipment, or service that is not identified in the Bid Documents or granted "Pre-Bid Approval" will be incorporated into the Work unless such substitution is authorized and agreed upon through a Contract Change Order.

d. If the Bid Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the bidder's proposal must be based upon the identified sole source.

e. Procedures for "Pre-bid Approval". If it is desired that a product, material, system, piece of equipment, or service from a source different from those sources identified in the Bid Documents be approved as an acceptable source, application for the approval of such source must reach the hands of the Architect at least ten days prior to the date set for the opening of bids. At the Architect's discretion, this ten day provision may be waived. The application for approval of a proposed source must be accompanied by technical data which the applicant desires to submit in support of the application. The Architect will give consideration to reports from reputable independent testing laboratories, verified experience records showing the reputation of the proposed source with previous users, evidence of reputation of the source for prompt delivery, evidence of reputation of the source for efficiency in servicing its products, or any other pertinent written information. The application to the Architect for approval of a proposed source must be accompanied by a schedule setting forth in which respects the materials or equipment submitted for consideration differ from the materials or equipment designated in the Bid Documents. The burden of proof of the merit of the proposed substitution is upon the proposer. To be approved, a proposed source must also meet or exceed all express requirements of the Bid Documents. Approval, if granted, shall not be effective until published by the Architect in an addendum to the Bid Documents.

8. PREPARATION and DELIVERY of BIDS:

a. DCM Form C-3: Proposal Form:

(1) Bids must be submitted on the Proposal Form as contained in the Bid Documents; only one copy is required to be submitted. A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with the Proposal Form.

(2) All information requested of the bidder on the Proposal Form must be filled in. The form must be completed by typewriter or hand-printed in ink.

(3) Identification of Bidder: On the first page of the Proposal Form the bidder must be fully identified by completing the spaces provided for:

(a) the legal name of the bidder,

(b) the state under which laws the bidder's business is organized and existing,

(c) the city (and state) in which the bidder has its principal offices,

(d) the bidder's business organization, i.e., individual, partnership, corporation, or limited liability company (LLC) (to be indicated by marking the applicable box and writing in the type of organization if it is not one of those listed), and

(e) the partners or officers of the bidder's organization, if the bidder is other than an individual. If the space provided on the Proposal Form is not adequate for this listing, the bidder may insert "See Attachment" in this space and provide the listing on an attachment to the Proposal Form.

(4) Where indicated by the format of the Proposal Form, the bidder must specify lump sum prices in both words and figures. In case of discrepancy between the prices shown in words and in figures, the words will govern.

(5) All bid items requested in the Proposal Form, including alternate bid prices and unit prices for separate items of the Work, must be bid. If a gross sum of bid items is requested in the Proposal Form, the gross sum shall be provided by the bidder.

(6) In the space provided in the Proposal Form under "Bidder's Alabama License", the bidder must insert his or her current general contractor's state license number, current bid limit, and type(s) of work for which bidder is licensed.

(7) The Proposal Form shall be properly signed by the bidder. If the bidder is:

(a) **an individual**, that individual or his or her "authorized representative" must sign the Proposal Form;
(b) **a partnership,** one of the partners or an "authorized representative" of the Partnership must sign the Proposal Form;
(c) **a corporation,** the president, vice-president, secretary, or "authorized representative" of the corporation must sign the Proposal Form.
(d) **a limited liability company,** a member, manager, or "authorized representative" of the limited liability company must sign the Proposal Form.

As used in these Instructions to Bidders, "authorized representative" is defined as a person to whom the bidder has granted written authority to conduct business in the bidder's behalf by signing and/or modifying the bid. Such written authority shall be signed by the bidder (the individual proprietor, or a member of the Partnership, or an officer of the Corporation, or member or manager of the limited liability company) and shall be attached to the Proposal Form.

(8) Interlineation, alterations or erasures on the Proposal Form must be initialed by the bidder or its "authorized representative".

b. DCM Form C-3A: Accounting of Sales Tax

DCM Form C-3A: Accounting of Sales Tax must be submitted with DCM Form C-3: Proposal Form. This requirement applies to all proposers. If you are not licensed by the Alabama State Licensing Board for General Contractors and therefore cannot claim the sales tax exemption under Ala. Code §40 9 14.1(b)(2), you must still submit DCM Form C-3A with your proposal. Non GC contractors must enter $0.00 in all fields on the Accounting of Sales Tax form. Failure to submit DCM Form C-3A, even with all values listed as $0.00, will render the proposal non-responsive.

c. Bid Guaranty

(1) The Proposal Form must be accompanied by a cashier's check, drawn on an Alabama bank, or a Bid Bond, executed by a surety company duly authorized and qualified to make such bonds in the State of Alabama, payable to the Awarding Authority.

(2) If a Bid Bond is provided in lieu of a cashier's check, the bond shall be on the Bid Bond form as stipulated in the Bid Documents.

(3) The amount of the cashier's check or Bid Bond should not be less than five percent of the contractor's bid, but is not required to be in an amount more than ten thousand dollars.

d. Delivery of Bids:

(1) Bids will be received until the time set, and at the location designated, in the Advertisement for Bids unless notice is given of postponement. Any bid not received prior to the time set for opening bids will be rejected absent extenuating circumstances and such bids shall be rejected in all cases where received after other bids are opened.

(2) Each bid shall be placed, together with the bid guaranty, in a sealed envelope. On the outside of the envelope the bidder shall write in large letters "Proposal", below which the bidder shall identify the Project and the Work bid on, the name of the bidder, and the bidder's current general contractor's state license number.

(3) Bids may be delivered in person, or by mail if ample time is allowed for delivery. When sent by mail, the sealed envelope containing the bid, marked as indicated above, shall be enclosed in another envelope for mailing.

9. WITHDRAWAL or REVISION of BIDS:

a. A bid may be withdrawn prior to the time set for opening of bids, provided a written request, executed by the bidder or the bidder's "authorized representative", is filed with the Architect prior to that time. The bid will then be returned to the bidder unopened.

b. A bid which has been sealed in its delivery envelope may be revised by writing the change in price and date on the outside of the delivery envelope over the signature of the bidder or the bidder's "authorized representative." In revising the bid in this manner, the bidder must only write the amount of the change in price on the envelope **and must not reveal the bid price.**

c. Written communications, signed by the bidder or its "authorized representative", to revise bids will be accepted if received by the Architect prior to the time set for opening bids. The Architect will record the instructed revision upon opening the bid. Such written communication may be by facsimile if so stipulated in Supplemental Instructions to Bidders. In revising the bid in this manner, the bidder must only write the amount of the change in price **and must not reveal the bid price.**

d. Except as provided in Article 12 of these Instructions to Bidders, no bid shall be withdrawn, modified, or corrected after the time set for opening bids.

10. OPENING of BIDS:

a. Bids will be opened and read publicly at the time and place indicated in the Advertisement for Bids. Bidders or their authorized representatives are invited to be present.

b. A list of all proposed major subcontractors and suppliers will be submitted by Bidders to the

Architect at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids. If the list includes a fire alarm contractor and/or fire sprinkler contractor, Bidders will also submit a copy of the fire alarm contractor's and/or fire sprinkler contractor's permits from the State of Alabama Fire Marshal's Office.

11. INCOMPLETE and IRREGULAR BIDS:

A bid that is not accompanied by data required by the Bid Documents, or a bid which is in any way incomplete, may be rejected. Any bid which contains any uninitialed alterations or erasures, or any bid which contains any additions, alternate bids, or conditions not called for, or any other irregularities of any kind, will be subject to rejection.

12. BID ERRORS:

a. Errors and Discrepancies in the Proposal Form. In case of error in the extension of prices in bids, the unit price will govern. In case of discrepancy between the prices shown in the figures and in words, the words will govern.

b. Mistakes within the Bid. If the low bidder discovers a mistake in its bid, the low bidder may seek withdrawal of its bid without forfeiture of its bid guaranty under the following conditions:

(1) Timely Notice: The low bidder must notify the Awarding Authority and Architect in writing, within three working days after the opening of bids, that a mistake was made. This notice must be given within this time frame whether or not award has been made.

(2) Substantial Mistake: The mistake must be of such significance as to render the bid price substantially out of proportion to the other bid prices.

(3) Type of Mistake: The mistake must be due to calculation or clerical error, an inadvertent omission, or a typographical error which results in an erroneous sum. A mistake of law, judgment, or opinion shall not constitute a valid ground for withdrawal without forfeiture.

(4) Documentary Evidence: Clear and convincing documentary evidence of the mistake must be presented to the Awarding Authority and the Architect as soon as possible, but no later than three working days after the opening of bids.

The Awarding Authority's decision regarding a low bidder's request to withdraw its bid without penalty shall be made within 10 days after receipt of the bidder's evidence or by the next regular meeting of the Awarding Authority. Upon withdrawal of bid without penalty, the low bidder shall be prohibited from (1) doing work on the project as a subcontractor or in any other capacity and (2) bidding on the same project if it is re-bid.

13. DISQUALIFICATION of BIDDERS:

Any bidder(s) may be disqualified from consideration for contract award for the following reasons:

a. Collusion. Any agreement or collusion among bidders or prospective bidders in restraint of freedom of competition to bid at a fixed price or to refrain from bidding or otherwise shall render the bids void and shall cause the bidders or prospective bidders participating in such agreement or collusion to be disqualified from submitting further bids to the Awarding Authority on future lettings. (See § 39-2-6, Code of Alabama 1975, for possible criminal sanctions.)

b. Advance Disclosure. Any disclosure in advance of the terms of a bid submitted in response to

an Advertisement for Bids shall render the proceedings void and require re-advertisement and rebid.

c. Failure to Settle Other Contracts. The Awarding Authority may reject a bid from a bidder who has not paid, or satisfactorily settled, all bills due for labor and material on other contracts in force at the time of letting.

14. CONSIDERATION of BIDS:

a. After the bids are opened and read publicly, the bid prices will be compared and the results of this comparison will be available to the public. Until the final award of the contract, however, the Awarding Authority shall have the right to reject any or all bids, and it shall have the right to waive technical errors and irregularities if, in its judgment, the bidder will not have obtained a competitive advantage and the best interests of the Awarding Authority will be promoted.

b. If the Bid Documents request bids for projects or parts of projects in combination or separately, the Bid Documents must include supplements to, these Instructions to Bidders setting forth applicable bid procedures. Award or awards will be made to the lowest responsible and responsive bidder or bidders in accordance with such bid procedures.

15. DETERMINATION of LOW BIDDER by USE of ALTERNATES:

a. The Awarding Authority may request alternate bid prices (alternates) to facilitate either reducing the base bid to an amount within the funds available for the project or adding items to the base bid within the funds available for the project. Alternates, if any, are listed in the Proposal Form in the order in which they shall cumulatively deduct from or add to the base bid for determining the lowest bidder.

b. If alternates are included in the Proposal Form, the Awarding Authority shall determine the dollar amount of funds available and immediately prior to the opening of bids shall announce publicly the funds available for the project. The dollar amount of such funds shall be used to determine the lowest bidder as provided herein below, notwithstanding that the actual funds available for the project may subsequently be determined to be more or less than the expected funds available as determined immediately prior to the time of the opening of bids.

c. If the base bid of the lowest bidder exceeds the funds available and alternate bid prices will reduce the base bids to an amount that is within the funds available, the lowest bidder will be determined by considering, in order, the fewest number of the alternates that produces a price within the funds available. If the base bid of the lowest bidder is within the funds available and alternate bid prices will permit adding items to the base bid, the lowest bidder will be determined by considering, in order, the greatest number of the alternates that produces a price within the funds available.

d. After the lowest bidder has been determined as set forth above, the Awarding Authority may award that bidder any combination of alternates, provided said bidder is also the low bidder when only the Base Bid and such combination of alternates are considered.

16. UNIT PRICES:

a. Work Bid on a Unit Price Basis. Where all, or part(s), of the planned Work is bid on a unit price basis, both the unit prices and the extensions of the unit prices constitute a basis of determining the lowest responsible and responsive bidder. In cases of error in the extension of prices of bids, the unit price will govern. A bid may be rejected if any of the unit prices are obviously unbalanced or non-competitive.

b. Unit Prices for Application to Change Orders. As a means of predetermining unit costs for changes in certain elements of the Work, the Bid Documents may require that the bidders furnish unit prices for those items in the Proposal Form. Unit prices for application to changes in the work are not a basis for determining the lowest bidder. Non-competitive unit prices proposed by the successful bidder may be rejected and competitive prices negotiated by the Awarding Authority prior to contract award. Unit prices for application to changes in the work are not effective unless specifically included and agreed upon in the Construction Contract.

17. AWARD of CONTRACT:

a. The contract shall be awarded to the lowest responsible and responsive bidder unless the Awarding Authority finds that all the bids are unreasonable or that it is not in the best interest of the Awarding Authority to accept any of the bids. A responsible bidder is one who, among other qualities determined necessary for performance, is competent, experienced, and financially able to perform the contract. A responsive bidder is one who submits a bid that complies with the terms and conditions of the Advertisement for Bids and the Bid Documents. Minor irregularities in the bid shall not defeat responsiveness.

b. A bidder to whom award is made will be notified by telegram, confirmed facsimile, or letter to the address shown on the Proposal Form at the earliest possible date. Unless other time frames are stipulated in Supplemental Instructions to Bidders, the maximum time frames allowed for each step of the process between the opening of bids and the issuance of an order to proceed with the work shall be as follows:

Table 1:

(1)	Award of contract by Awarding Authority	30 calendar days after the opening of bids
(2)	Contractor's return of the fully executed contract, with bonds and evidence of insurance, to the Awarding Authority	15 calendar days after the contract has been presented to the contractor for signature (from the Lead Design Professional)
(3)	Awarding Authority's approval of the contractor's bonds and evidence of insurance and completion of contract execution	20 calendar days after the contractor presents complete and acceptable documents to the Architect
(4)	Notice To Proceed issued to the contractor along with distribution of the fully executed construction contract to all parties.	15 calendar days after final execution of contract by the Awarding Authority, by various State Agencies if required and by the Governor if his or her signature on the contract is required by law

The time frames stated above, or as otherwise specified in the Bid Documents, may be extended by written agreement between the parties. Failure by the Awarding Authority to comply with the time frames stated above or stipulated in Supplemental Instructions to Bidders, or agreed extensions thereof, shall be just cause for the withdrawal of the contractor's bid and contract without forfeiture of bid security.

c. Should the successful bidder or bidders to whom the contract is awarded fail to execute the Construction Contract and furnish acceptable Performance and Payment Bonds and satisfactory evidence of insurance within the specified period, the Awarding Authority shall retain from the bid guaranty, if it is a cashier's check, or recover from the principal or the sureties, if the guaranty is a bid bond, the difference between the amount of the contract as awarded and the amount of the bid of the next lowest responsible and responsive bidder, but

not more than $10,000. If no other bids are received, the full amount of the bid guaranty shall be so retained or recovered as liquidated damages for such default. Any sums so retained or recovered shall be the property of the Awarding Authority.

d. All bid guaranties, except those of the three lowest bona fide bidders, will be returned immediately after bids have been checked, tabulated, and the relation of the bids established. The bid guaranties of the three lowest bidders will be returned as soon as the contract bonds and the contract of the successful bidder have been properly executed and approved. When the award is deferred for a period of time longer than 15 days after the opening of the bids, all bid guaranties, except those of the potentially successful bidders, shall be returned. If no award is made within the specified period, as it may by agreement be extended, all bids will be rejected, and all guaranties returned. If any potentially successful bidder agrees in writing to a stipulated extension in time for consideration of its bid and its bid was guaranteed with a cashier's check, the Awarding Authority may permit the potentially successful bidder to substitute a satisfactory bid bond for the cashier's check.

END of INSTRUCTIONS TO BIDDERS

PROPOSAL FORM

To: Troy University_____ Date: _____
(Awarding Authority)

In compliance with the Advertisement for Bids and subject to all the conditions thereof, the undersigned

_____
(Legal Name of Bidder)

hereby proposes to furnish all labor and materials and perform all work required for the construction of WORK ___Wallace Hall Renovation_____

_____

in accordance with Drawings and Specifications, dated 9/10/2026_____, prepared by Seay, Seay & Litchfield PC_____, Architect/Engineer.

The Bidder, which is organized and existing under the laws of the State of _____, having its principal offices in the City of _____, is: ☐ a Corporation ☐ a Partnership ☐ an Individual ☐ (other)_____.

LISTING OF PARTNERS OR OFFICERS: If Bidder is a Partnership, list all partners and their addresses; if Bidder is a Corporation, list the names, titles, and business addresses of its officers:

_____
_____
_____
_____

BIDDER'S REPRESENTATION: The Bidder declares that it has examined the site of the Work, having become fully informed regarding all pertinent conditions, and that it has examined the Drawings and Specifications (including all Addenda received) for the Work and the other Bid and Contract Documents relative thereto, and that it has satisfied itself relative to the Work to be performed.

ADDENDA: The Bidder acknowledges receipt of Addenda Nos._____ through _____ inclusively.

BASE BID: For construction complete as shown and specified, the sum of

_____ Dollars

($ _____)

ALTERNATES: If alternates as set forth in the Bid Documents are accepted, the following adjustments are to be made to the Base Bid:

ALTERNATE 1: Acoustic Improvements to Radio Department. $_____

ALTERNATE 2: Environmental Wall Graphics. $_____

ALTERNATE 3: Interior Storefront in Radio Department $_____

ALTERNATE 4: Replace Exterior Entry Storefront $_____

ALTERNATE 5: Door Resurfacing $_____

UNIT PRICE:

UNIT PRICE 1: Removal and Disposal of Friable Asbestos in Existing Drywall Joint Compoud	$_____ / Square Foot
UNIT PRICE 2: Additional Hat Channels and Gypsum Board	$_____ / Board Foot

ALLOWANCE:

ALLOWANCE 1: General contingency.	$100,000.00

BID SECURITY: The undersigned agrees to enter into a Construction Contract and furnish the prescribed Performance and Payment Bonds and evidence of insurance within fifteen calendar days, or such other period stated in the Bid Documents, after the contract forms have been presented for signature, provided such presentation is made within 30 calendar days after the opening of bids, or such other period stated in the Bid Documents. As security for this condition, the undersigned further agrees that the funds represented by the Bid Bond (or cashier's check) attached hereto may be called and paid into the account of the Awarding Authority as liquidated damages for failure to so comply.

Attached hereto is a: (Mark the appropriate box and provide the applicable information.)

☐ Bid Bond, executed by _____as Surety,

☐ a cashier's check on the_____ Bank of _____, for the sum of _____ Dollars ($ _____) made payable to the Awarding Authority.

BIDDER'S ALABAMA LICENSE:

State License for General Contracting:_____
License Number Bid Limit Type(s) of Work

CERTIFICATIONS: The undersigned certifies that he or she is authorized to execute contracts on behalf of the Bidder as legally named, that this proposal is submitted in good faith without fraud or collusion with any other bidder, that the information indicated in this document is true and complete, and that the bid is made in full accord with State law. Notice of acceptance may be sent to the undersigned at the address set forth below.

The Bidder also declares that a list of all proposed major subcontractors and suppliers will be submitted at a time subsequent to the receipt of bids as established by the Architect in the Bid Documents but in no event shall this time exceed twenty-four (24) hours after receipt of bids.

Legal Name of Bidder _____

Mailing Address _____
* By (Legal Signature) _____

* Name & Title (print) _____ (Seal)

Telephone Number _____

Email Address _____

* If other than the individual proprietor, or an above named member of the Partnership, or the above named president, vice-president, or secretary of the Corporation, attach written authority to bind the Bidder. Any modification to a bid shall be over the initials of the person signing the bid, or of an authorized representative.

Note: A completed DCM Form C-3A: Accounting of Sales Tax must be submitted with DCM Form C-3: Proposal Form. Submission of DCM Form C-3A is required, it is not optional. A proposal shall be rendered non-responsive if an Accounting of Sales Tax is not provided.

ACCOUNTING OF SALES TAX
Attachment to DCM Form C-3: Proposal Form

To: _____ Date: _____
(Awarding Authority)

NAME OF PROJECT:

SALES TAX ACCOUNTING

Pursuant to Act 2013-205, Section 1(g) the Contractor accounts for the sales tax NOT included in the bid proposal form as follows:

DESCRIPTION (Insert key word for Alternate)	ADD	DEDUCT	ESTIMATED SALES TAX AMOUNT
Base Bid:	N/A	N/A	$
Alternate No. 1 ( )	☐ (add)	☐ (deduct)	$
Alternate No. 2 ( )	☐ (add)	☐ (deduct)	$
Alternate No. 3 ( )	☐ (add)	☐ (deduct)	$
Alternate No. 4 ( )	☐ (add)	☐ (deduct)	$
Alternate No. 5 ( )	☐ (add)	☐ (deduct)	$
Alternate No. 6 ( )	☐ (add)	☐ (deduct)	$

Legal Name of Bidder _____

Mailing Address _____

By (Legal Signature) _____

Name (type or print) _____

Title _____

Telephone Number _____

Email Address _____

DCM Form C-3A: Accounting of Sales Tax must be submitted with DCM Form C-3: Proposal Form. This requirement applies to all proposers. If a contractor is not licensed by the Alabama State Licensing Board for General Contractors and therefore cannot claim the sales tax exemption under Ala. Code §40 9 14.1(b)(2), the contractor must still submit DCM Form C-3A with the proposal. Non-GC contractors must enter $0.00 in all fields on the Accounting of Sales Tax form. Failure to submit DCM Form C-3A will render the proposal non-responsive.

GENERAL CONDITIONS of the CONTRACT

CONTENTS **Page**

Article 1: DEFINITIONS 2
Article 2: INTENT and INTERPRETATION of the CONTRACT DOCUMENTS 4
Article 3: CONTRACTOR'S REPRESENTATIONS 5
Article 4: DOCUMENTS FURNISHED to CONTRACTOR 6
Article 5: OWNERSHIP of DRAWINGS 6
Article 6: SUPERVISION, SUPERINTENDENT, and EMPLOYEES 6
Article 7: REVIEW of CONTRACT DOCUMENTS and FIELD CONDITIONS by CONTRACTOR 7
Article 8: SURVEYS by CONTRACTOR 8
Article 9: SUBMITTALS 8
Article 10: DOCUMENTS and SAMPLES at the SITE 10
Article 11: "AS-BUILT" DOCUMENTS 11
Article 12: PROGRESS SCHEDULE 12
Article 13: EQUIPMENT, MATERIALS, and SUBSTITUTIONS 12
Article 14: SAFETY and PROTECTION of PERSONS and PROPERTY 13
Article 15: HAZARDOUS MATERIALS 14
Article 16: INSPECTION of the WORK 15
Article 17: CORRECTION of DEFECTIVE WORK 19
Article 18: DEDUCTIONS for UNCORRECTED WORK 19
Article 19: CHANGES in the WORK 19
Article 20: CLAIMS for EXTRA COST or EXTRA WORK 22
Article 21: DIFFERING SITE CONDITIONS 23
Article 22: CLAIMS for DAMAGES 23
Article 23: DELAYS 23
Article 24: RESOLUTION of CLAIMS and DISPUTES 24
Article 25: OWNER'S RIGHT to CORRECT DEFECTIVE WORK 25
Article 26: OWNER'S RIGHT to STOP or SUSPEND the WORK 26
Article 27: OWNER'S RIGHT to TERMINATE CONTRACT 26
Article 28: CONTRACTOR'S RIGHT to SUSPEND or TERMINATE the CONTRACT 29
Article 29: PROGRESS PAYMENTS 29
Article 30: CERTIFICATION and APPROVALS for PAYMENT 31
Article 31: PAYMENTS WITHHELD 32
Article 32: SUBSTANTIAL COMPLETION 33
Article 33: OCCUPANCY or USE PRIOR to COMPLETION 34
Article 34: FINAL PAYMENT 35
Article 35: CONTRACTOR'S WARRANTY 37
Article 36: INDEMNIFICATION AGREEMENT 39
Article 37: CONTRACTOR'S and SUBCONTRACTORS' INSURANCE 39
Article 38: PERFORMANCE and PAYMENT BONDS 43
Article 39: ASSIGNMENT 44
Article 40: CONSTRUCTION by OWNER or SEPARATE CONTRACTORS 44
Article 41: SUBCONTRACTS 46
Article 42: ARCHITECT'S STATUS 46
Article 43: CASH ALLOWANCES 48
Article 44: PERMITS, LAWS, and REGULATIONS 48
Article 45: ROYALTIES, PATENTS, and COPYRIGHTS 50

Article 46: USE of the SITE 50
Article 47: CUTTING and PATCHING 50
Article 48: IN-PROGRESS and FINAL CLEANUP 51
Article 49: LIQUIDATED DAMAGES 52
Article 50: USE of FOREIGN MATERIALS 52
Article 51: PROJECT SIGN 53

Article 1
DEFINITIONS

Whenever the following terms, or pronouns in place of them, are used in the Contract Documents, the intent and meaning shall be interpreted as follows:

A. ALABAMA DIVISION OF CONSTRUCTION MANAGEMENT: The Technical Staff of the Alabama Division of Construction Management.

B. ARCHITECT: The Architect is the person or entity lawfully licensed to practice architecture in the State of Alabama, who is under contract with the Owner as the primary design professional for the Project and identified as the Architect in the Construction Contract. The term "Architect" means the Architect or the Architect's authorized representative. If the employment of the Architect is terminated, the Owner shall employ a new Architect whose status under the Contract Documents shall be that of the former Architect. If the primary design professional for the Project is a Professional Engineer, the term "Engineer" shall be substituted for the term "Architect" wherever it appears in this document.

C. COMMISSION: The former Alabama Building Commission, for which the Alabama Division of Construction Management has been designated by the Legislature as its successor.

D. CONTRACT: The Contract is the embodiment of the Contract Documents. The Contract represents the entire and integrated agreement between the Owner and Contractor and supersedes any prior written or oral negotiations, representations or agreements that are not incorporated into the Contract Documents. The Contract may be amended only by a Contract Change Order or a Modification to the Construction Contract. The contractual relationship which the Contract creates between the Owner and the Contractor extends to no other persons or entities. The Contract consists of the following Contract Documents, including all additions, deletions, and modifications incorporated therein before the execution of the Construction Contract:

(1) Construction Contract
(2) Performance and Payment Bonds
(3) Conditions of the Contract (General, Supplemental, and other Conditions)
(4) Specifications
(5) Drawings
(6) Contract Change Orders
(7) Modifications to the Construction Contract (applicable to PSCA Projects)

E. CONTRACT SUM: The Contract Sum is the total amount payable by the Owner to the Contractor for performance of the Work under the Contract Documents. The term "Contract Sum" means the Contract Sum stated in the Construction Contract as may have been increased or decreased by Change Order(s) in accordance with the Contract Documents.

F. CONTRACT TIME: The Contract Time is the period of time in which the Contractor must achieve

Substantial Completion of the Work. The date on which the Contract Time begins is specified in the written Notice To Proceed issued to the Contractor by the Owner or Director. The Date of Substantial Completion is the date established in accordance with Article 32. The term "Contract Time" means the Contract Time stated in the Construction Contract as may have been extended by Change Order(s) in accordance with the Contract Documents. The term "day" as used in the Contract Documents shall mean calendar day unless otherwise specifically defined.

G. CONTRACTOR: The Contractor is the person or persons, firm, partnership, joint venture, association, corporation, cooperative, limited liability company, or other legal entity, identified as such in the Construction Contract. The term "Contractor" means the Contractor or the Contractor's authorized representative.

H. DCM: The Alabama Division of Construction Management.

I. DCM PROJECT INSPECTOR: The member of the Technical Staff of the Alabama Division of Construction Management to whom the Project is assigned relative to executing the respective inspections and authorities described in Article 16, Inspection of the Work.

J. DEFECTIVE WORK: The term "Defective Work" shall apply to: **(1)** any product, material, system, equipment, or service, or its installation or performance, which does not conform to the requirements of the Contract Documents, **(2)** in-progress or completed Work the workmanship of which does not conform to the quality specified or, if not specified, to the quality produced by skilled workers performing work of a similar nature on similar projects in the state, **(3) s**ubstitutions and deviations not properly submitted and approved or otherwise authorized, **(4)** temporary supports, structures, or construction which will not produce the results required by the Contract Documents, and **(5)** materials or equipment rendered unsuitable for incorporation into the Work due to improper storage or protection.

K. DIRECTOR: The Director of the Alabama Division of Construction Management.

L. DRAWINGS: The Drawings are the portions of the Contract Documents showing graphically the design, location, layout, and dimensions of the Work, in the form of plans, elevations, sections, details, schedules, and diagrams.

M. NOTICE TO PROCEED: A proceed order issued by the Owner or Director, as applicable, fixing the date on which the Contractor shall begin the prosecution of the Work, which is also the date on which the Contract Time shall begin.

N.1 OWNER: The Owner is the entity or entities identified as such in the Construction Contract and is referred to throughout the Contract Documents as if singular in number. The term "Owner" means the Owner or the Owner's authorized representative. The term "Owner" as used herein shall be synonymous with the term "Awarding Authority".

N.2 AWARDING AUTHORITY: §39-2-1 (1) of the Code of Alabama, 1975, as amended definition: Any governmental board, commission, agency, body, authority, instrumentality, department, or subdivision of the state, its counties and municipalities. This term includes, but shall not be limited to, the Department of Transportation, the Division of Real Property Management of the Department of Finance, the State Board of Education, and any other entity contracting for public works. This term shall exclude the State Docks Department and any entity exempted from the competitive bid laws of the state by statute.

O. THE PROJECT: The Project is the total construction of which the Work required by these Contract Documents may be the entirety or only a part with other portions to be constructed by the Owner or separate contractors.

P. PROJECT MANUAL: The Project Manual is the volume usually assembled for the Work which may include the Advertisement for Bids, Instructions to Bidders, sample forms, General Conditions of the Contract, Supplementary Conditions, and Specifications of the Work.

Q. SPECIFICATIONS: The Specifications are that portion of the Contract Documents which set forth in writing the standards of quality and performance of products, equipment, materials, systems, and services and workmanship required for acceptable performance of the Work.

R. SUBCONTRACTOR: A Subcontractor is a person or entity who is undertaking the performance of any part of the Work by virtue of a contract with the Contractor. The term "Subcontractor" means a Subcontractor or its authorized representatives.

S. THE WORK: The Work is the construction and services required by the Contract Documents and includes all labor, materials, supplies, equipment, and other items and services as are necessary to produce the required construction and to fulfill the Contractor's obligations under the Contract. The Work may constitute the entire Project or only a portion of it.

Article 2
INTENT and INTERPRETATION of the CONTRACT DOCUMENTS

A. INTENT

It is the intent of the Contract Documents that the Contractor shall properly execute and complete the Work described by the Contract Documents, and unless otherwise provided in the Contract, the Contractor shall provide all labor, materials, equipment, tools, construction equipment and machinery, water, heat, utilities, transportation, and other facilities and services, whether temporary or permanent and whether or not incorporated or to be incorporated in the Work, in full accordance with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

B. COMPLEMENTARY DOCUMENTS

The Contract Documents are complementary. If Work is required by one Contract Document, the Contractor shall perform the Work as if it were required by all of the Contract Documents. However, the Contractor shall be required to perform Work only to the extent that is consistent with the Contract Documents and reasonably inferable from them as being necessary to produce the indicated results.

C. ORDER of PRECEDENCE

Should any discrepancy arise between the various elements of the Contract Documents, precedence shall be given to them in the following order unless to do so would contravene the apparent Intent of the Contract Documents stated in preceding Paragraph A:

(1) The Construction Contract.
(2) Addenda, with those of later date having precedence over those of earlier date.
(3) Supplementary Conditions (or other Conditions which modify the General Conditions of the Contract).
(4) General Conditions of the Contract.

(5) The Specifications.
(6) Details appearing on the Drawings; large scale details shall take precedence over smaller scale details.
(7) The Drawings; large scale drawings shall take precedence over smaller scale drawings.

D. ORGANIZATION

Except as may be specifically stated within the technical specifications, neither the organization of the Specifications into divisions, sections, or otherwise, nor any arrangement of the Drawings shall control how the Contractor subcontracts portions of the Work or assigns Work to any trade.

E. INTERPRETATION

(1) The Contract Documents shall be interpreted collectively, each part complementing the others and consistent with the Intent of the Contract Documents stated in preceding Paragraph A. Unless an item shown or described in the Contract Documents is specifically identified to be furnished or installed by the Owner or others or is identified as "Not In Contract" ("N.I.C."), the Contractor's obligation relative to that item shall be interpreted to include furnishing, assembling, installing, finishing, and/or connecting the item at the Contractor's expense to produce a product or system that is complete, appropriately tested, and in operative condition ready for use or subsequent construction or operation of the Owner or separate contractors. The omission of words or phases for brevity of the Contract Documents, the inadvertent omission of words or phrases, or obvious typographical or written errors shall not defeat such interpretation as long as it is reasonably inferable from the Contract Documents as a whole.

(2) Words or phrases used in the Contract Documents which have well-known technical or construction industry meanings are to be interpreted consistent with such recognized meanings unless otherwise indicated.

(3) Except as noted otherwise, references to standard specifications or publications of associations, bureaus, or organizations shall mean the latest edition of the referenced standard specification or publication as of the date of the Advertisement for Bids.

(4) In the case of inconsistency between Drawings and Specifications or within either document not clarified by addendum, the better quality or greater quantity of Work shall be provided in accordance with the Architect's interpretation.

(5) Any portions of the Contract Documents written in longhand must be initialed by all parties.

(6) Any doubt as to the meaning of the Contract Documents or any obscurity as to the wording of them, shall be promptly submitted in writing to the Architect for written interpretation, explanation, or clarification.

F. SEVERABILITY

The partial or complete invalidity of any one or more provision of this Contract shall not affect the validity or continuing force and effect of any other provision.

Article 3
CONTRACTOR'S REPRESENTATIONS

By executing the Construction Contract the Contractor represents to the Owner:

A. The Contractor has visited the site of the Work to become familiar with local conditions under which the Work is to be performed and to evaluate reasonably observable conditions as compared with requirements of the Contract Documents.

B. The Contractor shall use its best skill and attention to perform the Work in an expeditious manner consistent with the Contract Documents.

C. The Contractor is an independent contractor and in performance of the Contract remains and shall act as an independent contractor having no authority to represent or obligate the Owner in any manner unless authorized by the Owner in writing.

Article 4
DOCUMENTS FURNISHED to CONTRACTOR

Unless otherwise provided in the Contract Documents, twenty sets of Drawings and Project Manuals will be furnished to the Contractor by the Architect without charge. Other copies requested will be furnished at reproduction cost.

Article 5
OWNERSHIP of DRAWINGS

All original or duplicated Drawings, Specifications, and other documents prepared by the Architect, and furnished to the Contractor are the property of the Architect and are to be used solely for this Project and not to be used in any manner for other work. Upon completion of the Work, all copies of Drawings and Specifications, with the exception of the Contractor's record set, shall be returned or accounted for by the Contractor to the Architect, on request.

Article 6
SUPERVISION, SUPERINTENDENT, and EMPLOYEES

A. SUPERVISION and CONSTRUCTION METHODS

(1) The term "Construction Methods" means the construction means, methods, techniques, sequences, and procedures utilized by the Contractor in performing the Work. The Contractor is solely responsible for supervising and coordinating the performance of the Work, including the selection of Construction Methods, unless the Contract Documents give other specific instructions concerning these matters.

(2) The Contractor is solely and completely responsible for job site safety, including the protection of persons and property in accordance with Article 14.

(3) The Contractor shall be responsible to the Owner for acts and omissions of not only the Contractor and its agents and employees, but all persons and entities, and their agents and employees, who are performing portions of the Work for or on behalf of the Contractor or any of its Subcontractors.

(4) The Contractor shall be responsible to inspect the in-progress and completed Work to verify its compliance with the Contract Documents and to insure that any element or portion of the Work upon which subsequent Work is to be applied or performed is in proper condition to receive the subsequent

Work.

B. SUPERINTENDENT

(1) The Contractor shall employ and maintain a competent level of supervision for the performance of the Work at the Project site, including a superintendent who shall:

(a) have full authority to receive instructions from the Architect or Owner and to act on those instructions and **(b)** be present at the Project site at all times during which Work is being performed.

(2) Before beginning performance of the Work, the Contractor shall notify the Architect in writing of the name and qualifications of its proposed superintendent so that the Owner may review the individual's qualifications. If, for reasonable cause, the Owner refuses to approve the individual, or withdraws its approval after once giving it, the Contractor shall name a different superintendent for the Owner's review and approval. Any disapproved superintendent will not perform in that capacity thereafter at the Project site.

C. EMPLOYEES

The Contractor shall permit only fit and skilled persons to perform the Work. The Contractor shall enforce safety procedures, strict discipline, and good order among persons performing the Work. The Contractor will remove from its employment on the Project any person who deliberately or persistently produces non-conforming Work or who fails or refuses to conform to reasonable rules of personal conduct contained in the Contract Documents or implemented by the Owner and delivered to the Contractor in writing during the course of the Work.

Article 7
REVIEW of CONTRACT DOCUMENTS and FIELD CONDITIONS by CONTRACTOR

A. In order to facilitate assembly and installation of the Work in accordance with the Contract Documents, before starting each portion of the Work, the Contractor shall examine and compare the relevant Contract Documents, and compare them to relevant field measurements made by the Contractor and any conditions at the site affecting that portion of the Work.

B. If the Contractor discovers any errors, omissions, or inconsistencies in the Contract Documents, the Contractor shall promptly report them to the Architect as a written request for information that includes a detailed statement identifying the specific Drawings or Specifications that are in need of clarification and the error, omission, or inconsistency discovered in them.

(1) The Contractor shall not be expected to act as a licensed design professional and ascertain whether the Contract Documents comply with applicable laws, statutes, ordinances, building codes, and rules and regulations, but the Contractor shall be obligated to promptly notify the Architect of any such noncompliance discovered by or made known to the Contractor. If the Contractor performs Work without fulfilling this notification obligation, the Contractor shall pay the resulting costs and damages that would have been avoided by such notification.

(2) The Contractor shall not be liable to the Owner for errors, omissions, or inconsistencies that may exist in the Contract Documents, or between the Contract Documents and conditions at the site, unless the Contractor knowingly fails to report a discovered error, omission, or inconsistency to the Architect, in which case the Contractor shall pay the resulting costs and damages that would have

been avoided by such notification.

C. If the Contractor considers the Architect's response to a request for information to constitute a change to the Contract Documents involving additional costs and/or time, the Contractor shall follow the procedures of Article 20, Claims for Extra Cost or Extra Work.

D. If, with undue frequency, the Contractor requests information that is obtainable through reasonable examination and comparison of the Contract Documents, site conditions, and previous correspondence, interpretations, or clarifications, the Contractor shall be liable to the Owner for reasonable charges from the Architect for the additional services required to review, research, and respond to such requests for information.

Article 8
SURVEYS by CONTRACTOR

A. The Contractor shall provide competent engineering services to assure accurate execution of the Work in accordance with the Contract Documents. The Contractor shall verify the figures given for the contours, approaches and locations shown on the Drawings before starting any Work and be responsible for the accuracy of the finished Work. Without extra cost to the Owner, the Contractor shall engage a licensed surveyor if necessary to verify boundary lines, keep within property lines, and shall be responsible for encroachments on rights or property of public or surrounding property owners.

B. The Contractor shall establish all base lines for the location of the principal components of the Work and make all detail surveys necessary for construction, including grade stakes, batter boards and other working points, lines and elevations. If the Work involves alteration of or addition to existing structures or improvements, the Contractor shall locate and measure elements of the existing conditions as is necessary to facilitate accurate fabrication, assembly, and installation of new Work in the relationship, alignment, and/or connection to the existing structure or improvement as is shown in the Contract Documents.

Article 9
SUBMITTALS

A. Where required by the Contract Documents, the Contractor shall submit shop drawings, product data, samples and other information (hereinafter referred to as Submittals) to the Architect for the purpose of demonstrating the way by which the Contractor proposes to conform to the requirements of the Contract Documents. Submittals which are not required by the Contract Documents may be returned by the Architect without action.

B. The Contractor shall be responsible to the Owner for the accuracy of its Submittals and the conformity of its submitted information to the requirements of the Contract Documents. Each Submittal shall bear the Contractor's approval, evidencing that the Contractor has reviewed and found the information to be in compliance with the requirements of the Contract Documents. Submittals which are not marked as reviewed and approved by the Contractor may be returned by the Architect without action.

C. The Contractor shall prepare and deliver its submittals to the Architect sufficiently in advance of construction requirements and in a sequence as to cause no delay in the Work or in the activities of

the Owner or of separate contractors. In coordinating the Submittal process with its construction schedule, the Contractor shall allow sufficient time to permit adequate review by the Architect.

D. By approving a Submittal the Contractor represents not only that the element of Work presented in the Submittal complies with the requirements of the Contract Documents, but also that the Contractor has:

(1) found the layout and/or dimensions in the Submittal to be comparable with those in the Contract Documents and other relevant Submittals and has made field measurements as necessary to verify their accuracy, and
(2) determined that products, materials, systems, equipment and/or procedures presented in the Submittal are compatible with those presented, or being presented, in other relevant Submittals and with the Contractor's intended Construction Methods.

E. The Contractor shall not fabricate or perform any portion of the Work for which the Contract Documents require Submittals until the respective Submittals have been approved by the Architect.

F. In the case of a resubmission, the Contractor shall direct specific attention to all revisions in a Submittal. The Architect's approval of a resubmission shall not apply to any revisions that were not brought to the Architect's attention.

G. If the Contract Documents specify that a Submittal is to be prepared and sealed by a registered architect or licensed engineer retained by the Contractor, all drawings, calculations, specifications, and certifications of the Submittal shall bear the Alabama seal of registration and signature of the registered/licensed design professional who prepared them or under whose supervision they were prepared. The Owner and the Architect shall be entitled to rely upon the adequacy, accuracy and completeness of such a Submittal, provided that all performance and design criteria that such Submittal must satisfy are sufficiently specified in the Contract Documents. The Architect will review, approve or take other appropriate action on such a Submittal 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 or design criteria specified in the Contract Documents.

H. DEVIATIONS

(1) The Architect is authorized by the Owner to approve "minor" deviations from the requirements of the Contract Documents. "Minor" deviations are defined as those which are in the interest of the Owner, do not materially alter the quality or performance of the finished Work, and do not affect the cost or time of performance of the Work. Deviations which are not "minor" may be authorized only by the Owner through the Change Order procedures of Article 19.

(2) Any deviation from the requirements of the Contract Documents contained in a Submittal shall be clearly identified as a "Deviation from Contract Requirements" (or by similar language) within the Submittal and, in a letter transmitting the Submittal to the Architect, the Contractor shall direct the Architect's attention to, and request specific approval of, the deviation. Otherwise, the Architect's approval of a Submittal does not constitute approval of deviations from the requirements of the Contract Documents contained in the Submittal.

(3) The Contractor shall bear all costs and expenses of any changes to the Work, changes to work performed by the Owner or separate contractors, or additional services by the Architect required to accommodate an approved deviation unless the Contractor has specifically informed the Architect in

writing of the required changes and a Change Order has been issued authorizing the deviation and accounting for such resulting changes and costs.

I. ARCHITECT'S REVIEW and APPROVAL

(1) The Architect will review the Contractor's Submittals for conformance with requirements of, and the design concept expressed in, the Contract Documents and will approve or take other appropriate action upon them. This review is not intended to verify the accuracy and completeness of details such as dimensions and quantities nor to substantiate installation instructions or performance of equipment or systems, all of which remain the responsibility of the Contractor. However, the Architect shall advise the Contractor of any errors or omissions which the Architect may detect during this review. The Architect's approval of a specific item shall not indicate approval of an assembly of which the item is a component.

(2) The Architect will review and respond to all Submittals with reasonable promptness to avoid delay in the Work or in the activities of the Owner, Contractor or separate contractors, while allowing sufficient time to permit adequate review.

(3) No corrections or changes to Submittals indicated by the Architect will be considered as authorizations to perform Extra Work. If the Contractor considers such correction or change of a Submittal to require Work which differs from the requirements of the Contract Documents, the Contractor shall promptly notify the Architect in writing in accordance with Article 20, Claims for Extra Cost or Extra Work.

J. CONFORMANCE with SUBMITTALS

The Work shall be constructed in accordance with approved Submittals.

Article 10
DOCUMENTS and SAMPLES at the SITE

A. "AS ISSUED" SET

The Contractor shall maintain at the Project site, in good order, at least one copy of all Addenda, Change Orders, supplemental drawings, written directives and clarifications, and approved Submittals intact as issued, and an updated construction schedule.

B. "POSTED" SET

The Contractor shall maintain at the Project site, in good order, at least one set of the Drawings and Project Manual into which the Contractor has "posted"(incorporated) all Addenda, Change Orders, supplemental drawings, clarifications, and other information pertinent to the proper performance of the Work. The Contractor shall assure that all sets of the Drawings and Project Manuals being used by the Contractor, Subcontractors, and suppliers are "posted" with the current information to insure that updated Contract Documents are used for performance of the Work.

C. RECORD SET

One set of the Drawings and Project Manual described in Paragraph B shall be the Contractor's record set in which the Contractor shall record all field changes, corrections, selections, final locations, and other information as will be duplicated on the "As-built" documents required under Article 11. The

Contractor shall record such "as-built" information in its record set as it becomes available through progress of the Work. The Contractor's performance of this requirement shall be subject to confirmation by the Architect at any time as a prerequisite to approval of Progress Payments.

D. AVAILABILITY

The documents and samples required by this Article to be maintained at the Project site shall be readily available to the Architect, Owner, DCM Project Inspector, and their representatives.

Article 11
"AS-BUILT" DOCUMENTS

A. Unless otherwise provided in the Contract Documents, the Contractor shall deliver two (2) sets of "As-built" documents, as described herein, to the Architect for submission to the Owner upon completion of the Work. Each set of "As-built' documents shall consist of a copy of the Drawings and Project Manual, in like-new condition, into which the Contractor has neatly incorporated all Addenda, Change Orders, supplemental drawings, clarifications, field changes, corrections, selections, actual locations of underground utilities, and other information as required herein or specified elsewhere in the Contract Documents.

B. The Contractor shall use the following methods for incorporating information into the "As-built" documents:

(1) Drawings

(a) To the greatest extent practicable, information shall be carefully drawn and lettered, in ink, on the Drawings in the form of sketches, details, plans, notes, and dimensions as required to provide a fully dimensioned record of the Work. When required for clarity, sketches, details, or partial plans shall be drawn on supplemental sheets and bound into the Drawings and referenced on the drawing being revised.

(b) Where a revised drawing has been furnished by the Architect, the drawing of latest date shall be bound into the Drawings in the place of the superseded drawing.

(c) Where a supplemental drawing has been furnished by the Architect, the supplemental drawing shall be bound into the Drawings in an appropriate location and referred to by notes added to the drawing being supplemented.

(d) Where the Architect has furnished details, partial plans, or lengthy notes of which it would be impractical for the Contractor to redraw or letter on a drawing, such information may be affixed to the appropriate drawing with transparent tape if space is available on the drawing.

(e) Any entry of information made in the Drawings that is the result of an Addendum or Change Order, shall identify the Addendum or Change Order from which it originated.

(2) Project Manual

(a) A copy of all Addenda and Change Orders, excluding drawings thereof, shall be bound in the front of the Project Manual.

(b) Where a document, form, or entire specification section is revised, the latest issue shall be bound into the Project Manual in the place of the superseded issue.

(c) Where information within a specification section is revised, the deleted or revised information shall be drawn through in ink and an adjacent note added identifying the Addendum or Change Order containing the revised information.

C. Within ten days after the Date of Substantial Completion of the Work, or the last completed portion

of the Work, the Contractor shall submit the "As-built" documents to the Architect for approval. If the Architect requires that any corrections be made, the documents will be returned in a reasonable time for correction and resubmission.

Article 12
PROGRESS SCHEDULE

(Not applicable if the Contract Time is 60 days or less.)

A. The Contractor shall within fifteen days after the date of commencement stated in the Notice to Proceed, or such other time as may be provided in the Contract Documents, prepare and submit to the Architect for review and approval a practicable construction schedule informing the Architect and Owner of the order in which the Contractor plans to carry on the Work within the Contract Time. The Architect's review and approval of the Contractor's construction schedule shall be only for compliance with the specified format, Contract Time, and suitability for monitoring progress of the Work and shall not be construed as a representation that the Architect has analyzed the schedule to form opinions of sequences or durations of time represented in the schedule.

B. If a schedule format is not specified elsewhere in the Contract Documents, the construction schedule shall be prepared using DCM Form C-11, "Sample Progress Schedule and Report", (contained in the Project Manual) or similar format of suitable scale and detail to indicate the percentage of Work scheduled to be completed at the end of each month. At the end of each month the Contractor shall enter the actual percentage of completion on the construction schedule submit two copies to the Architect, and attach one copy to each copy of the monthly Application for Payment. The construction schedule shall be revised to reflect any agreed extensions of the Contract Time or as required by conditions of the Work.

C. If a more comprehensive schedule format is specified elsewhere in the Contract Documents or voluntarily employed by the Contractor, it may be used in lieu of DCM Form C-11.

D. The Contractor's construction schedule shall be used by the Contractor, Architect, and Owner to determine the adequacy of the Contractor's progress. The Contractor shall be responsible for maintaining progress in accordance with the currently approved construction schedule and shall increase the number of shifts, and/or overtime operations, days of work, and/or the amount of construction plant and equipment as may be necessary to do so. If the Contractor's progress falls materially behind the currently approved construction schedule and, in the opinion of the Architect or Owner, the Contractor is not taking sufficient steps to regain schedule, the Architect may, with the Owner's concurrence, issue the Contractor a Notice to Cure pursuant to Article 27. In such a Notice to Cure the Architect may require the Contractor to submit such supplementary or revised construction schedules as may be deemed necessary to demonstrate the manner in which schedule will be regained.

Article 13
EQUIPMENT, MATERIALS, and SUBSTITUTIONS

A. Every part of the Work shall be executed in a workmanlike manner in accordance with the Contract Documents and approved Submittals. All materials used in the Work shall be furnished in sufficient quantities to facilitate the proper and expeditious execution of the Work and shall be new except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise.

B. Whenever a product, material, system, item of equipment, or service is identified in the Contract Documents by reference to a trade name, manufacturer's name, model number, etc.(hereinafter referred to as "source"), and only one or two sources are listed, or three or more sources are listed and followed by "or approved equal" or similar wording, it is intended to establish a required standard of performance, design, and quality, and the Contractor may submit, for the Architect's approval, products, materials, systems, equipment, or services of other sources which the Contractor can prove to the Architect's satisfaction are equal to, or exceed, the standard of performance, design and quality specified, unless the provisions of Paragraph D below apply. Such proposed substitutions are not to be purchased or installed without the Architect's written approval of the substitution.

C. If the Contract Documents identify three or more sources for a product, material, system, item of equipment or service to be used and the list of sources is not followed by "or approved equal" or similar wording, the Contractor may make substitution only after evaluation by the Architect and execution of an appropriate Contract Change Order.

D. If the Contract Documents identify only one source and expressly provide that it is an approved sole source for the product, material, system, item of equipment, or service, the Contractor must furnish the identified sole source.

Article 14
SAFETY and PROTECTION of PERSONS and PROPERTY

A. The Contractor shall be solely and completely responsible for conditions at the Project site, including safety of all persons (including employees) and property. The Contractor shall create, maintain, and supervise conditions and programs to facilitate and promote safe execution of the Work, and shall supervise the Work with the attention and skill required to assure its safe performance. Safety provisions shall conform to OSHA requirements and all other federal, state, county, and local laws, ordinances, codes, and regulations. Where any of these are in conflict, the more stringent requirement shall be followed. Nothing contained in this Contract shall be construed to mean that the Owner has employed the Architect nor has the Architect employed its consultants to administer, supervise, inspect, or take action regarding safety programs or conditions at the Project site.

B. The Contractor shall employ Construction Methods, safety precautions, and protective measures that will reasonably prevent damage, injury or loss to:

(1) workers and other persons on the Project site and in adjacent and other areas that may be affected by the Contractor's operations;

(2) the Work and materials and equipment to be incorporated into the Work and stored by the Contractor on or off the Project site; and

(3) other property on, or adjacent to, the Project site, including trees, shrubs, lawns, walks, pavements, roadways, structures, utilities, and other improvements not designated in the Contract Documents to be removed, relocated, or replaced.

C. The Contractor shall be responsible for the prompt remedy of damage and loss to property, including the filing of appropriate insurance claims, caused in whole or in part by the fault or negligence of the Contractor, a Subcontractor, or anyone for whose acts they may be liable.

D. The Contractor shall comply with and give notices required by applicable laws, ordinances, rules,

regulations and lawful orders of public authorities bearing on safety and protection of persons or property, including without limitation notices to adjoining property owners of excavation or other construction activities that potentially could cause damage or injury to adjoining property or persons thereon.

E. The Contractor shall erect and maintain barriers, danger signs, and any other reasonable safeguards and warnings against hazards as may be required for safety and protection during performance of the Contract and shall notify owners and users of adjacent sites and utilities of conditions that may exist or arise which may jeopardize their safety.

F. If use or storage of explosives or other hazardous materials or equipment or unusual Construction Methods are necessary for execution of the Work, the Contractor shall exercise commensurate care and employ supervisors and workers properly qualified to perform such activity.

G. The Contractor shall furnish a qualified safety representative at the Project site whose duties shall include the prevention of accidents. The safety representative shall be the Contractor's superintendent, unless the Contractor assigns this duty to another responsible member of its on-site staff and notifies the Owner and Architect in writing of such assignment.

H. The Contractor shall not permit a load to be applied, or forces introduced, to any part of the construction or site that may cause damage to the construction or site or endanger safety of the construction, site, or persons on or near the site.

I. The Contractor shall have the right to act as it deems appropriate in emergency situations jeopardizing life or property. The Contractor shall be entitled to equitable adjustment of the Contract Sum or Contract Time for its efforts expended for the sole benefit of the Owner in an emergency. Such adjustment shall be determined as provided in Articles 19 and 20.

J. The duty of the Architect and the Architect's consultants to visit the Project site to conduct periodic inspections of the Work or for other purposes shall not give rise to a duty to review or approve the adequacy of the Contractor's safety program, safety supervisor, or any safety measure which Contractor takes or fails to take in, on, or near the Project site.

Article 15
HAZARDOUS MATERIALS

A. A Hazardous Material is any substance or material identified as hazardous under any federal, state, or local law or regulation, or any other substance or material which may be considered hazardous or otherwise subject to statutory or regulatory requirements governing its handling, disposal, and/or clean-up. Existing Hazardous Materials are Hazardous Materials discovered at the Project site and not introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable.

B. If, during the performance of the Work, the Contractor encounters a suspected Existing Hazardous Material, the Contractor shall immediately stop work in the affected area, take measures appropriate to the condition to keep people away from the suspected Existing Hazardous Material, and immediately notify the Architect and Owner of the condition in writing.

C. The Owner shall obtain the services of an independent laboratory or professional consultant, appropriately licensed and qualified, to determine whether the suspected material is a Hazardous

Material requiring abatement and, if so, to certify after its abatement that it has been rendered harmless. Any abatement of Existing Hazardous Materials will be the responsibility of the Owner. The Owner will advise the Contractor in writing of the persons or entities who will determine the nature of the suspected material and those who will, if necessary, perform the abatement. The Owner will not employ persons or entities to perform these services to whom the Contractor or Architect has reasonable objection.

D. After certification by the Owner's independent laboratory or professional consultant that the material is harmless or has been rendered harmless, work in the affected area shall resume upon written agreement between the Owner and Contractor. If the material is found to be an Existing Hazardous Material and the Contractor incurs additional cost or delay due to the presence and abatement of the material, the Contract Sum and/or Contract Time shall be appropriately adjusted by a Contract Change Order pursuant to Article 19.

E. The Owner shall not be responsible for Hazardous Materials introduced to the Project site by the Contractor, a Subcontractor, or anyone for whose acts they may be liable unless such Hazardous Materials were required by the Contract Documents.

Article 16
INSPECTION of the WORK

A. GENERAL

(1) The Contractor is solely responsible for the Work's compliance with the Contract Documents; therefore, the Contractor shall be responsible to inspect in-progress and completed Work, and shall verify its compliance with the Contract Documents and that any element or portion of the Work upon which subsequent Work is to be applied or performed is in proper condition to receive the subsequent Work. Neither the presence nor absence of inspections by the Architect, Owner, Director, DCM Project Inspector, any public authority having jurisdiction, or their representatives shall relieve the Contractor of responsibility to inspect the Work, for responsibility for Construction Methods and safety precautions and programs in connection with the Work, or from any other requirement of the Contract Documents.

(2) The Architect, Owner, Director, DCM Project Inspector, any public authority having jurisdiction, and their representatives shall have access at all times to the Work for inspection whenever it is in preparation or progress, and the Contractor shall provide proper facilities for such access and inspection. All materials, workmanship, processes of manufacture, and methods of construction, if not otherwise stipulated in the Contract Documents, shall be subject to inspection, examination, and test at any and all places where such manufacture and/or construction are being carried on. Such inspections will not unreasonably interfere with the Contractor's operations.

(3) The Architect will inspect the Work as a representative of the Owner. The Architect's inspections may be supplemented by inspections by the DCM Project Inspector as a representative of the Alabama Division of Construction Management.

(4) The Contractor may be charged by the Owner for any extra cost of inspection incurred by the Owner or Architect on account of material and workmanship not being ready at the time of inspection set by the Contractor.

B. TYPES of INSPECTIONS

(1) SCHEDULED INSPECTIONS and CONFERENCES. Scheduled Inspections and Conferences are conducted by the Architect, scheduled by the Architect in coordination with the Contractor and DCM Project Inspector, and are attended by the Contractor and applicable Subcontractors, suppliers and manufacturers, and the DCM Project Inspector. Scheduled Inspections and Conferences of this Contract include:

(a) Pre-construction Conference.

(b) Pre-roofing Conference (not applicable if the Contract involves no roofing work)

(**c) Above Ceiling Inspection(s)**: An above ceiling inspection of all spaces in the building is required before the ceiling material is installed. Above ceiling inspections are to be conducted at a time when all above ceiling systems are complete and tested to the greatest extent reasonable pending installation of the ceiling material. System identifications and markings are to be complete. All fire-rated construction including fire-stopping of penetrations and specified identification above the ceiling shall be complete. Ceiling framing and suspension systems shall be complete with lights, grilles and diffusers, access panels, fire protection drops for sprinkler heads, etc., installed in their final locations to the greatest extent reasonable. Above ceiling framing to support ceiling mounted equipment shall be complete. The above ceiling construction shall be complete to the extent that after the inspection the ceiling material can be installed without disturbance.

(**d) Final Inspection(s):** A Final Inspection shall establish that the Work, or a designated portion of the Work, is Substantially Complete in accordance with Article 32 and is accepted by the Architect, Owner, and DCM Project Inspector as being ready for the Owner's occupancy or use. At the conclusion of this inspection, items requiring correction or completion ("punch list" items) shall be minimal and require only a short period of time for accomplishment to establish Final Acceptance of the Work. If the Work, or designated portion of the Work, includes the installation, or modification, of a fire alarm system or other life safety systems essential to occupancy, such systems shall have been tested and appropriately certified before the Final Inspection.

(**e) Year-end Inspection(s):** An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one year warranty period(s). The subsequent delivery of the Architect's report of this inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period in accordance with Article 35.

(2) PERIODIC INSPECTIONS. Periodic Inspections are conducted throughout the course of the Work by the Architect, the Architect's consultants, their representatives, and the DCM Project Inspector, jointly or independently, with or without advance notice to the Contractor.

(3) SPECIFIED INSPECTIONS and TESTS. Specified Inspections and Tests include inspections, tests, demonstrations, and approvals that are either specified in the Contract Documents or required by laws, ordinances, rules, regulations, or orders of public authorities having jurisdiction, to be performed by the Contractor, one of its Subcontractors, or an independent testing laboratory or firm (whether paid for by the Contractor or Owner).

C. INSPECTIONS by the ARCHITECT

(1) The Architect is not authorized to revoke, alter, relax, or waive any requirements of the Contract Documents (other than "minor" deviations as defined in Article 9 and "minor" changes as defined in Article 19), to finally approve or accept any portion of the Work or to issue instructions contrary to the Contract Documents without concurrence of the Owner.

(2) The Architect will visit the site at intervals appropriate to the stage of the Contractor's operations and as otherwise necessary to:

(a) become generally familiar with the in-progress and completed Work and the quality of the Work,

(b) determine whether the Work is progressing in general accordance with the Contractor's schedule and is likely to be completed within the Contract Time,

(c) visually compare readily accessible elements of the Work to the requirements of the Contract Documents to determine, in general, if the Contractor's performance of the Work indicates that the Work will conform to the requirements of the Contract Documents when completed,

(d) endeavor to guard the Owner against Defective Work,

(e) review and address with the Contractor any problems in implementing the requirements of the Contract Documents that the Contractor may have encountered, and

(f) keep the Owner fully informed about the Project.

(3) The Architect shall have the authority to reject Defective Work or require its correction, but shall not be required to make exhaustive investigations or examinations of the in-progress or completed portions of the Work to expose the presence of Defective Work. However, it shall be an obligation of the Architect to report in writing, to the Owner, Contractor, and DCM Project Inspector, any Defective Work recognized by the Architect.

(4) The Architect shall have the authority to require the Contractor to stop work only when, in the Architect's reasonable opinion, such stoppage is necessary to avoid Defective Work. The Architect shall not be liable to the Contractor or Owner for the consequences of any decisions made by the Architect in good faith either to exercise or not to exercise this authority.

(5) "Inspections by the Architect" includes appropriate inspections by the Architect's consultants as dictated by their respective disciplines of design and the stage of the Contractor's operations.

D. INSPECTIONS by the DCM PROJECT INSPECTOR

(1) The DCM Project Inspector will:

(a) participate in scheduled inspections and conferences as practicable,

(b) perform periodic inspections of in-progress and completed Work to ensure code compliance of the Project and general conformance of the Work with the Contract Documents, and

(c) monitor the Contractor's progress and performance of the Work.

(2) The DCM Project Inspector shall have the authority to:

(a) reject Work that is not in compliance with the State Building Code adopted by the DCM, unless the Work is in accordance with the Contract Documents in which case the DCM Project Inspector will advise the Architect to initiate appropriate corrective action, and

(b) notify the Architect, Owner, and Contractor of Defective Work recognized by the DCM Project Inspector.

(3) The DCM Project Inspector's periodic inspections will usually be scheduled around key stages of construction based upon information reported by the Architect. As the Architect or Owner deems appropriate, the DCM Project Inspector, as well as other members of the Technical Staff, can be requested to schedule special inspections or meetings to address specific matters. The written findings of DCM Project Inspector will be transmitted to the Owner, Contractor, and Architect.

(4) The DCM Project Inspector is not authorized to revoke, alter, relax, or waive any requirements

of the Contract Documents, to finally approve or accept any portion of the Work or to issue instructions contrary to the Contract Documents without concurrence of the Owner. The Contractor shall not proceed with Work as a result of instructions or findings of the DCM Project Inspector which the Contractor considers to be a change to the requirements of the Contract Documents without written authorization of the Owner through the Architect.

E. UNCOVERING WORK

(1) If the Contractor covers a portion of the Work before it is examined by the Architect and this is contrary to the Architect's request or specific requirements in the Contract Documents, then, upon written request of the Architect, the Work must be uncovered for the Architect's examination and be replaced at the Contractor's expense without change in the Contract Time.

(2) Without a prior request or specific requirement that Work be examined by the Architect before it is covered, the Architect may request that Work be uncovered for examination and the Contractor shall uncover it. If the Work is in accordance with the Contract Documents, the Contract Sum shall be equitably adjusted under Article 19 to compensate the Contractor for the costs of uncovering and replacement. If the Work is not in accordance with the Contract Documents, uncovering, correction, and replacement 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.

F. SPECIFIED INSPECTIONS and TESTS

(1) The Contractor shall schedule and coordinate Specified Inspections and Tests to be made at appropriate times so as not to delay the progress of the Work or the work of the Owner or separate contractors. If the Contract Documents require that a Specified Inspection or Test be witnessed or attended by the Architect or Architect's consultant, the Contractor shall give the Architect timely notice of the time and place of the Specified Inspection or Test. If a Specified Inspection or Test reveals that Work is not in compliance with requirements of the Contract Documents, the Contractor shall bear the costs of correction, repeating the Specified Inspection or Test, and any related costs incurred by the Owner, including reasonable charges, if any, by the Architect for additional services. Through appropriate Contract Change Order the Owner shall bear costs of tests, inspections or approvals which become Contract requirements subsequent to the receipt of bids.

(2) If the Architect, Owner, or public authority having jurisdiction determines that inspections, tests, demonstrations, or approvals in addition to Specified Inspections and Tests are required, the Contractor shall, upon written instruction from the Architect, arrange for their performance by an entity acceptable to the Owner, giving timely notice to the architect of the time and place of their performance. Related costs shall be borne by the Owner unless the procedures reveal that Work is not in compliance with requirements of the Contract Documents, in which case the Contractor shall bear the costs of correction, repeating the procedures, and any related costs incurred by the Owner, including reasonable charges, if any, by the Architect for additional services.

(3) Unless otherwise required by the Contract Documents, required certificates of Specified Inspections and Tests shall be secured by the Contractor and promptly delivered to the Architect.

(4) Failure of any materials to pass Specified Inspections and Tests will be sufficient cause for refusal to consider any further samples of the same brand or make of that material for use in the Work.

Article 17
CORRECTION of DEFECTIVE WORK

A. The Contractor shall, at the Contractor's expense, promptly correct Defective Work rejected by the Architect or which otherwise becomes known to the Contractor, removing the rejected or nonconforming materials and construction from the project site.

B. Correction of Defective Work shall be performed in such a timely manner as will avoid delay of completion, use, or occupancy of the Work and the work of the Owner and separate contractors.

C. The Contractor shall bear all expenses related to the correction of Defective Work, including but not limited to: **(1)** additional testing and inspections, including repeating Specified Inspections and Tests**, (2)** reasonable services and expenses of the Architect, and **(3)** the expense of making good all work of the Contractor, Owner, or separate contractors destroyed or damaged by the correction of Defective Work.

Article 18
DEDUCTIONS for UNCORRECTED WORK

If the Owner deems it advisable and in the Owner's interest to accept Defective Work, the Owner may allow part or all of such Work to remain in place, provided an equitable deduction from the Contract Sum, acceptable to the Owner, is offered by the Contractor.

Article 19
CHANGES in the WORK

A. GENERAL

(1) The Owner may at any time direct the Contractor to make changes in the Work which are within the general scope of the Contract, including changes in the Drawings, Specifications, or other portions of the Contract Documents to add, delete, or otherwise revise portions of the Work. The Architect is authorized by the Owner to direct "minor" changes in the Work by written order to the Contractor. "Minor" changes in the Work are defined as those which are in the interest of the Owner, do not materially alter the quality or performance of the finished Work, and do not affect the cost or time of performance of the Work. Changes in the Work which are not "minor" may be authorized only by the Owner.

(2) If the Owner directs a change in the Work, the change shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract, stating their agreement upon the change or changes in the Work and the adjustments, if any, in the Contract Sum and the Contract Time.

(3) Subject to compliance with Alabama's Public Works Law, the Owner may, upon agreement by the Contractor, incorporate previously unawarded bid alternates into the Contract.

(4) In the event of a claim or dispute as to the appropriate adjustment to the Contract Sum or Contract Time due to a directive to make changes in the Work, the Work shall proceed as provided in this article subject to subsequent agreement of the parties or final resolution of the dispute pursuant to Article 24.

(5) Consent of surety will be obtained for all Contract Change Orders involving an increase in the Contract Sum.

(6) Changes in the Work shall be performed under applicable provisions of the Contract Documents and the Contractor shall proceed promptly to perform changes in the Work, unless otherwise directed by the Owner through the Architect.

(7) All change orders require DCM Form C-12: Contract Change Order and DCM Form B-11: Change Order Justification. Only Change Orders 10% or greater of the current contract amount require the Owner's legal advisor's signature on DCM Form B-11: Change Order Justification.

B. DETERMINATION of ADJUSTMENT of the CONTRACT SUM

The adjustment of the Contract Sum resulting from a change in the Work shall be determined by one of the following methods, or a combination thereof, as selected by the Owner:

(1) Lump Sum. By mutual agreement to a lump sum based on or negotiated from an itemized cost proposal from the Contractor. Additions to the Contract Sum shall include the Contractor's direct costs plus a maximum 15% markup for overhead and profit. Where subcontract work is involved the total mark-up for the Contractor and a Subcontractor shall not exceed 25%. **Changes which involve a net credit to the Owner shall include fair and reasonable credits for overhead and profit on the deducted work, in no case less than 5%.** For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of bonds, superintendent and other job office personnel, watchman, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

(2) Unit Price. By application of Unit Prices included in the Contract or subsequently agreed to by the parties. However, if the character or quantity originally contemplated is materially changed so that application of such unit price to quantities of Work proposed will cause substantial inequity to either party, the applicable unit price shall be equitably adjusted.

(3) Force Account. By directing the Contractor to proceed with the change in the Work on a "force account" basis under which the Contractor shall be reimbursed for reasonable expenditures incurred by the Contractor and its Subcontractors in performing added Work and the Owner shall receive reasonable credit for any deleted Work. The Contractor shall keep and present, in such form as the Owner may prescribe, an itemized accounting of the cost of the change together with sufficient supporting data. Unless otherwise stated in the directive, the adjustment of the Contract Sum shall be limited to the following:

(a) costs of labor and supervision, including employee benefits, social security, retirement, unemployment and workers' compensation insurance required by law, agreement, or under Contractor's or Subcontractor's standard personnel policy;

(b) cost of materials, supplies and equipment, including cost of delivery, whether incorporated or consumed;

(c) rental cost of machinery and equipment, not to exceed prevailing local rates if contractor-owned;

(d) costs of premiums for insurance required by the Contract Documents, permit fees, and sales, use or similar taxes related to the change in the Work;

(e) reasonable credits to the Owner for the value of deleted Work, without Contractor or Subcontractor mark-ups; and

(f) for additions to the Contract Sum, mark-up of the Contractor's direct costs for overhead and profit not exceeding 15% on Contractor's work nor exceeding 25% for Contractor and Subcontractor on a Subcontractor's work. **Changes which involve a net credit to the Owner**

shall include fair and reasonable credits for overhead and profit on the deducted work, in no case less than 5%. For the purposes of this method of determining an adjustment of the Contract Sum, "overhead" shall cover the Contractor's indirect costs of the change, such as the cost of insurance other than mentioned above, bonds, superintendent and other job office personnel, watchman, use and rental of small tools, job office, job office supplies and expenses, temporary facilities and utilities, and home office expenses.

C. ADJUSTMENT of the CONTRACT TIME due to CHANGES

(1) Unless otherwise provided in the Contract Documents, the Contract Time shall be equitably adjusted for the performance of a change provided that the Contractor notifies the Architect in writing that the change will increase the time required to complete the Work. Such notice shall be provided no later than:

(a) with the Contractor's cost proposal stating the number of days of extension requested, or
(b) within ten days after the Contractor receives a directive to proceed with a change in advance of submitting a cost proposal, in which case the notice should provide an estimated number of days of extension to be requested, which may be subject to adjustment in the cost proposal.

(2) The Contract Time shall be extended only to the extent that the change affects the time required to complete the entire Work of the Contract, taking into account the concurrent performance of the changed and unchanged Work.

D. CHANGE ORDER PROCEDURES

(1) If the Owner proposes to make a change in the Work, the Architect will request that the Contractor provide a cost proposal for making the change to the Work. The request shall be in writing and shall adequately describe the proposed change using drawings, specifications, narrative, or a combination thereof. Within 21 days after receiving such a request, or such other time as may be stated in the request, the Contractor shall prepare and submit to the Architect a written proposal, properly itemized and supported by sufficient substantiating data to facilitate evaluation. The stated time within which the Contractor must submit a proposal may be extended if, within that time, the Contractor makes a written request with reasonable justification thereof.

(2) The Contractor may voluntarily offer a change proposal which, in the Contractor's opinion, will reduce the cost of construction, maintenance, or operation or will improve the cost-effective performance of an element of the Project, in which case the Owner, through the Architect, will accept, reject, or respond otherwise within 21 days after receipt of the proposal, or such other reasonable time as the Contractor may state in the proposal.

(3) If the Contractor's proposal is acceptable to the Owner, or is negotiated to the mutual agreement of the Contractor and Owner, the Architect will prepare an appropriate Contract Change Order for execution. Upon receipt of the fully executed Contract Change Order, the Contractor shall proceed with the change.

(4) In advance of delivery of a fully executed Contract Change Order, the Architect may furnish to the Contractor a written authorization to proceed with an agreed change. However, such an authorization shall be effective only if it:

(a) identifies the Contractor's accepted or negotiated proposal for the change,
(b) states the agreed adjustments, if any, in Contract Sum and Contract Time,
(c) states that funds are available to pay for the change, and
(d) is signed by the Owner.

(5) If the Contractor and Owner cannot agree on the amount of the adjustment in the Contract Sum for a change, the Owner, through the Architect, may order the Contractor to proceed with the change on a Force Account basis, but the net cost to the Owner shall not exceed the amount quoted in the Contractor's proposal. Such order shall state that funds are available to pay for the change.

(6) If the Contractor does not promptly respond to a request for a proposal, or the Owner determines that the change is essential to the final product of the Work and that the change must be effected immediately to avoid delay of the Project, the Owner may:

(a) determine with the Contractor a sufficient maximum amount to be authorized for the change and

(b) direct the Contractor to proceed with the change on a Force Account basis pending delivery of the Contractor's proposal, stating the maximum increase in the Contract Sum that is authorized for the change.

(7) Pending agreement of the parties or final resolution of any dispute of the total amount due the Contractor for a change in the Work, amounts not in dispute for such changes in the Work may be included in Applications for Payment accompanied by an interim Change Order indicating the parties' agreement with part of all of such costs or time extension. Once a dispute is resolved, it shall be implemented by preparation and execution of an appropriate Change Order.

Article 20
CLAIMS for EXTRA COST or EXTRA WORK

A. If the Contractor considers any instructions by the Architect, Owner, DCM Project Inspector, or public authority having jurisdiction to be contrary to the requirements of the Contract Documents and will involve extra work and/or cost under the Contract, the Contractor shall give the Architect written notice thereof within ten days after receipt of such instructions, and in any event before proceeding to execute such work. As used in this Article, "instructions" shall include written or oral clarifications, directions, instructions, interpretations, or determinations.

B. The Contractor's notification pursuant to Paragraph 20.A shall state: (1) the date, circumstances, and source of the instructions, **(2)** that the Contractor considers the instructions to constitute a change to the Contract Documents and why, and **(3)** an estimate of extra cost and time that may be involved to the extent an estimate may be reasonably made at that time.

C. Except for claims relating to an emergency endangering life or property, no claim for extra cost or extra work shall be considered in the absence of prior notice required under Paragraph 20.A.

D. Within ten days of receipt of a notice pursuant to Paragraph 20.A, the Architect will respond in writing to the Contractor, stating one of the following:

(1) The cited instruction is rescinded.

(2) The cited instruction is a change in the Work and in which manner the Contractor is to proceed with procedures of Article 19, Changes in the Work.

(3) The cited instruction is reconfirmed, is not considered by the Architect to be a change in the Contract Documents, and the Contractor is to proceed with Work as instructed.

E. If the Architect's response to the Contractor is as in Paragraph 20.D(3), the Contractor shall proceed

with the Work as instructed. If the Contractor continues to consider the instructions to constitute a change in the Contract Documents, the Contractor shall, within ten days after receiving the Architect's response, notify the Architect in writing that the Contractor intends to submit a claim pursuant to Article 24, Resolution of Claims and Disputes

Article 21
DIFFERING SITE CONDITIONS

A. DEFINITION

"Differing Site Conditions" are:

(1) subsurface or otherwise concealed physical conditions at the Project site which differ materially from those indicated in the Contract Documents, or

(2) unknown physical conditions at the Project site which are of an unusual nature, differing materially from conditions ordinarily encountered and generally recognized as inherent in construction activities of the character required by the Contract Documents.

B. PROCEDURES

If Differing Site Conditions are encountered, then the party discovering the condition shall promptly notify the other party before the condition is disturbed and in no event later than ten days after discovering the condition. Upon such notice and verification that a Differing Site Condition exists, the Architect will, with reasonable promptness and with the Owner's concurrence, make changes in the Drawings and/or Specifications as are deemed necessary to conform to the Differing Site Condition. Any increase or decrease in the Contract Sum or Contract Time that is warranted by the changes will be made as provided under Article 19, Changes in the Work. If the Architect determines a Differing Site Condition has not been encountered, the Architect shall notify the Owner and Contractor in writing, stating the reason for that determination.

Article 22
CLAIMS for DAMAGES

If either party to the Contract 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 after the discovery. The notice shall provide sufficient detail to enable the other party to investigate the matter.

Article 23
DELAYS

A. A delay beyond the Contractor's control at any time in the commencement or progress of Work by an act or omission of the Owner, Architect, or any separate contractor or by labor disputes, unusual delay in deliveries, unavoidable casualties, fires, abnormal floods, tornadoes, or other cataclysmic events of nature, may entitle the Contractor to an extension of the Contract Time provided, however, that the Contractor shall, within ten days after the delay first occurs, give written notice to the Architect of the cause of the delay and its probable effect on progress of the entire Work.

B. Adverse weather conditions that are more severe than anticipated for the locality of the Work during any given month may entitle the Contractor to an extension of Contract Time provided, however;

(1) the weather conditions had an adverse effect on construction scheduled to be performed during the period in which the adverse weather occurred, which in reasonable sequence would have an effect on completion of the entire Work,

(2) the Contractor shall, within twenty-one days after the end of the month in which the delay occurs, give the Architect written notice of the delay that occurred during that month and its probable effect on progress of the Work, and

(3) within a reasonable time after giving notice of the delay, the Contractor provides the Architect with sufficient data to document that the weather conditions experienced were unusually severe for the locality of the Work during the month in question. Unless otherwise provided in the Contract Documents, data documenting unusually severe weather conditions shall compare actual weather conditions to the average weather conditions for the month in question during the previous five years as recorded by the National Oceanic and Atmospheric Administration (NOAA) or similar record-keeping entities.

C. Adjustments, if any, of the Contract Time pursuant to this Article shall be incorporated into the Contract by a Contract Change Order prepared by the Architect and signed by the Contractor, Owner, and other signatories to the Construction Contract or, at closeout of the Contract, by mutual written agreement between the Contractor and Owner. The adjustment of the Contract Time shall not exceed the extent to which the delay extends the time required to complete the entire Work of the Contract.

D. The Contractor shall not be entitled to any adjustment of the Contract Sum for damage due to delays claimed pursuant to this Article unless the delay was caused by the Owner or Architect and was either:
(1) the result of bad faith or active interference or
(2) beyond the contemplation of the parties and not remedied within a reasonable time after notification by the Contractor of its presence.

Article 24
RESOLUTION of CLAIMS and DISPUTES

A. APPLICABILITY of ARTICLE

(1) As used in this Article, "Claims and Disputes" include claims or disputes asserted by the Contractor, its Surety, or Owner arising out of or related to the Contract, or its breach, including without limitation claims seeking, under the provisions of the Contract, equitable adjustment of the Contract Sum or Contract Time and claims and disputes arising between the Contractor (or its Surety) and Owner regarding interpretation of the Contract Documents, performance of the Work, or breach of or compliance with the terms of the Contract.

(2) "Resolution" addressed in this Article applies only to Claims and Disputes arising between the Contractor (or its Surety) and Owner and asserted after execution of the Construction Contract and prior to the date upon which final payment is made. Upon making application for final payment the Contractor may reserve the right to subsequent Resolution of existing Claims by including a list of all Claims, in stated amounts, which remain to be resolved and specifically excluding them from any release of claims executed by the Contractor, and in that event Resolution may occur after final payment is made.

B. CONTINUANCE of PERFORMANCE

An unresolved Claim or Dispute shall not be just cause for the Contractor to fail or refuse to proceed

diligently with performance of the Contract or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

C. GOOD FAITH EFFORT to SETTLE

The Contractor and Owner agree that, upon the assertion of a Claim by the other, they will make a good faith effort, with the Architect's assistance and advice, to achieve mutual resolution of the Claim. If mutually agreed, the Contractor and Owner may endeavor to resolve a Claim through mediation. If efforts to settle are not successful, the Claim shall be resolved in accordance with paragraph D or E below, whichever applies.

D FINAL RESOLUTION for STATE-FUNDED CONTRACTS

(1) If the Contract is funded in whole or in part with state funds, the final Resolution of Claims and Disputes which cannot be resolved by the Contractor (or its Surety) and Owner shall be by the Director, whose decision shall be final, binding, and conclusive upon the Contractor, its Surety, and the Owner.

(2) When it becomes apparent to the party asserting a Claim (the Claimant) that an impasse to mutual resolution has been reached, the Claimant may request in writing to the Director that the Claim be resolved by decision of the Director. Such request by the Contractor (or its Surety) shall be submitted through the Owner. Should the Owner fail or refuse to submit the Contractor's request within ten days of receipt of same, the Contractor may forward such request directly to the Director. Upon receipt of a request to resolve a Claim, the Director will instruct the parties as to procedures to be initiated and followed.

(3) If the respondent to a Claim fails or refuses to participate or cooperate in the Resolution procedures to the extent that the Claimant is compelled to initiate legal proceedings to induce the Respondent to participate or cooperate, the Claimant will be entitled to recover, and may amend its Claim to include, the expense of reasonable attorney's fees so incurred.

E. FINAL RESOLUTION for LOCALLY-FUNDED CONTRACTS

If the Contract is funded in whole with funds provided by a city or county board of education or other local governmental authority and the Contract Documents do not stipulate a binding alternative dispute resolution method, the final resolution of Claims and Disputes which cannot be resolved by the Contractor (or its Surety) and Owner may be by any legal remedy available to the parties. Alternatively, upon the written agreement of the Contractor (or its Surety) and the Owner, final Resolution of Claims and Disputes may be by submission to binding arbitration before a neutral arbitrator or panel or by submission to the Director in accordance with preceding Paragraph D.

Article 25
OWNER'S RIGHT to CORRECT DEFECTIVE WORK

If the Contractor fails or refuses to correct Defective Work in a timely manner that will avoid delay of completion, use, or occupancy of the Work or work by the Owner or separate contractors, the Architect may give the Contractor written Notice to Cure the Defective Work within a reasonable, stated time. If within ten days after receipt of the Notice to Cure the Contractor has not proceeded and satisfactorily continued to cure the Defective Work or provided the Architect with written verification that satisfactory positive action is in process to cure the Defective Work, the Owner may, without prejudice to any other

remedy available to the Owner, correct the Defective Work and deduct the actual cost of the correction from payment then or thereafter due to the Contractor.

Article 26
OWNER'S RIGHT to STOP or SUSPEND the WORK

A. STOPPING the WORK for CAUSE

If the Contractor fails to correct Defective Work or persistently fails to carry out Work in accordance with the Contract Documents, the Owner may direct the Contractor in writing to stop the Work, or any part of the Work, until the cause for the Owner's directive has been eliminated; however, the Owner's right to stop the Work shall not be construed as a duty of the Owner to be exercised for the benefit of the Contractor or any other person or entity.

B. SUSPENSION by the OWNER for CONVENIENCE

(1) The Owner may, at any time and without cause, direct the Contractor in writing to suspend, delay or interrupt the Work, or any part of the Work, for a period of time as the Owner may determine.

(2) The Contract Sum and Contract Time shall be adjusted, pursuant to Article 19, for reasonable increases in the cost and time caused by an Owner-directed suspension, delay or interruption of Work for the Owner's convenience. However, no adjustment to the Contract Sum shall be made to the extent that the same or concurrent Work is, was or would have been likewise suspended, delayed or interrupted for other reasons not caused by the Owner.

Article 27
OWNER'S RIGHT to TERMINATE CONTRACT

A. TERMINATION by the OWNER for CAUSE

(1) Causes: The Owner may terminate the Contractor's right to complete the Work, or any designated portion of the Work, if the Contractor:

(a) should be adjudged bankrupt, or should make a general assignment for the benefit of the Contractor's creditors, or if a receiver should be appointed on account of the Contractor's insolvency to the extent termination for these reasons is permissible under applicable law;

(b) refuses or fails to prosecute the Work, or any part of the Work, with the diligence that will insure its completion within the Contract Time, including any extensions, or fails to complete the Work within the Contract Time;

(c) refuses or fails to perform the Work, including prompt correction of Defective Work, in a manner that will insure that the Work, when fully completed, will be in accordance with the Contract Documents;

(d) fails to pay for labor or materials supplied for the Work or to pay Subcontractors in accordance with the respective Subcontract;

(e) persistently disregards laws, ordinances, or rules, regulations or orders of a public authority having jurisdiction, or the instructions of the Architect or Owner; or

(f) is otherwise guilty of a substantial breach of the Contract.

(2) Procedure for Unbonded Construction Contracts (Generally, contracts less than $100,000):

(a) Notice to Cure: In the presence of any of the above conditions the Architect may give the Contractor written notice to cure the condition within a reasonable, stated time, but not less than ten days after the Contractor receives the notice.

(b) Notice of Termination: If, at the expiration of the time stated in the Notice to Cure, the Contractor has not proceeded and satisfactorily continued to cure the condition or provided the Architect with written verification that satisfactory positive action is in process to cure the condition, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor written notice that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the written Notice of Termination.

(c) If the Contractor satisfies a Notice to Cure, but the condition for which the notice was first given reoccurs, the Owner may give the Contractor a seven day Notice of Termination without giving the Contractor another Notice to Cure.

(d) At the expiration of the seven days of the termination notice, the Owner may:

.1 take possession of the site, of all materials and equipment stored on and off site, and of all Contractor-owned tools, construction equipment and machinery, and facilities located at the site, and

.2 finish the Work by whatever reasonable method the Owner may deem expedient.

(e) The Contractor shall not be entitled to receive further payment under the Contract until the Work is completed.

(f) If the Owner's cost of completing the Work, including correction of Defective Work, compensation for additional architectural, engineering, managerial, and administrative services, and reasonable attorneys' fees due to the default and termination, is less than the unpaid balance of the Contract Sum, the excess balance less liquidated damages for delay shall be paid to the Contractor. If such cost to the Owner including attorney's fees, plus liquidated damages, exceeds the unpaid balance of the Contract Sum, the Contractor shall pay the difference to the Owner. Final Resolution of any claim or Dispute involving the termination or any amount due any party as a result of the termination shall be pursuant to Article 24.

(g) Upon the Contractor's request, the Owner shall furnish to the Contractor a detailed accounting of the Owner's cost of completing the Work.

(3) Procedure for Bonded Construction Contracts (Generally, contracts of $100,000 or more):

(a) Notice to Cure: In the presence of any of the above conditions the Architect may give the Contractor and its Surety written Notice to Cure the condition within a reasonable, stated time, but not less than ten days after the Contractor receives the notice.

(b) Notice of Termination: If, at the expiration of the time stated in the Notice to Cure, the Contractor has not proceeded and satisfactorily continued to cure the condition or provided the Architect with written verification that satisfactory positive action is in process to cure the condition, the Owner may, without prejudice to any other rights or remedies of the Owner, give the Contractor and its Surety written notice declaring the Contractor to be in default under the Contract and stating that the Contractor's right to complete the Work, or a designated portion of the Work, shall terminate seven days after the Contractor's receipt of the written Notice of Termination.

(c) If the Contractor satisfies a Notice to Cure, but the condition for which the notice was first given reoccurs, the Owner may give the Contractor a Notice of Termination without giving the Contractor another Notice to Cure.

(d) Demand on the Performance Bond: With the Notice of Termination the Owner shall give the Surety a written demand that, upon the effective date of the Notice of Termination, the Surety promptly fulfill its obligation to take charge of and complete the Work in accordance with the terms of the Performance Bond.

(e) Surety Claims: Upon receiving the Owner's demand on the Performance Bond, the Surety shall assume all rights and obligations of the Contractor under the Contract. However, the Surety shall also have the right to assert "Surety Claims" to the Owner, which are defined as claims relating to acts or omissions of the Owner or Architect prior to termination of the Contractor which may have prejudiced its rights as Surety or its interest in the unpaid balance of the Contract Sum. If the Surety wishes to assert a Surety Claim, it shall give the Owner, through the Architect, written notice within twenty-one days after first recognizing the condition giving rise to the Surety Claim. The Surety Claim shall then be submitted to the Owner, through the Architect, no later than sixty days after giving notice thereof, but no such Surety Claims shall be considered if submitted after the date upon which final payment becomes due. Final resolution of Surety Claims shall be pursuant to Article 24, Resolution of Claims and Disputes. The presence or possibility of a Surety Claim shall not be just cause for the Surety to fail or refuse to take charge of and complete the Work or for the Owner to fail or refuse to continue to make payments in accordance with the Contract Documents.

(f) Payments to Surety: The Surety shall be paid for completing the Work in accordance with the Contract Documents as if the Surety were the Contractor. The Owner shall have the right to deduct from payments to the Surety any reasonable costs incurred by the Owner, including compensation for additional architectural, engineering, managerial, and administrative services, and attorneys' fees as necessitated by termination of the Contractor and completion of the Work by the Surety. No further payments shall be made to the Contractor by the Owner. The Surety shall be solely responsible for any accounting to the Contractor for the portion of the Contract Sum paid to Surety by Owner or for the costs and expenses of completing the Work.

(4) Wrongful Termination: If any notice of termination by the Owner for cause, made in good faith, is determined to have been wrongly given, such termination shall be effective and compensation therefore determined as if it had been a termination for convenience pursuant to Paragraph B below.

B. TERMINATION by the OWNER for CONVENIENCE

(1) The Owner may, without cause and at any time, terminate the performance of Work under the Contract in whole, or in part, upon determination by the Owner that such termination is in the Owner's best interest. Such termination is referred to herein as Termination for Convenience.

(2) Upon receipt of a written notice of Termination for Convenience from the Owner, the Contractor shall:

(a) stop Work as specified in the notice;

(b) enter into no further subcontracts or purchase orders for materials, services, or facilities, except as may be necessary for Work directed to be performed prior to the effective date of the termination or to complete Work that is not terminated;

(c) terminate all existing subcontracts and purchase orders to the extent they relate to the terminated Work;

(d) take such actions as are necessary, or directed by the Architect or Owner, to protect, preserve, and make safe the terminated Work; and

(e) complete performance of the Work that is not terminated.

(3) In the event of Termination for Convenience, the Contractor shall be entitled to receive payment for the Work performed prior to its termination, including materials and equipment purchased and delivered for incorporation into the terminated Work, and any reasonable costs incurred because of the termination. Such payment shall include reasonable mark-up of costs for overhead and profit, not to exceed the limits stated in Article 19, Changes in the Work. The Contractor shall be entitled to

receive payment for reasonable anticipated overhead ("home office") and shall not be entitled to receive payment for any profits anticipated to have been gained from the terminated Work. A proposal for decreasing the Contract Sum shall be submitted to the Architect by the Contractor in such time and detail, and with such supporting documentation, as is reasonably directed by the Owner. Final modification of the Contract shall be by Contract Change Order pursuant to Article 19. Any Claim or Dispute involving the termination or any amount due a party as a result shall be resolved pursuant to Article 24.

Article 28
CONTRACTOR'S RIGHT to SUSPEND or TERMINATE the CONTRACT

A. SUSPENSION by the OWNER

If all of the Work is suspended or delayed for the Owner's convenience or under an order of any court, or other public authority, for a period of sixty days, through no act or fault of the Contractor or a Subcontractor, or anyone for whose acts they may be liable, then the Contractor may give the Owner a written Notice of Termination which allows the Owner fourteen days after receiving the Notice in which to give the Contractor appropriate written authorization to resume the Work. Absent the Contractor's receipt of such authorization to resume the Work, the Contract shall terminate upon expiration of this fourteen day period and the Contractor will be compensated by the Owner as if the termination had been for the Owner's convenience pursuant to Article 27.B.

B. NONPAYMENT

The Owner's failure to pay the undisputed amount of an Application for Payment within sixty days after receiving it from the Architect (Certified pursuant to Article 30) shall be just cause for the Contractor to give the Owner fourteen days' written notice that the Work will be suspended pending receipt of payment but that the Contract shall terminate if payment is not received within fourteen days (or a longer period stated by the Contractor) of the expiration of the fourteen day notice period.

(1) If the Work is then suspended for nonpayment, but resumed upon receipt of payment, the Contractor will be entitled to compensation as if the suspension had been by the Owner pursuant to Article 26, Paragraph B.

(2) If the Contract is then terminated for nonpayment, the Contractor will be entitled to compensation as if the termination had been by the Owner pursuant to Article 27, Paragraph B.

Article 29
PROGRESS PAYMENTS

A. FREQUENCY of PROGRESS PAYMENTS

Unless otherwise provided in the Contract Documents, the Owner will make payments to the Contractor as the Work progresses based on monthly estimates prepared and certified by the Contractor, approved and certified by the Architect, and approved by the Owner and other authorities whose approval is required.

B. SCHEDULE of VALUES

Within ten days after receiving the Notice to Proceed the Contractor shall submit to the Architect a

DCM Form C-10SOV, Schedule of Values, which is a breakdown of the Contract Sum showing the value of the various parts of the Work for billing purposes. The Schedule of Values shall be printable on 8.5" × 11" and shall divide the Contract Sum into as many parts ("line items") as the Architect and Owner determine necessary to permit evaluation and to show amounts attributable to Subcontractors. The Contractor's overhead and profit are to be proportionately distributed throughout the line items of the Schedule of Values. Upon approval, the Schedule of Values shall be used as a basis for monthly Applications for Payment, unless it is later found to be in error. Approved change order amounts shall be added to or incorporated into the Schedule of Values as mutually agreed by the Contractor and Architect.

C. APPLICATIONS for PAYMENTS

(1) Based on the approved Schedule of Values, each DCM Form C-10, Application and Certificate for Payment shall show the Contractor's estimate of the value of Work performed in each line item as of the end of the billing period. The Contractor's cost of materials and equipment not yet incorporated into the Work, but delivered and suitably stored on the site, may be considered in monthly Applications for Payment. One payment application per month may be submitted. Each DCM Form C-10, Application and Certificate for Payment shall match to the penny and be accompanied by an attached DCM Form C-10SOV, Schedule of Values.

(2) The Contractor's estimate of the value of Work performed and stored materials must represent such reasonableness as to warrant certification by the Architect to the Owner in accordance with Article 30. Each monthly Application for Payment shall be supported by such data as will substantiate the Contractor's right to payment, including without limitation copies of requisitions from subcontractors and material suppliers.

(3) If no other date is stated in the Contract Documents or agreed upon by the parties, each Application for Payment shall be submitted to the Architect on or about the first day of each month and payment shall be issued to the Contractor within thirty days after an Application for Payment is Certified pursuant to Article 30 and delivered to the Owner.

(4) The Applications for Payment of State Agency/Authority projects and Public School and College Authority (PSCA)-funded projects must be activated via the appropriate DocuSign link available from DCM's Engage Portal.

D. MATERIALS STORED OFF SITE

Unless otherwise provided in the Contract Documents, the Contractor's cost of materials and equipment to be incorporated into the Work, which are stored off the site, may also be considered in monthly Applications for Payment under the following conditions:

(1) the contractor has received written approval from the Architect and Owner to store the materials or equipment off site in advance of delivering the materials to the off site location;

(2) a Certificate of Insurance is furnished to the Architect evidencing that a special insurance policy, or rider to an existing policy, has been obtained by the Contractor providing all-risk property insurance coverage, specifically naming the materials or equipment stored, and naming the Owner as an additionally insured party;

(3) the Architect is provided with a detailed inventory of the stored materials or equipment and the materials or equipment are clearly marked in correlation to the inventory to facilitate inspection and verification of the presence of the materials or equipment by the Architect or Owner;

(4) the materials or equipment are properly and safely stored in a bonded warehouse, or a facility otherwise approved in advance by the Architect and Owner; and

(5) 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.

E. RETAINAGE

(1) "Retainage" is defined as the money earned and, therefore, belonging to the Contractor (subject to final settlement of the Contract) which has been retained by the Owner conditioned on final completion and acceptance of all Work required by the Contract Documents. Retainage shall not be relied upon by Contractor (or Surety) to cover or off-set unearned monies attributable to uncompleted or uncorrected Work.

(2) In making progress payments the Owner shall retain five percent of the estimated value of Work performed and the value of the materials stored for the Work; but after retainage has been held upon fifty percent of the Contract Sum, no additional retainage will be withheld.

F. CONTRACTOR'S CERTIFICATION

(1) Each Application for Payment shall bear the Contractor's certification that, to the best of the Contractor's knowledge, information, and belief, the Work covered by the Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by the Contractor for Work for which previous Certificates for Payments were issued and payments received from the Owner and that the current payment shown in the Application for Payment has not yet been received.

(2) By making this certification the Contractor represents to the Architect and Owner that, upon receipt of previous progress payments from the Owner, the Contractor has promptly paid each Subcontractor, in accordance with the terms of its agreement with the Subcontractor, the amount due the Subcontractor from the amount included in the progress payment on account of the Subcontractor's Work and stored materials. The Architect and Owner may advise Subcontractors and suppliers regarding percentages of completion or amounts requested and/or approved in an Application for Payment on account of the Subcontractor's Work and stored materials.

G. PAYMENT ESTABLISHES OWNERSHIP

All material and Work covered by progress payments shall become the sole property of the Owner, but the Contractor shall not be relieved from the sole responsibility for the care and protection of material and Work upon which payments have been made and for the restoration of any damaged material and Work.

Article 30
CERTIFICATION and APPROVALS for PAYMENT

A. The Architect's review, approval, and certification of Applications for Payment shall be based on the Architect's general knowledge of the Work obtained through site visits and the information provided by the Contractor with the Application. The Architect shall not be required to perform exhaustive examinations, evaluations, or estimates of the cost of completed or uncompleted Work or stored materials to verify the accuracy of amounts requested by the Contractor, but the Architect shall have the authority to adjust the Contractor's estimate when, in the Architect's reasonable opinion, such estimates are overstated or understated.

B. Within seven days after receiving the Contractor's monthly Application for Payment, or such other

time as may be stated in the Contract Documents, the Architect will take one of the following actions:

(1) The Architect will approve and certify the Application as submitted and forward it to the Owner as a Certification for Payment for approval by the Owner (and other approving authorities, if any) and payment.

(2) If the Architect takes exception to any amounts claimed by the Contractor and the Contractor and Architect cannot agree on revised amounts, the Architect will promptly issue a Certificate for Payment for the amount for which the Architect is able to certify to the Owner, transmitting a copy of same to the Contractor.

(3) To the extent the Architect determines may be necessary to protect the Owner from loss on account of any of the causes stated in Article 31, the Architect may subtract from the Contractor's estimates and will issue a Certificate for Payment to the Owner, with a copy to the Contractor, for such amount as the Architect determines is properly due and notify the Contractor and Owner in writing of the Architect's reasons for withholding payment in whole or in part.

C. Neither the Architect's issuance of a Certificate for Payment nor the Owner's resulting progress payment shall be a representation to the Contractor that the Work in progress or completed at that time is accepted or deemed to be in conformance with the Contract Documents.

D. The Architect shall not be required to determine that the Contractor has promptly or fully paid Subcontractors and suppliers or how or for what purpose the Contractor has used monies paid under the Construction Contract. However, the Architect may, upon request and if practical, inform any Subcontractor or supplier of the amount, or percentage of completion, approved or paid to the Contractor on account of the materials supplied or the Work performed by the Subcontractor.

Article 31
PAYMENTS WITHHELD

A. The Architect may nullify or revise a previously issued Certificate for Payment prior to Owner's payment thereunder to the extent as may be necessary in the Architect's opinion to protect the Owner from loss on account of any of the following causes not discovered or fully accounted for at the time of the certification or approval of the Application for Payment:

(1) Defective Work;

(2) filed, or reasonable evidence indicating probable filing of, claims arising out of the Contract by other parties against the Contractor;

(3) the Contractor's failure to pay for labor, materials or equipment or to pay Subcontractors;

(4) reasonable evidence that the Work cannot be completed for the unpaid balance of the Contract Sum;

(5) damage suffered by the Owner or another contractor caused by the Contractor, a Subcontractor, or anyone for whose acts they may be liable;

(6) reasonable evidence that the Work will not be completed within the Contract Time, and that the unpaid balance is insufficient to cover applicable liquidated damages; or

(7) the Contractor's persistent failure to conform to the requirements of the Contract Documents.

B. If the Owner deems it necessary to withhold payment pursuant to preceding Paragraph A, the Owner will notify the Contractor and Architect in writing of the amount to be withheld and the reason for same.

C. The Architect shall not be required to withhold payment for completed or partially completed Work for which compliance with the Contract Documents remains to be determined by Specified Inspections or Final Inspections to be performed in their proper sequence. However, if Work for which payment has been approved, certified, or made under an Application for Payment is subsequently determined to be Defective Work, the Architect shall determine an appropriate amount that will protect the Owner's interest against the Defective Work.

(1) If payment has not been made against the Application for Payment first including the Defective Work, the Architect will notify the Owner and Contractor of the amount to be withheld from the payment until the Defective Work is brought into compliance with the Contract Documents.

(2) If payment has been made against the Application for Payment first including the Defective Work, the Architect will withhold the appropriate amount from the next Application for Payment submitted after the determination of noncompliance, such amount to then be withheld until the Defective Work is brought into compliance with the Contract Documents.

D. The amount withheld will be paid with the next Application for Payment certified and approved after the condition for which the Owner has withheld payment is removed or otherwise resolved to the Owner's satisfaction.

E. The Owner shall have the right to withhold from payments due the Contractor under this Contract an amount equal to any amount which the Contractor owes the Owner under another contract.

Article 32
SUBSTANTIAL COMPLETION

A. Substantial Completion is the stage in the progress of the Work when the Work or designated portion of the Work is sufficiently complete in accordance with the Contract Documents so that the Owner can occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work ("punch list" items). Substantial Completion of the Work, or a designated portion of the Work, is not achieved until so agreed in a Certificate of Substantial Completion signed by the Contractor, Architect, Owner, and Technical Staff of the Alabama Division of Construction Management.

B. The Contractor shall notify the Architect in writing when it considers the Work, or a portion of the Work which the Owner has agreed to accept separately, to be substantially complete and ready for a Final Inspection pursuant to Article 16. In this notification the Contractor shall identify any items remaining to be completed or corrected for Final Acceptance prior to final payment.

C. Substantial Completion is achieved and a Final Inspection is appropriate only when a minimal number of punch list items exists and only a short period of time will be required to correct or complete them. Upon receipt of the Contractor's notice for a Final Inspection, the Architect will advise the Contractor in writing of any conditions of the Work which the Architect or Owner is aware do not constitute Substantial Completion, otherwise, a Final Inspection will proceed within a reasonable time after the

Contractor's notice is given. However, the Architect will not be required to prepare lengthy listings of punch list items; therefore, if the Final Inspection discloses that Substantial Completion has not been achieved, the Architect may discontinue or suspend the inspection until the Contractor does achieve Substantial Completion.

D. CERTIFICATE of SUBSTANTIAL COMPLETION

(1) When the Work or a designated portion of the Work is substantially complete, the Architect will prepare (via the appropriate DocuSign link available from DCM's Engage Portal) and sign a Certificate of Substantial Completion to be signed in order by the Contractor, Owner, and Alabama Division of Construction Management.

(2) When signed by all parties, the Certificate of Substantial Completion shall establish the Date of Substantial Completion which is the date upon which:

(a) the Work, or designated portion of the Work, is accepted by the Architect, Owner, and Alabama Division of Construction Management as being ready for occupancy,

(b) the Contractor's one-year and special warranties for the Work covered by the Certificate commence, unless stated otherwise in the Certificate (the one-year warranty for punch list items completed or corrected after the period allowed in the Certificate shall commence on the date of their Final Acceptance), and

(c) Owner becomes responsible for building security, maintenance, utility services, and insurance, unless stated otherwise in the Certificate.

(3) The Certificate of Substantial Completion shall set the time within which the Contractor shall finish all items on the "punch list" accompanying the Certificate. The completion of punch list items shall be a condition precedent to Final Payment.

(4) If the Work or designated portion covered by a Certificate of Substantial Completion includes roofing work, the General Contractor's (5-year) Roofing Guarantee, DCM Form C-9, must be executed by the Contractor and attached to the Certificate of Substantial Completion. If the Contract Documents specify any other roofing warranties to be provided by the roofing manufacturer, Subcontractor, or Contractor, they must also be attached to the Certificate of Substantial Completion. The Alabama Division of Construction Management will not sign the Certificate of Substantial Completion in the absence of the roofing guarantees.

E. The Date of Substantial Completion of the Work, as set in the Certificate of Substantial Completion of the Work or of the last completed portion of the Work, establishes the extent to which the Contractor is liable for Liquidated Damages, if any; however, should the Contractor fail to complete all punch list items within thirty days, or such other time as may be stated in the respective Certificate of Substantial Completion, the Contractor shall bear any expenses, including additional Architectural services and expenses, incurred by the Owner as a result of such failure to complete punch list items in a timely manner.

Article 33
OCCUPANCY or USE PRIOR to COMPLETION

A. UPON SUBSTANTIAL COMPLETION

Prior to completion of the entire Work, the Owner may occupy or begin utilizing any designated portion of the Work on the agreed Date of Substantial Completion of that portion of the Work.

B. BEFORE SUBSTANTIAL COMPLETION

(1) The Owner shall not occupy or utilize any portion of the Work before Substantial Completion of that portion has been achieved.

(2) The Owner may deliver furniture and equipment and store, or install it in place ready for occupancy and use, in any designated portion of the Work before it is substantially completed under the following conditions:

(a) The Owner's storage or installation of furniture and equipment will not unreasonably disrupt or interfere with the Contractor's completion of the designated portion of the Work.

(b) The Contractor consents to the Owner's planned action (such consent shall not be unreasonably withheld).

(c) The Owner shall be responsible for insurance coverage of the Owner's furniture and equipment, and the Contractor's liability shall not be increased.

(d) The Contractor, Architect, and Owner will jointly inspect and record the condition of the Work in the area before the Owner delivers and stores or installs furniture and equipment; the Owner will equitably compensate the Contractor for making any repairs to the Work that may subsequently be required due to the Owner's delivery and storage or installation of furniture and equipment.

(e) The Owner's delivery and storage or installation of furniture and equipment shall not be deemed an acceptance of any Work not completed in accordance with the requirements of the Contract Documents.

Article 34
FINAL PAYMENT

A. PREREQUISITES to FINAL PAYMENT

The following conditions are prerequisites to Final Payment becoming due the Contractor:

(1) Full execution of a Certificate of Substantial Completion for the Work, or each designated portion of the Work.

(2) Final Acceptance of the Work.

(3) The Contractor's completion, to the satisfaction of the Architect and Owner, of all documentary requirements of the Contract Documents; such as delivery of "as-built" documents, operating and maintenance manuals, warranties, etc.

(4) Delivery to the Owner of a final Application for Payment, prepared by the Contractor and approved and certified by the Architect. Architect prepares DCM Form B-13: Final Payment Checklist and forwards it to the Owner along with the final Application for Payment.

(5) Completion of an Advertisement for Completion pursuant to Paragraph C below.

(6) Delivery by the Contractor to the Owner through the Architect of DCM Form C-18: Contractor's Affidavit of Payment of Debts and Claims, and a Release of Claims, if any, and such other documents as may be required by Owner, satisfactory in form to the Owner pursuant to Paragraph D below.

(7) Consent of Surety to Final Payment, if any, to Contractor. This Consent of Surety is required for projects which have Payment and Performance Bonds.

(8) Delivery by the Contractor to the Architect and Owner of other documents, if any, required by the Contract Documents as prerequisites to Final Payment.

(9) See Manual of Procedures Chapter 7, Section L.7 concerning reconciliation of contract time, if any.

B. FINAL ACCEPTANCE of the WORK

"Final Acceptance of the Work" shall be achieved when all "punch list" items recorded with the Certificate(s) of Substantial Completion are accounted for by either: **(1)** their completion or correction by the Contractor and acceptance by the Architect, Owner, and DCM Project Inspector, or **(2)** their resolution under Article 18, Deductions for Uncorrected Work.

C. ADVERTISEMENT for COMPLETION

(1) If the Contract Sum is less than $100,000: Advertisement for Completion shall not apply to contractors performing contracts of less than $100,000.00 in amount. §39-1-1(g)

(2) If the Contract Sum is $100,000 or more: The Contractor, immediately after being notified by the Architect that all other requirements of the Contract have been completed, shall give public notice of completion of the Contract by having an Advertisement for Completion, similar to the sample contained in the Project Manual, published for a period of three weeks. The contractor can publish a notice in one or more of the following ways:

(a) In a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done.

(b) On a website that is maintained by a newspaper of general circulation in the county or counties in which the work, or some portion thereof, has been done. (c) On a website utilized by the awarding authority for publishing notices.

(d) If no newspaper is published in the county in which the work was done, and if the awarding authority does not utilize a website for the purpose of publishing notices, the notice may be given by posting at the courthouse for 30 days, and proof of the posting of the notice shall be given by the awarding authority and the contractor.

Proof of publication of the notice shall be made by the contractor to the authority by whom the contract was made by affidavit of the publisher or website owner and a printed copy of the notice published. A final settlement shall not be made upon the contract until the expiration of 30 days after the completion of the notice.

D. RELEASE of CLAIMS

The Release of Claims and other documents referenced in Paragraph A(6) above are as follows:

(1) A release executed by Contractor of all claims and claims of lien against the Owner arising under and by virtue of the Contract, other than such claims of the Contractor, if any, as may have been previously made in writing and as may be specifically excepted by the Contractor from the operation of the release in stated amounts to be set forth therein.

(2) An affidavit under oath, if required, stating that so far as the Contractor has knowledge or information, there are no claims or claims of lien which have been or will be filed by any Subcontractor, Supplier or other party for labor or material for which a claim or claim of lien could be filed.

(3) A release, if required, of all claims and claims of lien made by any Subcontractor, Supplier or other party against the Owner or unpaid Contract funds held by the Owner arising under or related to the Work on the Project; provided, however, that if any Subcontractor, Supplier or others refuse to furnish a release of such claims or claims of lien, the Contractor may furnish a bond executed by Contractor and its Surety to the Owner to provide an unconditional obligation to defend, indemnify and hold harmless the Owner against any loss, cost or expense, including attorney's fees, arising out

of or as a result of such claims, or claims of lien, in which event Owner may make Final Payment notwithstanding such claims or claims of lien. If Contractor and Surety fail to fulfill their obligations to Owner under the bond, the Owner shall be entitled to recover damages as a result of such failure, including all costs and reasonable attorney's fees incurred to recover such damages.

E. EFFECT of FINAL PAYMENT

(1) The making of Final Payment shall constitute a waiver of Claims by the Owner except those arising from:

- **(a)** liens, claims, security interests or encumbrances arising out of the Contract and unsettled;
- **(b)** failure of the Work to comply with the requirements of the Contract Documents;
- **(c)** terms of warranties or indemnities required by the Contract Documents, or
- **(d)** latent defects.

(2) Acceptance of Final Payment by the Contractor shall constitute a waiver of claims by Contractor except those previously made in writing, identified by Contractor as unsettled at the time of final Application for Payment, and specifically excepted from the release provided for in Paragraph D(1), above.

Article 35
CONTRACTOR'S WARRANTY

A. GENERAL WARRANTY

The Contractor warrants to the Owner and Architect that all materials and equipment furnished under the Contract will be of good quality and new, except such materials as may be expressly provided or allowed in the Contract Documents to be otherwise, and that none of the Work will be Defective Work as defined in Article 1.

B. ONE-YEAR WARRANTY

(1) If, within one year after the date of Substantial Completion of the Work or each designated portion of the Work (or otherwise as agreed upon in a mutually-executed Certificate of Substantial Completion), any of the Work is found to be Defective Work, the Contractor shall promptly upon receipt of written notice from the Owner or Architect, and without expense to either, replace or correct the Defective Work to conform to the requirements of the Contract Documents, and repair all damage to the site, the building and its contents which is the result of Defective Work or its replacement or correction.

(2) The one-year warranty for punch list items shall begin on the Date of Substantial Completion if they are completed or corrected within the time period allowed in the Certificate of Substantial Completion in which they are recorded. The one-year warranty for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion, and other Work performed after Substantial Completion, shall begin on the date of Final Acceptance of the Work. The Contractor's correction of Work pursuant to this warranty does not extend the period of the warranty. The Contractor's one-year warranty does not apply to defects or damages due to improper or insufficient maintenance, improper operation, or wear and tear during normal usage.

(3) Upon recognizing a condition of Defective Work, the Owner shall promptly notify the Contractor of the condition. If the condition is causing damage to the building, its contents, equipment, or site, the Owner shall take reasonable actions to mitigate the damage or its continuation,

if practical. If the Contractor fails to proceed promptly to comply with the terms of the warranty, or to provide the Owner with satisfactory written verification that positive action is in process, the Owner may have the Defective Work replaced or corrected and the Contractor and the Contractor's Surety shall be liable for all expense incurred.

(4) Year-end Inspection(s): An inspection of the Work, or each separately completed portion thereof, is required near the end of the Contractor's one-year warranty period(s). The inspection must be scheduled with the Owner, Architect and DCM Inspector. The subsequent delivery of the Architect's report of a Year-end Inspection will serve as confirmation that the Contractor was notified of Defective Work found within the warranty period.

(5) The Contractor's warranty of one year is in addition to, and not a limitation of, any other remedy stated herein or available to the Owner under applicable law.

C. GENERAL CONTRACTOR'S ROOFING GUARANTEE

(1) In addition to any other roof related warranties or guarantees that may be specified in the Contract Documents, the roof and associated work shall be guaranteed by the General Contractor against leaks and defects of materials and workmanship for a period of five (5) years, starting on the Date of Substantial Completion of the Project as stated in the Certificate of Substantial Completion. This guarantee for punch list items shall begin on the Date of Substantial Completion if they are completed or corrected within the time period allowed in the Certificate of Substantial Completion in which they are recorded. The guarantee for punch list items that are not completed or corrected within the time period allowed in the Certificate of Substantial Completion shall begin on the date of Final Acceptance of the Work.

(2) The "General Contractor's Roofing Guarantee" (DCM Form C-9), included in the Project Manual, shall be executed in triplicate, signed by the appropriate party and submitted to the Architect for submission with the Certificate of Substantial Completion to the Owner and the Division of Construction Management.

(3) This guarantee does not include costs which might be incurred by the General Contractor in making visits to the site requested by the Owner regarding roof problems that are due to lack of proper maintenance (keeping roof drains and/or gutters clear of debris that cause a stoppage of drainage which results in water ponding, overflowing of flashing, etc.), or damages caused by vandalism or misuse of roof areas. Should the contractor be required to return to the job to correct problems of this nature that are determined not to be related to faulty workmanship and materials in the installation of the roof, payment for actions taken by the Contractor in response to such request will be the responsibility of the Owner. A detailed written report shall be made by the General Contractor on each of these 'Service Calls' with copies to the Architect, Owner and Division of Construction Management.

D. SPECIAL WARRANTIES

(1) The Contractor shall deliver to the Owner through the Architect all special or extended warranties required by the Contract Documents from the Contractor, Subcontractors, and suppliers.

(2) The Contractor and the Contractor's Surety shall be liable to the Owner for such special warranties during the Contractor's one-year warranty; thereafter, the Contractor's obligations relative to such special warranties shall be to provide reasonable assistance to the Owner in their enforcement.

E. ASSUMPTION of GUARANTEES of OTHERS

If the Contractor disturbs, alters, or damages any work guaranteed under a separate contract, thereby voiding the guarantee of that work, the Contractor shall restore the work to a condition satisfactory to the Owner and shall also guarantee it to the same extent that it was guaranteed under the separate contract.

Article 36
INDEMNIFICATION AGREEMENT

To the fullest extent permitted by law, the Contractor shall defend, indemnify, and hold harmless the Owner, Architect, Architect's consultants, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, employees, and consultants (hereinafter collectively referred to as the "Indemnitees") from and against all claims, damages, losses and expenses, including but not limited to attorneys' fees, arising out of, related to, 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, including loss of use resulting therefrom, and is caused in whole or in part by 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 such claim, damage, loss or expense is caused in part, or is alleged but not legally established to have been caused in whole or in part by the negligence or other fault of a party indemnified hereunder.

A. This indemnification shall extend to all claims, damages, losses and expenses for injury or damage to adjacent or neighboring property, or persons injured thereon, that arise out of, relate to, or result from performance of the Work.

B. This indemnification does not extend to the liability of the Architect, or the Architect's Consultants, agents, or employees, arising out of **(1)** the preparation or approval of maps, shop drawings, opinions, reports, surveys, field orders, Change Orders, drawings or specifications, or **(2)** the giving of or the failure to give directions or instructions, provided such giving or failure to give instructions is the primary cause of the injury or damage.

C. This indemnification does not apply to the extent of the sole negligence of the Indemnitees.

Article 37
CONTRACTOR'S and SUBCONTRACTORS' INSURANCE

(Provide entire Article 37 to Contractor's insurance representative.)

A. GENERAL

(1) RESPONSIBILITY. The Contractor shall be responsible to the Owner from the time of the signing of the Construction Contract or from the beginning of the first work, whichever shall be earlier, for all injury or damage of any kind resulting from any negligent act or omission or breach, failure or other default regarding the work by the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, regardless of who may be the owner of the property.

(2) INSURANCE PROVIDERS. Each of the insurance coverages required below shall be issued by an insurer licensed by the Insurance Commissioner to transact the business of insurance in the

State of Alabama for the applicable line of insurance, and such insurer (or, for qualified self-insureds or group self-insureds, a specific excess insurer providing statutory limits) must have a Best Policyholders Rating of "A-" or better and a financial size rating of Class V or larger.

(3) NOTIFICATION ENDORSEMENT. Each policy shall be endorsed to provide that the insurance company agrees that the policy shall not be canceled, changed, allowed to lapse or allowed to expire for any reason until thirty days after the Owner has received written notice by certified mail as evidenced by return receipt or until such time as other insurance coverage providing protection equal to protection called for in the Contract Documents shall have been received, accepted and acknowledged by the Owner. Such notice shall be valid only as to the Project as shall have been designated by Project Name and Number in said notice.

(4) INSURANCE CERTIFICATES. The Contractor shall procure the insurance coverages identified below, or as otherwise required in the Contract Documents, at the Contractor's own expense, and to evidence that such insurance coverages are in effect, the Contractor shall furnish the Owner an insurance certificate(s) acceptable to the Owner and listing the Owner as the certificate holder. The insurance certificate(s) must be delivered to the Owner with the Construction Contract and Bonds for final approval and execution of the Construction Contract. The insurance certificate must provide the following:

(a) Name and address of authorized agent of the insurance company
(b) Name and address of insured
(c) Name of insurance company or companies
(d) Description of policies
(e) Policy Number(s)
(f) Policy Period(s)
(g) Limits of liability
(h) Name and address of Owner as certificate holder
(i) Project Name and Number, if any
(j) Signature of authorized agent of the insurance company
(k) Telephone number of authorized agent of the insurance company
(l) Mandatory thirty day notice of cancellation / non-renewal / change

(5) MAXIMUM DEDUCTIBLE. Self-insured retention, except for qualified self-insurers or group self-insurers, in any policy shall not exceed $25,000.00.

B. INSURANCE COVERAGES

Unless otherwise provided in the Contract Documents, the Contractor shall purchase the types of insurance coverages with liability limits not less than as follows:

(1) WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE

(a) Workers' Compensation coverage shall be provided in accordance with the statutory coverage required in Alabama. A group insurer must submit a certificate of authority from the Alabama Department of Industrial Relations approving the group insurance plan. A self-insurer must submit a certificate from the Alabama Department of Industrial Relations stating the Contractor qualifies to pay its own workers' compensation claims.

(b) Employer's Liability Insurance limits shall be at least:

.1 Bodily Injury by Accident - $1,000,000 each accident
.2 Bodily Injury by Disease - $1,000,000 each employee

(2) COMMERCIAL GENERAL LIABILITY INSURANCE

(a) Commercial General Liability Insurance, written on an ISO Occurrence Form (current edition as of the date of Advertisement for Bids) or equivalent, shall include, but need not be limited to, coverage for bodily injury and property damage arising from premises and operations liability, products and completed operations liability, blasting and explosion, collapse of structures, underground damage, personal injury liability and contractual liability. The Commercial General Liability Insurance shall provide at minimum the following limits:

Coverage	**Limit**
.1 General Aggregate	$ 2,000,000.00 per Project
.2 Products, Completed Operations Aggregate	$ 2,000,000.00 per Project
.3 Personal and Advertising Injury	$ 1,000,000.00 per Occurrence
.4 Each Occurrence	$ 1,000,000.00

(b) Additional Requirements for Commercial General Liability Insurance:

.1 The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants and employees as additional insureds, state that this coverage shall be primary insurance for the additional insureds; and contain no exclusions of the additional insureds relative to job accidents.

.2 The policy must include separate per project aggregate limits.

(3) COMMERCIAL BUSINESS AUTOMOBILE LIABILITY INSURANCE

(a) Commercial Business Automobile Liability Insurance which shall include coverage for bodily injury and property damage arising from the operation of any owned, non-owned or hired automobile. The Commercial Business Automobile Liability Insurance Policy shall provide not less than $1,000,000 Combined Single Limits for each occurrence.

(b) The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants, and employees as additional insureds.

(4) COMMERCIAL UMBRELLA OR COMMERCIAL EXCESS LIABILITY INSURANCE

(a) Commercial Umbrella or Commercial Excess Liability Insurance to provide excess coverage above the Commercial General Liability, Commercial Business Automobile Liability and the Workers' Compensation and Employer's Liability to satisfy the minimum limits set forth herein.

(b) Minimum Combined Primary Commercial General Liability and Commercial Umbrella or Commercial Excess Limits of:

.1 $ 5,000,000 per Occurrence

.2 $ 5,000,000 Aggregate

(c) Additional Requirements for Commercial Umbrella or Commercial Excess Liability Insurance:

.1 The policy shall name the Owner, Architect, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, consultants, and employees as additional insureds.

.2 The policy must be on an "occurrence" basis.

(5) BUILDER'S RISK INSURANCE

(a) The Builder's Risk Policy shall be made payable to the Owner and Contractor, as their interests may appear. The policy amount shall be equal to 100% of the Contract Sum, written on a Causes of Loss - Special Form (current edition as of the date of Advertisement for Bids), or its equivalent. All deductibles shall be the sole responsibility of the Contractor.

(b) The policy shall be endorsed as follows:

"The following may occur without diminishing, changing, altering or otherwise affecting the coverage and protection afforded the insured under this policy:

(i) Furniture and equipment may be delivered to the insured premises and installed in place ready for use; or

(ii) Partial or complete occupancy by Owner; or

(iii) Performance of work in connection with construction operations insured by the Owner, by agents or lessees or other contractors of the Owner, or by contractors of the lessee of the Owner."

Exception: projects containing only abatement and/or only demolition do not require Builder's Risk insurance, unless required by the Owner. Note: projects containing any scope of work besides abatement and/or demolition require Builder's Risk insurance.

C. SUBCONTRACTORS' INSURANCE

(1) WORKERS' COMPENSATION and EMPLOYER'S LIABILITY INSURANCE. The Contractor shall require each Subcontractor to obtain and maintain Workers' Compensation and Employer's Liability Insurance coverages as described in preceding Paragraph B, or to be covered by the Contractor's Workers' Compensation and Employer's Liability Insurance while performing Work under the Contract.

(2) LIABILITY INSURANCE. The Contractor shall require each Subcontractor to obtain and maintain adequate General Liability, Automobile Liability, and Umbrella or Excess Liability Insurance coverages similar to those described in preceding Paragraph B. Such coverage shall be in effect at all times that a Subcontractor is performing Work under the Contract.

(3) ENFORCEMENT RESPONSIBILITY. The Contractor shall have responsibility to enforce its Subcontractors' compliance with these or similar insurance requirements; however, the Contractor shall, upon request, provide the Architect or Owner acceptable evidence of insurance for any Subcontractor.

D. TERMINATION of OBLIGATION to INSURE

Unless otherwise expressly provided in the Contract Documents, the obligation to insure as provided herein shall continue as follows:

(1) BUILDER'S RISK INSURANCE. The obligation to insure under Subparagraph B(5) shall remain in effect until the Date of Substantial Completion as shall be established in the Certificate of Substantial Completion. In the event that multiple Certificates of Substantial Completion covering designated portions of the Work are issued, Builder's Risk coverage shall remain in effect until the Date of Substantial Completion as shall be established in the last issued Certificate of Substantial Completion. However, in the case that the Work involves separate buildings, Builder's Risk coverage of each separate building may terminate on the Date of Substantial Completion as established in the Certificate of Substantial Completion issued for each building.

(2) PRODUCTS and COMPLETED OPERATIONS. The obligation to carry Products and Completed Operations coverage specified under Subparagraph B(2) shall remain in effect for two years after the Date(s) of Substantial Completion.

(3) ALL OTHER INSURANCE. The obligation to carry other insurance coverages specified under Subparagraphs B(1) through B(4) and Paragraph C shall remain in effect after the Date(s) of

Substantial Completion until such time as all Work required by the Contract Documents is completed. Equal or similar insurance coverages shall remain in effect if, after completion of the Work, the Contractor, a Subcontractor, anyone directly or indirectly employed by them or anyone for whose acts they may be liable, returns to the Project to perform warranty or maintenance work pursuant to the terms of the Contract Documents.

E. 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 performing construction or operations related to the Project, if any, and any of their subcontractors, sub-subcontractors, agents and employees, for damages caused by fire or other causes of loss. But said waiver shall apply only to the extent the loss or damage is covered by builder's risk insurance applicable to the Work or to other property located within or adjacent to the Project, except such rights as they may have to proceeds of such insurance held by the Owner or Contractor as fiduciary. The Owner or Contractor, as appropriate, shall require of the Architect, Architect's consultants, separate contractors, if any, and the subcontractor, sub-subcontractors, suppliers, 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 the 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. The waivers provided for in this paragraph shall not be applicable to loss or damage that occurs after final acceptance of the Work. Any provision found herein which attempts to waive or invalidate the subrogation interests of Alabama's State Insurance Fund against any party to this contract or any other person or entity is void and invalid. No such waiver is intended or made by the parties to this agreement with regard to any property insured by the State Insurance Fund.

Article 38
PERFORMANCE and PAYMENT BONDS

A. GENERAL

Upon signing and returning the Construction Contract to the Owner for final approval and execution, the Contractor shall, at the Contractor's expense, furnish to the Owner a Performance Bond and a Payment Bond (P&P Bonds), DCM Forms C-6 and C-7 as contained in the Project Manual, each in a penal sum equal to 100% of the Contract Sum. Each bond shall be on the form contained in the Project Manual, shall be executed by a surety company (Surety) acceptable to the Owner and duly authorized and qualified to make such bonds in the State of Alabama in the required amount. The P&P bonds must be signed either on the same day or after the construction contract date. Each P&P Bond shall have attached thereto a power of attorney (POA) of the signing official. The POA signature date must be the same day as the P&P Bond's signature date. All signatures must be present.

The provisions of this Article are not applicable to this Contract if the Contract Sum is less than $100,000, unless bonds are required for this Contract in the Supplemental General Conditions.

B. PERFORMANCE BOND

Through the Performance Bond, the Surety's obligation to the Owner shall be to assure the prompt

and faithful performance of the Contract and Contract Change Orders. The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. In case of default on the part of the Contractor, the Surety shall take charge of and complete the Work in accordance with the terms of the Performance Bond. Any reasonable expenses incurred by the Owner as a result of default on the part of the Contractor, including architectural, engineering, administrative, and legal services, shall be recoverable under the Performance Bond.

C. PAYMENT BOND

Through the Payment Bond the Surety's obligation to the Owner shall be to guarantee that the Contractor and its Subcontractors shall promptly make payment to all persons supplying labor, materials, or supplies for, or in, the prosecution of the Work, including the payment of reasonable attorneys fees incurred by successful claimants or plaintiffs in civil actions on the Bond. Any person or entity indicating that they have a claim of nonpayment under the Bond shall, upon written request, be promptly furnished a certified copy of the Bond and Construction Contract by the Contractor, Architect, Owner, or Alabama Division of Construction Management, whomever is recipient of the request.

D. CHANGE ORDERS

The Penal Sum shall remain equal to the Contract Sum as the Contract Sum is adjusted by Contract Change Orders. All Contract Change Orders involving an increase in the Contract Sum will require consent of Surety by endorsement of the Contract Change Order form. The Surety waives notification of any Contract Change Orders involving only extension of the Contract Time.

E. EXPIRATION

The obligations of the Contractor's performance bond surety shall be coextensive with the contractor's performance obligations under the Contract Documents; provided, however, that the surety's obligation shall expire at the end of the one-year warranty period(s) of Article 35.

Article 39
ASSIGNMENT

The Contractor shall not assign the Contract or sublet it as a whole nor assign any moneys due or to become due to the Contractor thereunder without the previous written consent of the Owner (and of the Surety, in the case of a bonded Construction Contract). As prescribed by the Public Works Law, the Contract shall in no event be assigned to an unsuccessful bidder for the Contract whose bid was rejected because the bidder was not a responsible or responsive bidder.

Article 40
CONSTRUCTION by OWNER or SEPARATE CONTRACTORS

A. OWNER'S RESERVATION of RIGHT

(1) The Owner reserves the right to self-perform, or to award separate contracts for, other portions of the Project and other Project related construction and operations on the site. The contractual conditions of such separate contracts shall be substantially similar to those of this Contract, including insurance requirements and the provisions of this Article. If the Contractor considers such actions to involve delay or additional cost under this Contract, notifications and assertion of claims shall be as

provided in Article 20 and Article 23.

(2) When separate contracts are awarded, the term "Contractor" in the separate Contract Documents shall mean the Contractor who executes the respective Construction Contract.

B. COORDINATION

Unless otherwise provided in the Contract Documents, the Owner shall be responsible for coordinating the activities of the Owner's forces and separate contractors with the Work of the Contractor. The Contractor shall cooperate with the Owner and separate contractors, shall participate in reviewing and comparing their construction schedules relative to that of the Contractor when directed to do so, and shall make and adhere to any revisions to the construction schedule resulting from a joint review and mutual agreement.

C. CONDITIONS APPLICABLE to WORK PERFORMED by OWNER

Unless otherwise provided in the Contract Documents, when the Owner self-performs construction or operations related to the Project, the Owner shall be subject to the same obligations to Contractor as Contractor would have to a separate contractor under the provision of this Article 40.

D. MUTUAL RESPONSIBILITY

(1) The Contractor shall reasonably accommodate the required introduction and storage of materials and equipment and performance of activities by the Owner and separate contractors and shall connect and coordinate the Contractor's Work with theirs as required by the Contract Documents.

(2) By proceeding with an element or portion of the Work that is applied to or performed on construction by the Owner or a separate contractor, or which relies upon their operations, the Contractor accepts the condition of such construction or operations as being suitable for the Contractor's Work, except for conditions that are not reasonably discoverable by the Contractor. If the Contractor discovers any condition in such construction or operations that is not suitable for the proper performance of the Work, the Contractor shall not proceed, but shall instead promptly notify the Architect in writing of the condition discovered.

(3) The Contractor shall reimburse the Owner for any costs incurred by a separate contractor and payable by the Owner because of acts or omissions of the Contractor. Likewise, the Owner shall be responsible to the Contractor for any costs incurred by the Contractor because of the acts or omissions of a separate contractor.

(4) The Contractor shall not cut or otherwise alter construction by the Owner or a separate contractor without the written consent of the Owner and separate contractor; such consent shall not be unreasonably withheld. Likewise, the Contractor shall not unreasonably withhold its consent allowing the Owner or a separate contractor to cut or otherwise alter the Work.

(5) The Contractor shall promptly remedy any damage caused by the Contractor to the construction or property of the Owner or separate contractors**.**

Article 41
SUBCONTRACTS

A. AWARD of SUBCONTRACTS and OTHER CONTRACTS for PORTIONS of the WORK

(1) Unless otherwise provided in the Contract Documents, when delivering the executed Construction Contract, bonds, and evidence of insurance to the Architect, the Contractor shall also submit a listing of Subcontractors proposed for each principal portion of the Work and fabricators or suppliers proposed for furnishing materials or equipment fabricated to the design of the Contract Documents. This listing shall be in addition to any naming of Subcontractors, fabricators, or suppliers that may have been required in the bid process. The Architect will promptly reply to the Contractor in writing stating whether or not the Owner, after due investigation, has reasonable objection to any Subcontractor, fabricator, or supplier proposed by the Contractor. The issuance of the Notice to Proceed in the absence of such objection by the Owner shall constitute notice that no reasonable objection to them is made.

(2) The Contractor shall not contract with a proposed Subcontractor, fabricator, or supplier to whom the Owner has made reasonable and timely objection. Except in accordance with prequalification procedures as may be contained in the Contract Documents, through specified qualifications, or on the grounds of reasonable objection, the Owner may not restrict the Contractor's selection of Subcontractors, fabricators, or suppliers.

(3) Upon the Owner's reasonable objection to a proposed Subcontractor, fabricator, or supplier, the Contractor shall promptly propose another to whom the Owner has no reasonable objection. If the proposed Subcontractor, fabricator, or supplier to whom the Owner made reasonable objection was reasonably capable of performing the Work, the Contract Sum and Contract Time shall be equitably adjusted by Contract Change Order for any resulting difference if the Contractor has acted promptly and responsively in this procedure.

(4) The Contractor shall not change previously selected Subcontractors, fabricators, or suppliers without notifying the Architect and Owner in writing of proposed substitute Subcontractors, fabricators, or suppliers. If the Owner does not make a reasonable objection to a proposed substitute within three working days, the substitute shall be deemed approved.

B. SUBCONTRACTUAL RELATIONS

(1) The Contractor agrees to bind every Subcontractor and material supplier (and require every Subcontractor to so bind its subcontractors and material suppliers) to all the provisions of the Contract Documents as they apply to the Subcontractor's and material supplier's portion of the Work.

(2) Nothing contained in the Contract Documents shall be construed as creating any contractual relationship between any Subcontractor and the Owner, nor to create a duty of the Architect, Owner, or Director to resolve disputes between or among the Contractor or its Subcontractors and suppliers or any other duty to such Subcontractors or suppliers.

Article 42
ARCHITECT'S STATUS

A. The Architect is an independent contractor performing, with respect to this Contract, pursuant to an agreement executed between the Owner and the Architect. The Architect has prepared the Drawings

and Specifications and assembled the Contract Document and is, therefore, charged with their interpretation and clarification as described in the Contract Documents. As a representative of the Owner, the Architect will endeavor to guard the Owner against variances from the requirements of the Contract Documents by the Contractor. On behalf of the Owner, the Architect will administer the Contract as described in the Contract Documents during construction and the Contractor's one-year warranty.

B. So as to maintain continuity in administration of the Contract and performance of the Work, and to facilitate complete documentation of the project record, all communications between the Contractor and Owner regarding matters of or related to the Contract shall be directed through the Architect, unless direct communication is otherwise required to provide a legal notification. Unless otherwise authorized by the Architect, communications by and with the Architect's consultants shall be through the Architect. Unless otherwise authorized by the Contractor, communications by and with Subcontractors and material suppliers shall be through the Contractor.

C. ARCHITECT'S AUTHORITY

Subject to other provisions of the Contract Documents, the following summarizes some of the authority vested in the Architect by the Owner with respect to the Construction Contract and as further described or conditioned in other Articles of these General Conditions of the Contract.

(1) The Architect is authorized to:

(a) approve "minor" deviations as defined in Article 9, Submittals,
(b) make "minor" changes in the Work as defined in Article 19, Changes in the Work,
(c) reject or require the correction of Defective Work,
(d) require the Contractor to stop the performance of Defective Work,
(e) adjust an Application for Payment by the Contractor pursuant to Article 30, Certification and Approval of payments, and
(f) issue Notices to Cure pursuant to Article 27.

(2) The Architect is not authorized to:

(a) revoke, alter, relax, or waive any requirements of the Contract Documents (other than "minor" deviations and changes) without concurrence of the Owner,
(b) finally approve or accept any portion of the Work without concurrence of the Owner,
(c) issue instructions contrary to the Contract Documents,
(d) issue Notice of Termination or otherwise terminate the Contract, or
(e) require the Contractor to stop the Work except only to avoid the performance of Defective Work.

D. LIMITATIONS of RESPONSIBILITIES

(1) The Architect shall not be responsible to Contractors or to others for supervising or coordinating the performance of the Work or for the Construction Methods or safety of the Work, unless the Contract Documents give other specific instructions concerning these matters.

(2) The Architect will not be responsible to the Contractor (nor the Owner) for the Contractor's failure to perform the Work in accordance with the requirements of the Contract Documents or for acts or omissions of the Contractor, a Subcontractor, or anyone for whose acts they may be liable. However, the Architect will report to the Owner and Contractor any Defective Work recognized by the Architect.

(3) The Architect will endeavor to secure faithful performance by Owner and Contractor, and the Architect will not show partiality to either or be liable to either for results of interpretations or decisions rendered in good faith.

(4) The Contractor's remedies for additional time or expense arising out of or related to this Contract, or the breach thereof, shall be solely as provided for in the Contract Documents. The Contractor shall have no claim or cause of action against the Owner, Architect, or its consultants for any actions or failures to act, whether such claim may be in contract, tort, strict liability, or otherwise, it being the agreement of the parties that the Contractor shall make no claim against the Owner or any agents of the Owner, including the Architect or its consultants, except as may be provided for claims or disputes submitted in accordance with Article 24. The Architect and Architect's consultants shall be considered third party beneficiaries of this provision of the Contract and entitled to enforce same.

E. ARCHITECT'S DECISIONS

Decisions by the Architect shall be in writing The Architect's decisions on matters relating to aesthetic effect will be final and binding if consistent with the intent expressed in the Contract Documents. The Architect's decisions regarding disputes arising between the Contractor and Owner shall be advisory.

Article 43
CASH ALLOWANCES

A. All allowances stated in the Contract Documents shall be included in the Contract Sum. Items covered by allowances shall be supplied by the Contractor as directed by the Architect or Owner and the Contractor shall afford the Owner the economy of obtaining competitive pricing from responsible bidders for allowance items unless other purchasing procedures are specified in the Contract Documents.

B. Unless otherwise provided in the Contract Documents:
- **(1)** allowances shall cover the cost to the Contractor of materials and equipment delivered to the Project site and all applicable taxes, less applicable trade discounts;
- **(2)** the Contractor's costs for unloading, storing, protecting, and handling at the site, labor, installation, overhead, profit and other expenses related to materials or equipment covered by an allowance shall be included in the Contract Sum but not in the allowances;
- **(3)** if required, the Contract Sum shall be adjusted by Change Order to reflect the actual costs of an allowance.

C. Any selections of materials or equipment required of the Architect or Owner under an allowance shall be made in sufficient time to avoid delay of the Work.

Article 44
PERMITS, LAWS, and REGULATIONS

A. PERMITS, FEES AND NOTICES

(1) Unless otherwise provided in the Contract Documents, the Contractor shall secure and pay for the building permit and other permits and governmental fees, licenses, and inspections necessary for proper execution and completion of the Work which are customarily secured after award of the

Construction Contract and which are in effect on the date of receipt of bids.

(2) The Contractor shall comply with and give notices required by all laws, ordinances, rules, regulations, and lawful orders of public authorities applicable to performance of the Work.

B. TAXES

Unless stated otherwise in the Contract Documents, materials incorporated into the Work are exempt from sales and use tax pursuant to Section 40-9-33, Code of Alabama, 1975 as amended. The Owner, Contractor and its subcontractors shall be responsible for complying with rules and regulations of the Sales, Use, & Business Tax Division of the Alabama Department of Revenue regarding certificates and other qualifications necessary to claim such exemption when making qualifying purchases from vendors. The Contractor shall pay all applicable taxes that are not covered by the exemption of Section 40-9-33 and which are imposed as of the date of receipt of bids, including those imposed as of the date of receipt of bids but scheduled to go into effect after that date.

C. COMPENSATION for INCREASES

The Contractor shall be compensated for additional costs incurred because of increases in tax rates imposed after the date of receipt of bids.

D. ALABAMA IMMIGRATION LAW

Per ACT 2011-535 as codified in Title 31, Chapter 13 of the Code of Alabama, 1975, as amended:

The contracting parties affirm, for the duration of the agreement, that they will not violate federal immigration law or knowingly employ, hire for employment, or continue to employ an unauthorized alien within the State of Alabama. Furthermore, a contracting party found to be in violation of this provision shall be deemed in breach of the agreement and shall be responsible for all damages resulting therefrom.

E. ALABAMA TRADE BOYCOTT LAW

Per Act 2016-312as codified in Title 41, Chapter 16, Article 1, of the Code of Alabama, 1975, as amended:

The contracting parties affirm, for the duration of the agreement, that they are not currently engaged in, and will not engage in, the boycott of a person or an entity based in or doing business with a jurisdiction with which this state can enjoy open trade.

EE. ALABAMA ECONOMIC BOYCOTT LAW

Per Act 2023-409 as codified in Title 41, Chapter 16, Article 1 of the Code of Alabama, 1975, as amended:

The contracting parties affirm, for the duration of the agreement, that they are not currently engaged in, and will not engage in, economic boycotts.

F. ACCOUNTING OF SALES TAX EXEMPT PROJECTS

Per Act 2013-205 as codified in Title 40, Chapter 9, Article 1, of the Code of Alabama, 1975, as amended:

In bidding the work on a tax exempt project, the bid form shall provide an accounting for the tax savings.

Article 45
ROYALTIES, PATENTS, and COPYRIGHTS

The Contractor shall pay all royalties and license fees. The Contractor shall defend, indemnify and hold harmless the Owner, Architect, Architect's consultants, Alabama Division of Construction Management, State Department of Education (if applicable), and their agents, employees, and consultants from and against all claims, damages, losses and expenses, including but not limited to attorney's fees, arising out of, related to, or resulting from all suits or claims for infringement of any patent rights or copyrights arising out of the inclusion of any patented or copyrighted materials, methods, or systems selected by the Contractor and used during the execution of or incorporated into the Work. This indemnification does not apply to any suits or claims of infringement of any patent rights or copyrights arising out of any patented or copyrighted materials, methods, or systems specified in the Contract Documents. However, if the Contractor has information that a specified material, method, or system is or may constitute an infringement of a patent or copyright, the Contractor shall be responsible for any resulting loss unless such information is promptly furnished to the Architect.

Article 46
USE of the SITE

A. The Contractor shall confine its operations at the Project site to areas permitted by the Owner and by law, ordinances, permits and the Contract Documents and shall not unreasonably encumber the site with materials, equipment, employees' vehicles, or debris. The Contractor's operations at the site shall be restricted to the sole purpose of constructing the Work, use of the site as a staging, assembly, or storage area for other business which the Contractor may undertake shall not be permitted.

B. Unless otherwise provided in the Contract Documents, temporary facilities, such as storage sheds, shops, and offices may be erected on the Project site with the approval of the Architect and Owner. Such temporary buildings and/or utilities shall remain the property of the Contractor, and be removed at the Contractor's expense upon completion of the Work, unless the Owner authorizes their abandonment without removal.

Article 47
CUTTING and PATCHING

A. The Contractor shall be responsible for all cutting, fitting, or patching that may be required to execute the Work to the results indicated in the Contract Documents or to make its parts fit together properly.

B. Any cutting, patching, or excavation by the Contractor shall be supervised and performed in a manner that will not endanger persons nor damage or endanger the Work or any fully or partially completed construction of the Owner or separate contractors.

Article 48
IN-PROGRESS and FINAL CLEANUP

A. IN-PROGRESS CLEAN-UP

(1) The Contractor shall at all times during the progress of the Work keep the premises and surrounding area free from rubbish, scrap materials and debris resulting from the Work. Trash and combustible materials shall not be allowed to accumulate inside buildings or elsewhere on the premises. At no time shall any rubbish be thrown from window openings. Burning of trash and debris on site is not permitted.

(2) The Contractor shall make provisions to minimize and confine dust and debris resulting from construction activities.

B. FINAL CLEAN-UP

(1) Before Substantial Completion or Final Acceptance is achieved, the Contractor shall have removed from the Owner's property all construction equipment, tools, and machinery; temporary structures and/or utilities including the foundations thereof (except such as the Owner permits in writing to remain); rubbish, debris, and waste materials; and all surplus materials, leaving the site clean and true to line and grade, and the Work in a safe and clean condition, ready for use and operation.

(2) In addition to the above, and unless otherwise provided in the Contract Documents, the Contractor shall be responsible for the following special cleaning for all trades as the Work is completed:

(a) Cleaning of all painted, enameled, stained, or baked enamel work: Removal of all marks, stains, finger prints and splatters from such surfaces.

(b) Cleaning of all glass: Cleaning and removing of all stickers, labels, stains, and paint from all glass, and the washing and polishing of same on interior and exterior.

(c) Cleaning or polishing of all hardware: Cleaning and polishing of all hardware.

(d) Cleaning all tile, floor finish of all kinds: Removal of all splatters, stains, paint, dirt, and dust, the washing and polishing of all floors as recommended by the manufacturer or required by the Architect.

(e) Cleaning of all manufactured articles, materials, fixtures, appliances, and equipment: Removal of all stickers, rust stains, labels, and temporary covers, and cleaning and conditioning of all manufactured articles, material, fixtures, appliances, and electrical, heating, and air conditioning equipment as recommended or directed by the manufacturers, unless otherwise required by the Architect; blowing out or flushing out of all foreign matter from all equipment, piping, tanks, pumps, fans, motors, devices, switches, panels, fixtures, boilers, sanitizing potable water systems; and freeing identification plates on all equipment of excess paint and the polishing thereof.

C. OWNER'S RIGHT to CLEAN-UP

If the Contractor fails to comply with these clean-up requirements and then fails to comply with a written directive by the Architect to clean-up the premises within a specified time, the Architect or Owner may implement appropriate clean-up measures and the cost thereof shall be deducted from any amounts due or to become due the Contractor.

Article 49
LIQUIDATED DAMAGES

A. Time is the essence of the Contract. Any delay in the completion of the Work required by the Contract Documents may cause inconvenience to the public and loss and damage to the Owner including but not limited to interest and additional administrative, architectural, inspection and supervision charges. By executing the Construction Contract, the Contractor agrees that the Contract Time is sufficient for the achievement of Substantial Completion.

B. The Contract Documents may provide in the Construction Contract or elsewhere for a certain dollar amount for which the Contractor and its Surety (if any) will be liable to the Owner as liquidated damages for each calendar day after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work. If such daily liquidated damages are provided for, Owner and Contractor, and its Surety, agree that such amount is reasonable and agree to be bound thereby.

C. If a daily liquidated damage amount is not otherwise provided for in the Contract Documents, a time charge equal to six percent interest per annum on the total Contract Sum may be made against the Contractor for the entire period after expiration of the Contract Time that the Contractor fails to achieve Substantial Completion of the Work.

D. The amount of liquidated damages due under either paragraph B or C, above, may be deducted by the Owner from the moneys otherwise due the Contractor in the Final Payment, not as a penalty, but as liquidated damages sustained, or the amount may be recovered from Contractor or its Surety. If part of the Work is substantially completed within the Contract Time and part is not, the stated charge for liquidated damages shall be equitably prorated to that portion of the Work that the Contractor fails to substantially complete within the Contract Time. It is mutually understood and agreed between the parties hereto that such amount is reasonable as liquidated damages.

Article 50
USE of FOREIGN MATERIALS

A. In the performance of the Work the Contractor agrees to use materials, supplies, and products manufactured, mined, processed or otherwise produced in the United States or its territories, if same are available at reasonable and competitive prices and are not contrary to any sole source specification implemented under the Public Works Law.

B. In the performance of the Work the Contractor agrees to use iron or steel, that are made a permanent part of the structure, produced in the United States if the Contract Documents require the use of iron or steel and do not limit its supply to a sole source pursuant to the Public Works Law. If the Owner decides that the procurement of domestic steel products becomes impractical as a result of national emergency, national strike, or other cause, the Owner shall waive this restriction.

C. If domestic steel or other domestic materials, supplies, and products are not used in accordance with preceding Paragraphs A and B, the Contract Sum shall be reduced by an amount equal to any savings or benefits realized by the Contractor.

D. This Article applies only to Public Works projects financed entirely by the State of Alabama or any political subdivision of the state.

Article 51
PROJECT SIGN

A. Fully locally-funded State Agency and Public Higher Education projects: DCM Form C-15: Detail of Project Sign must be included in the project manual regardless of expected bid amount. If the awarded contract sum is $100,000.00 or more, Contractor shall furnish and erect a project sign. Other conditions besides the contract sum may warrant waiver of this requirement, but only with approval of the Technical Staff.

B. Fully locally-funded K-12 school projects: Project sign is not required unless requested by Owner; if project sign is requested by Owner, include DCM Form C-15: Detail of Project Sign in the project manual.

C. Partially or fully PSCA-funded projects: DCM Form C-15: Detail of Project Sign must be included in the project manual. Contractor shall furnish and erect a project sign for all PSCA-funded projects, regardless of the contract sum. "Alabama Public School and College Authority" as well as the local owner entity must be included as awarding authorities on the project sign of all PSCA-funded projects.

When required per the above conditions, the project sign shall be erected in a prominent location selected by the Architect and Owner and shall be maintained in good condition until completion of Work. If the Contract involves Work on multiple sites, only one project sign is required, which shall be erected on one of the sites in a location selected by the Architect and Owner. Slogan: The title of the current PSCA Act should be placed on the project sign of all PSCA-funded projects, otherwise the Awarding Authority/Owner's slogan, if any, should be used. If the Awarding Authority/Owner of a fully locally-funded project does not have a slogan, the project sign does not require a slogan.

END of
GENERAL CONDITIONS of the CONTRACT

DCM Form C-10
Revised July 2022

DCM (BC) No. _____

PSCA Projects: PSCA No. _____

Application No. _____

Date: _____

APPLICATION and CERTIFICATE for PAYMENT

Attach DCM Form C-10SOV: Schedule of Values

TO OWNER: Entity Name: Address:	PROJECT:
FROM CONTRACTOR: Company Name & Address, which must exactly match co. name & payment address spelling as registered in State of AL Accounting & Resource System (STAARS) or AL Buys to avoid rejection: STAARS or AL Buys Vendor #:	ARCHITECT / ENGINEER: Firm Name: Address:

A. Total Original Contract	$
B. Fully Executed (fully signed) Change Order(s) Numbers __ through __	+$ _____
C. Total Contract To Date	$

1. Work Completed to Date per attached Schedule of Values *(Form C-10SOV's Column F Total)*		$
2. Materials Presently Stored *(When this amount is greater than $0.00, attach Form C-10SM: Inventory of Stored Materials, or similar list)*		+$ _____
3. Total Work Completed to Date & Materials Presently Stored *(_____% of Contract To Date)*		$
4. Less Retainage *(If Total Work Completed to Date & Materials Presently Stored (#3) is less than or equal to 50% of Total Contract to Date (C), Retainage = #3 x 0.05. Once #3 exceeds 50% of C and up until project is complete, Retainage = C x 0.025. $0 is retained on final payment application, see last bullet point below Instructions.)*	Final pay app? ☐ Yes.	−$ _____
5. Total Due		$
6. Less Total Previous Payments Billed *(Must exactly match #5 Total Due from previous payment application. # 6 is $0.00 if there is no previous payment application)*		−$ _____
7. Balance Due This Estimate		$

CONTRACTOR'S CERTIFICATION

The undersigned Contractor certifies that to the best of his knowledge, information, and belief the Work covered by this Application for Payment has been completed in accordance with the Contract Documents, that all amounts have been paid by him for Work for which previous Certificates for Payments were issued and payments received from the Owner and that current payment shown herein has not yet been received.

By: _____ Date: _____
Contractor's Signature

Name & Title _____

Sworn and subscribed before me this _____ day of _____
Day Month, Year

Seal:

_____
Notary Public's Signature

ARCHITECT'S / ENGINEER'S CERTIFICATION

In accordance with the Contract Documents, the Architect/ Engineer certifies to the Owner that, to the best of the Architect's/ Engineer's knowledge and belief, the Work has progressed to the point indicated herein, the quality of the Work is in accordance with the Contract Documents, and the Contractor is entitled to payment of the amount approved.

By _____
Architect's / Engineer's Signature

Name & Title _____

Date _____

INSTRUCTIONS

- PSCA-funded projects, and State Agency-owned projects: Two copies of pay. app., each with original signatures and all attachments required.
- Date of first payment application cannot precede the Notice to Proceed's Begin Date.
- Pay. app. must exactly match an attached DCM Form C-10SOV: Schedule of Values.
- A change order must be fully executed before inclusion on a payment application.
- Contractor's signature date cannot precede the payment application date.
- Contractor and Notary signee dates must match.
- Progress schedules must be included with non-final payment applications.
- One payment application per month may be submitted.
- On a final payment application, the following is required for release of retainage: all change orders must be fully executed (signed by all parties and approval authorities) and included in B., the Certificate of Substantial Completion for entire work is fully executed, and all other close-out requirements per General Conditions Article 34 are completed.

APPROVAL

_____
Owner Entity

By _____
Signature

Name & Title _____

Date _____

INVENTORY OF STORED MATERIALS

DCM Form C-10SM
Revised October 2021

Project:	DCM (BC) No.:
	PSCA No, if any:
Contractor Company:	For Estimate No.:
	For Period Ending:

A	B	C	D	E
Description	**Materials Stored Last Period**	**Materials Purchased This Period (period noted above)**	**Materials Used This Period (period noted above)**	**Materials Presently Stored (B + C - D)**
TOTALS:				

Instructions :

· This Form C-10SM must be submitted as part of the payment application documentation when a Materials Presently Stored amount of anything greater than $0 is noted on line 2 of DCM Form C-10: Application and Certificate for Payment.

· Receipts must be provided as attachments to this form C-10SM for all amounts placed in Column C: Materials Purchased This Period.

· The total $ amount of this Form C-10SM's column E: Materials Presently Stored must match both Form C-10's line 2: Materials Presently Stored, and Form C-10SOV: Schedule of Values' total $ amount of Column G: Materials Presently Stored.

· The $ amounts in this current Form C-10SM's Column D: Materials Used This Period are amounts that must all be included in the current payment application's Form C-10SOV's Column E: Work Completed This Period.

· The $ amounts in this current Form C-10SM's Column E: Materials Presently Stored are the amounts that must be listed in the next payment application's Form C-10SM's Column B: Materials Stored Last Period.

SCHEDULE OF VALUES (SOV)

DCM Form C-10SOV
Revised October 2021

Project:	DCM (BC) Project Number:
	PSCA Project Number, if any:
Contractor Company:	Application Number:
	Application Date:
	Period From: / Period To:

A	B	C	D	E	F	G	H	I	J
Item No.	Description of Work	Scheduled Value (including fully executed [signed by all parties] change order amounts)	Work Completed: Work Previously Completed (Previous pay app SOV's column F. D is $0 if this SOV is for first pay app.)	Work Completed: Work Completed This Period (Period as noted above)	Total Work Completed to Date (This application SOV's D + E)	Materials Presently Stored (G total greater than $0 must match C-10SM's column E total. This SOV's G amounts are not in this SOV's D nor E amounts.)	Total Work Completed to Date & Materials Presently Stored (This SOV's F + G)	Percent of Contract Completed to Date (This SOV's H / C)	Retainage (This column's Total's cell formula calculates the applicable variable rate)
1.					$ -		$ -		Retainage Variable Rate:
2.					$ -		$ -		
3.					$ -		$ -		
4.					$ -		$ -		If Total Work Completed to Date & Materials Presently Stored (H) is less than or equal to 50% of Total Scheduled Value (C), Retainage = H x 0.05.
5.					$ -		$ -		
6.					$ -		$ -		
7.					$ -		$ -		
8.					$ -		$ -		
9.					$ -		$ -		
10.					$ -		$ -		
11.					$ -		$ -		
12.					$ -		$ -		
13.					$ -		$ -		
14.					$ -		$ -		
15.					$ -		$ -		Once H exceeds 50% of C and up until project is complete, Retainage = C x 0.025.
16.					$ -		$ -		
17.					$ -		$ -		
18.					$ -		$ -		
19.					$ -		$ -		
20.					$ -		$ -		
21.					$ -		$ -		There will be no retainage on final payment application.
22.					$ -		$ -		
23.					$ -		$ -		
24.					$ -		$ -		
25.					$ -		$ -		
	TOTALS:	$ -	$ -	$ -	$ -	$ -	$ -		$ -
This pay app SOV's column totals must match amounts in this pay app Form C-10 per the following indicated Form C-10 line #s:		C.	None	None	1.	2.	3.	3.	4.

Note: If this SOV's column G: Materials Presently Stored includes any amounts other than $0, then DCM Form C-10SM: Inventory of Stored Materials with back-up receipts must be submitted as part of the payment application documentation.

SAMPLE PROGRESS SCHEDULE & REPORT	CONTRACTOR (Contractor may use own form in lieu of Form C-11):	DATE OF REPORT:
DCM (BC) No.:		
PSCA projects: PSCA No.:		PROCEED DATE:
PROJECT:	ARCHITECT/ENGINEER:	PROJECTED COMPLETION DATE:

	WORK DIVISION	%	AMOUNT													
1.	GENERAL REQUIREMENTS															
2.	SITEWORK															
3.	CONCRETE															
4.	MASONRY															
5.	METALS															
6.	WOOD AND PLASTIC															100%
7.	THERMAL AND MOISTURE PROTECTION															90%
8.	DOORS AND WINDOWS															80%
9.	FINISHES															70%
10.	SPECIALTIES															60%
11.	EQUIPMENT															50%
12.	FURNISHINGS															40%
13.	SPECIAL CONSTRUCTION															30%
14.	CONVEYING SYSTEMS															20%
15.	MECHANICAL															10%
16.	ELECTRICAL															0%
TOTAL ORIG. CONTRACT		100%														
ANTICIPATED DRAW IN $1,000																
ACTUAL DRAW IN $1,000																

LEGEND: ANTICIPATED ACTIVITY — ACTUAL ACTIVITY — ANTICIPATED CASH FLOW — ACTUAL CASH FLOW

USE ADDITIONAL SHEETS IF JOB IS SCHEDULED OVER 12 MONTHS.

DCM Form C-11 August 2021

CONTRACT CHANGE ORDER

Change Order No. _____ **Date** _____ **DCM No.** _____

TO: (*Contractor*) Co. Name: Address:	**PROJECT:**

TERMS: You are hereby authorized, subject to the provisions of your Contract for this project, to make the following changes thereto in accordance with your proposal(s) dated _____

_____.

FURNISH the necessary labor, materials, and equipment to (*Description of work to be done or changes to be made. If the description is continued in an attachment, identify the attachment below; only use an attachment if fields below become full.):*

Description continued from Page 1:

ORIGINAL CONTRACT SUM $ _____

NET TOTAL OF PREVIOUS CHANGE ORDERS $ _____

PREVIOUS REVISED CONTRACT SUM $ _____

THIS CHANGE ORDER WILL INCREASE DECREASE THE CONTRACT SUM BY $ _____

REVISED CONTRACT SUM, INCLUDING THIS CHANGE ORDER $ _____

EXTENSION OF TIME resulting from this Change Order None *or* _____ Calendar days.

The Owner does hereby certify that this Change Order was executed in accordance with the provisions of Title 39, Code of Alabama, 1975, as amended.

_____
Architectural/Engineering Firm

Recommended By _____

Name & Title _____

APPROVAL, if any

_____
Entity

By _____

Name & Title _____

CONTRACTING PARTIES

_____
Contractor Company

By _____

Name & Title _____

_____
Awarding Authority/Owner Entity

By _____

Name & Title _____

CONSENT OF SURETY (for additive $ change orders only)

_____
Surety Company

By _____
(Attach current Power of Attorney)

Name & Title _____

TO: **Alabama Department of Finance**
Real Property Management
Division of Construction Management
770 Washington Avenue, Suite 444
Montgomery, AL 36130-1150
(334) 242-4082

DCM Form C-13
revised October 2024;
(Must be activated via DocuSign link from DCM's Engage Portal)

CERTIFICATE OF SUBSTANTIAL COMPLETION

ROUTING PROCEDURES *ON NEXT PAGE*

DCM (BC) No. _____

OWNER ENTITY NAME AND ADDRESS:	**ARCHITECTURAL / ENGINEERING FIRM NAME AND ADDRESS:**
Email to receive executed copy: _____	Email to receive executed copy: _____
CONTRACTOR COMPANY NAME AND ADDRESS:	**BONDING COMPANY NAME AND ADDRESS:**
Email to receive executed copy: _____	Email to receive executed copy: _____
PROJECT:	

Substantial Completion has been achieved for ☐ the entire Work ☐ the following portion of the Work:

_____

_____.

The **Date of Substantial Completion** of the Work covered by this certificate is established to be _____.

"Substantial Completion" means the designated Work is sufficiently complete, in accordance with the Contract Documents, such that the Owner may occupy or utilize the Work for its intended use without disruption or interference by the Contractor in completing or correcting any remaining unfinished Work. The Date of Substantial Completion is the date upon which all warranties for the designated Work commence, unless otherwise agreed and recorded herein.

Punch List: A _____ page list of items to be completed or corrected prior to the Owner's approval of Final Payment is attached hereto, but does not alter the Contractor's responsibility to complete or correct all Work in full compliance with the Contract Documents. The Contractor shall complete or correct all items on the attached list, ready for re-inspection for Final Acceptance, within 30 days after the above Date of Substantial Completion, unless another date is stated here: _____. If completed or corrected within this period, warranties of these items commence on the Date of Substantial Completion, otherwise such warranties commence on the date of Final Acceptance of each item.

Only <u>one</u> (1) originally executed substantial completion form shall be routed for signature. DCM office will mail the fully-executed original to the Owner and email copies to all parties.

RECOMMENDED BY *(signature and email address required)*:	
ARCHITECT/ENGINEER: _____	DATE: _____
CONTRACTING PARTIES:	
CONTRACTOR: _____	DATE: _____
OWNER: _____	DATE: _____
_____	DATE: _____
APPROVALS:	
DCM INSPECTOR: _____	DATE: _____
DCM CHIEF INSPECTOR: _____	DATE: _____
DCM DIRECTOR: _____	DATE: _____

CERTIFICATE OF SUBSTANTIAL COMPLETION ROUTING PROCEDURE

Only <u>one</u> (1) substantial completion form shall be routed for e-signatures, via DocuSign link from DCM's Engage Portal at: https://engagealabama-rpm.facilityforce.cloud

NOTICE

THE EXECUTED "GENERAL CONTRACTOR'S ROOFING GUARANTEE" (DCM Form C-9) AND ANY OTHER ROOFING WARRANTY REQUIRED BY THE CONTRACT MUST ACCOMPANY THIS CERTIFICATE TO OBTAIN DCM APPROVAL.

Also, any standard manufacturer's roofing guarantees which contain language regarding the governing of the guarantee by any state other than the State of Alabama, must be amended to exclude such language, and substituting the requirement that the Laws of the State of Alabama shall govern all such guarantees.

SAMPLE FORM OF ADVERTISEMENT FOR COMPLETION

LEGAL NOTICE

In accordance with Chapter 1, Title 39, Code of Alabama, 1975, as amended, notice is hereby given

that _____,
(*Contractor Company Name*)
Contractor, has completed the Contract for ☐(Construction) ☐(Renovation)
☐(Alteration) ☐(Equipment) ☐(Improvement) of (*Name of Project*):

at _____

(*Insert location data in County or City*)
for the State of Alabama and the (County) (City) of _____,
Owner(s), and have made request for final settlement of said Contract. All persons having any claim for labor, materials, or otherwise in connection with this project should immediately notify

_____

_____
(*Architect / Engineer*)

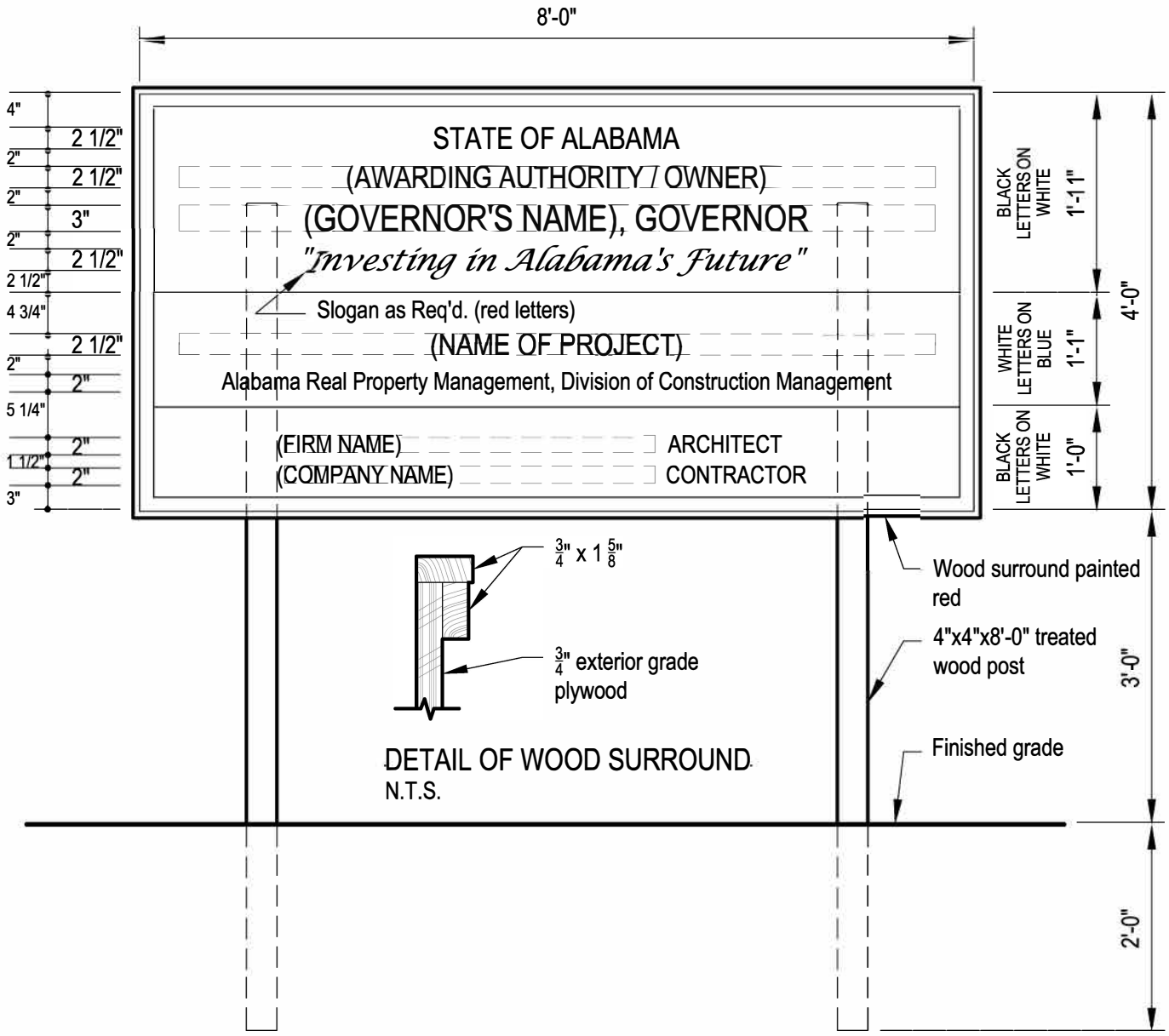
_____
(Contractor)

_____
(Business Address)

NOTE: This notice must be run for a minimum of three weeks for projects of $100,000.00 or more. For acceptable methods of advertisement, see General Conditions of the Contract, Article 34. Proof of publication of the notice shall be made by the contractor to the authority by whom the contract was made by affidavit of the publisher or website owner and a printed copy of the notice published. A final settlement shall not be made upon the contract until the expiration of 30 days after the completion of the notice.

DETAIL OF PROJECT SIGN

N.T.S.



DETAIL OF WOOD SURROUND
N.T.S.

Notes:

1. Project and Funding Types:
   - **Fully locally-funded State Agency and Public University projects:** DCM Form C-15 must be included in the project manual regardless of expected bid amount. If the awarded contract sum is $100,000.00 or more, Contractor shall furnish and erect a project sign.
   - **Fully locally-funded K-12 school projects:** Project sign is not required unless requested by Owner, if project sign is requested by Owner, include DCM Form C-15 in the project manual.
   - **Partially or fully PSCA-funded projects:** DCM Form C-15 must be included in the project manual. Contractor shall furnish and erect a project sign for all PSCA-funded projects, regardless of contract sum. "Alabama Public School and College Authority " as well as the local owner entity must be included as awarding authorities on the project sign of all PSCA-funded projects. Exception: Alabama Community College System (ACCS) PSCA-funded projects with Notice-To-Proceeds issued after July 31, 2021 are not submitted to DCM.
   - **Fully locally-funded ACCS projects with Notice-To-Proceeds issued prior to August 1, 2021:** DCM Form C-15 must be included in the project manual regardless of expected bid amount. If the awarded contract sum is $100,000.00 or more, Contractor shall furnish and erect a project sign.
2. Sign to be constructed of ¾" exterior grade plywood.
3. Paint with two coats best grade exterior paint before letters are painted. Option: In lieu of painted lettering on plywood, a corrugated plastic sign (displaying the same lettering, layout and colors as above) may be secured directly to the unpainted exterior grade plywood.
4. Sign shall be placed in a prominent location and easily readable from existing street or roadway.
5. Sign shall be maintained in good condition until project completion.
6. Slogan: Act 2020-167's title "Investing In Alabama's Future" should be placed on the project signs of all PSCA-funded projects, otherwise the Awarding Authority/Owner's slogan, if any, should be used. If the Awarding Authority/Owner of a fully locally-funded project does not have a slogan, the project sign does not require a slogan.

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Contractor's Affidavit of Payment of Debts and Claims

To Owner (*Entity name and address*)**:**	**Project** (*Same as appears in the Construction Contract*)**:**

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, payment has been made in full and all obligations have otherwise been satisfied for all materials and equipment furnished, for all work, labor and services performed, and for all known indebtedness and claims against the Contractor for damages arising in any manner in connection with the performance of the Construction Contract referenced above for which the Owner or Owner's property might in any way be held responsible or encumbered.

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Consent of Surety to Final Payment. Whenever Surety is involved, Consent of Surety is required. DCM Form C-20, Consent of Surety to Final Payment, may be used for this purpose.

   Indicate attachment: ☐ Yes ☐ No

The following supporting document should be attached hereto if required by the Owner:

1. Contractor's Release of Waiver of Liens.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof.
3. Contractor's Affidavit of Release of Liens, DCM Form C-19.

Contractor (*Insert company name and address*)**:**

By:_____
Signature of authorized representative

_____
Name and Title

Sworn to and subscribed before me this _____ day

of _____, _____.

_____
Notary Public's Signature

My commission expires: _____

Seal:

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Contractor's Affidavit of Release of Liens

To Owner (*Entity name and address*)**:**	**Project** (*Same as appears in the Construction Contract*)**:**

STATE OF:

COUNTY OF:

The undersigned hereby certifies that, except as listed below, the Releases or Waivers of Lien attached hereto include the Contractor, all Subcontractors, all suppliers of materials and equipment, and all performers of Work, labor or services who have or may have liens or encumbrances or the right to assert liens or encumbrances against any property of the Owner arising in any manner out of the performance of the Construction Contract referenced above.

EXCEPTIONS:

Supporting Documents Attached Hereto:

1. Contractor's Release of Waiver of Liens.
2. Separate Releases or Waivers of Liens from Subcontractors and material and equipment supplies, to the extent required by the Owner, accompanied by the list thereof.

Contractor (*Insert company name and address*)**:**

By: _____
Signature of authorized representative

_____
Name and Title

Sworn to and subscribed before me this _____ day

of _____, _____.

_____
Notary Public's Signature

My commission expires: _____

Seal:

DCM (BC) Number: _____

PSCA Projects: PSCA Number: _____

Date of the Construction Contract: _____

Surety's Bond Number: _____

CONSENT OF SURETY TO FINAL PAYMENT

To Owner (*Entity name and address):*	**Project** (*Same as appears in the Construction Contract*)**:**

In accordance with the provisions of the Contract between the Owner and the Contractor as indicated above, the

Surety (*Insert name and address of Surety*)

on bond of

Contractor (*Insert name and address of Contractor*)

hereby approves of the final payment to the Contractor, and agrees that final payment to the Contractor shall not relieve the Surety of any of its obligations to

Owner (*Insert name and address of Entity*)**:**

as set forth in said Surety's bond.

SIGNED AND SEALED this _____ day of _____, _____.

SURETY:

_____ Seal:
Company Name

By _____
Signature of Authorized Representative

_____
Printed Name and Title

Note: Original Power of Attorney for the Surety's signatory shall be furnished with each of the original forms to be attached to each of the four (4) final payment forms.

STATE OF ALABAMA
DEPARTMENT OF FINANCE
REAL PROPERTY MANAGEMENT
Division of Construction Management

P.O. Box 301150, Montgomery, AL 36130-1150
770 Washington Avenue, Suite 444, Montgomery, AL 36104
Telephone: (334) 242-4082

E-Verify Memorandum of Understanding

Instructions for inclusion in project manuals.

Per DCM's May 29, 2012 bulletin *Guidance on Act 2012-491 Amending the Alabama Immigration Law*: "Contractors (including architects and engineers) will … be required to enroll in the E-Verify program and to provide documentation of enrollment in the E-Verify program with their contracts or agreements."

Upon completing enrollment in the E-Verify program available at https://www.e-verify.gov/employers/enrolling-in-e-verify, an E-Verify Memorandum of Understanding (MOU) is issued to the enrolled business. The same E-Verify MOU can be repeatedly used until any information in the business's E-Verify user profile is updated, at which time E-Verify updates the printable Company Information section of the MOU, while the original signatory information remains the same. Typically, an E-Verify MOU is 13-18 pages long depending on business type and number of employees.

DCM requires a copy of the entire current E-Verify MOU document including the completed Department of Homeland Security – Verification Division section (with name, signature and date included) to be submitted as an attachment to each Agreement Between Owner and Architect original and to each Construction Contract original.

ALABAMA DEPARTMENT OF REVENUE
SALES AND USE TAX DIVISION
P.O. Box 327710 • Montgomery, AL 36132-7710

Reset

ST: EXC-01
6/21

Application For Sales and Use Tax Certificate of Exemption

FOR GOVERNMENT ENTITY PROJECT

This Certificate of Exemption will be limited to purchases which qualify for an exemption of sales and use taxes pursuant to Rule No. 810-6-3-.77

PROJECT INFORMATION:

PROJECT NAME				PROJECT OWNER'S FEIN (EXEMPT ENTITY)
STREET ADDRESS OF PROJECT (CITY AND COUNTY INCLUDED)	CITY	ZIP	COUNTY	

APPLICANT'S INFORMATION:

RELATION: *(CHOOSE ONE)*

☐ Government Entity ☐ General Contractor ☐ Subcontractor

APPLICANT'S LEGAL NAME				FEIN
DBA				CONSUMER'S USE TAX ACCOUNT NUMBER
MAILING ADDRESS: STREET	CITY	STATE	ZIP	COUNTY

CONTACT PERSON	BUSINESS TELEPHONE NUMBER
	( )

EMAIL ADDRESS

CONTRACT SIGN DATE (PROVIDED BY GENERAL CONTRACTOR)	CONTRACT COMPLETION DATE (PROVIDED BY GENERAL CONTRACTOR)
ESTIMATED START DATE (FOR APPLICANT)	ESTIMATED COMPLETION DATE (FOR APPLICANT)
WILL THE APPLICANT HAVE ANY SUBCONTRACTORS ON THIS JOB? ☐ Yes ☐ No If yes, please attach list.	NAME OF PARTY TO THE CONTRACT

JOB DESCRIPTION

WILL ANY POLLUTION CONTROL EXEMPTION BE APPLICABLE? ☐ Yes ☐ No	ESTIMATED POLLUTION CONTROL COST
	$

TOTAL PROJECT BID AMOUNT (APPLICANT'S PORTION OF PROJECT)	LABOR COST (APPLICANT'S PORTION OF PROJECT)	MATERIAL COST (APPLICANT'S PORTION OF PROJECT)
$	$	$

REVENUE DEPARTMENT USE ONLY

PENDING DOCUMENTATION / INFORMATION:

☐ GCL ☐ SBL ☐ Contract / NTP / LOI ☐ LOS ☐ Contract Dates / Breakdown of Costs

Contact Dates: _____ Received Date: _____

_____ Forwarded for Denial: _____

PROJECT NAME	PROJECT OWNER'S FEIN (EXEMPT ENTITY)

FORM OF OWNERSHIP:

☐ Individual ☐ Partnership ☐ Corporation ☐ Multi member LLC ☐ Single member LLC ☐ Government Entity

If applicant is a corporation, a copy of the certified certificate of incorporation, amended certificate of incorporation, certificate of authority, or articles of incorporation should be attached. If the applicant is a limited liability company or a limited liability partnership, a copy of the certified articles of organization should be attached.

OWNERSHIP INFORMATION:

Corporations – give name, title, home address, and Social Security Number of each officer.

Partnerships – give name, home address, Social Security Number or FEIN of each partner.

Sole Proprietorships – give name, home address, Social Security Number of owner.

LLC – give name, home address, and Social Security Number or FEIN of each member.

LLP – give name, home address, and Social Security Number or FEIN of each partner.

NAME *(PLEASE PRINT)* _____ SIGNATURE _____

TITLE _____ DATE _____

REVENUE DEPARTMENT USE ONLY

PENDING OTHER:

☐ Government Entity ☐ General Contractor ☐ Not on LOS

Contact Dates: _____ Received Date: _____

_____ Forwarded for Denial: _____

Examiner's Remarks _____

Examiner _____ Date _____

Instructions For Preparation of Form ST: EXC-01
Sales and Use Tax Certificate of Exemption for Government Entity Project

NOTE: Exemption Certificates will be issued as of the contract sign date or the received date of the application. If, upon receipt of the application, the project has already commenced, the certificate will be issued as of the received date of the application. Any purchases made prior to the issuance of a certificate will not be exempt.

*** **Please allow 10 to 14 business days for your application to be processed.** ***

In order to expedite the processing of your application, please include the following documentation when submitting your application:

Exempt Entity:
1. Signed Application
2. Copy of Executed/Signed Contract, Letter of Intent, Notice of Award, and/or Notice to Proceed

General Contractor:
1. Signed Application
2. Copy of Executed/Signed Contract, Letter of Intent, Notice of Award, and/or Notice to Proceed
3. List of Subcontractors
4. Alabama Board of General Contractor's License
5. State/County Business License (usually obtained through county probate office)
6. Any other municipal business licenses associated with the project

Subcontractor:
1. Signed Application
2. Alabama Board of General Contractor's License
3. State/County Business License (usually obtained through county probate office)
4. Any other municipal business licenses associated with the project
5. List of Subcontractors (if any)

General contractors and subcontractors:
- Any additions and/or deletions to the list of subcontractors working on a project must be submitted to the Department within 30 days of occurrence.
- If an extension is needed for a project, please contact the Department of Revenue at the address, number, or email listed below. Extension requests should be submitted no more than 30 days after expiration date.
- Subcontractor's Estimated Start Date should be the date they will begin working on the project and ordering materials instead of the General Contractor's Estimated Start Date for the project.

THERE IS A FILING REQUIREMENT IF YOUR APPLICATION IS APPROVED. The return will be filed through the Consumer's Use Tax account. Please see the following page for detailed instructions and general information regarding the reporting requirements.

The application and required documentation may be mailed, faxed, or emailed to the following:

Fax: (334) 353-7867

Email: STExemptionUnit@revenue.alabama.gov

Mailing Address: ATTN: Contractor's Exemption
Alabama Department of Revenue
Sales & Use Tax Division
Room 4303
PO Box 327710
Montgomery, AL 36132-7710

General Information and Instructions Regarding the Reporting Requirements for Contractors Awarded an Exemption Certificate

A contractor's exemption certificate for a Government Entity project is needed in order to purchase materials tax exempt for the qualified project. Once the exemption certificate has been applied for and awarded, there is a monthly filing requirement to report the purchases that have been made for each exempt project. The Consumer's Use (CNU) tax account is used to report the tax-exempt purchases made with each certificate for each exempt project for each month.

The consumer's use tax return must be filed for each of the months covered by the exemption certificate. (For example, if the certificate's effective date is June 29, 2014 and the expected completion date is October 1, 2014, a consumer's use tax return must be filed for each of the following months: June, July, August, September, and October.) A return MUST be filed each month to report the monthly purchases. Therefore, all active exemption certificates must be included on the monthly report even if the monthly purchases for a specific project was $0.

If a CNU tax account is not already open under the taxpayer/business name, one will automatically be assigned at the time the exemption certificate is generated. Electronic filing is required through the Department's online filing system, My Alabama Taxes (MAT). A letter containing the online filing information will be mailed to the address on file within a few days after the new CNU tax account has been assigned. This letter will contain all the information needed to create your online filing account in MAT. For questions relating to setting up the account on www.myalabamataxes.alabama.gov, please contact Business Registration at 334-242-1584 or the Sales Tax Division at 1-866-576-6531.

Once the MAT account is set up, please log in and file the monthly CNU tax return. There is a table located at the bottom left hand corner labeled "Contractor's Exemption for Government Construction Projects." All three fields in the table are required to be completed: exemption number, project number, and total amount of purchases for that specific project for the month. Additional projects may be added on the additional rows that appear as data is added; the table will allow the addition of more projects.

***Please do not use lines 1 through 9 of the return for reporting exempt project information. Leave these lines blank unless taxable purchases were made outside of the state of Alabama that need to be reported and tax remitted. (Lines 1 through 9 do not have anything to do with the exemption reporting requirements).

When the certificate expires (upon the project's completion) and the CNU tax account is no longer needed, please contact the Business Registration Unit at 334-242-1584 and close the CNU tax account. Please be advised that if there are multiple government entity projects open, the consumer's use tax account should remain open until the last project completion date. For example, if Project EXC00ABCD ends in June of 2014 but Project EXC00EFGH ends January of 2015, the CNU tax account must remain open until the end of January 2015. A return for Project EXC00EFGH must be filed all the way through January 2015.

If the applicant already has a CNU tax account and it is currently set up online, please use this account to report exempt project purchases through www.myalabamataxes.alabama.gov using the instructions provided above. The return may then be filed as usual.

***All Consumer's Use Tax returns are due on the 20th of the month following the month in which purchases were made (i.e., the return for the month of June is due July 20th, etc. There are 20 days to file the return before it is deemed late.)

***Any penalty waiver requests may be directed to the Sales and Use Tax Division at 1-866-576-6531. Only one waiver per 18 month period is allowed.

State of Alabama
Disclosure Statement

Required by Article 3B of Chapter 16 of Title 41, Code of Alabama 1975

ENTITY COMPLETING FORM

ADDRESS

CITY, STATE, ZIP TELEPHONE NUMBER

STATE AGENCY/DEPARTMENT THAT WILL RECEIVE GOODS, SERVICES, OR IS RESPONSIBLE FOR GRANT AWARD

ADDRESS

CITY, STATE, ZIP TELEPHONE NUMBER

This form is provided with:

☐ Contract ☐ Proposal ☐ Request for Proposal ☐ Invitation to Bid ☐ Grant Proposal

Have you or any of your partners, divisions, or any related business units previously performed work or provided goods to any State Agency/Department in the current or last fiscal year?

☐ Yes ☐ No

If yes, identify below the State Agency/Department that received the goods or services, the type(s) of goods or services previously provided, and the amount received for the provision of such goods or services.

STATE AGENCY/DEPARTMENT	TYPE OF GOODS/SERVICES	AMOUNT RECEIVED

Have you or any of your partners, divisions, or any related business units previously applied and received any grants from any State Agency/Department in the current or last fiscal year?

☐ Yes ☐ No

If yes, identify the State Agency/Department that awarded the grant, the date such grant was awarded, and the amount of the grant.

STATE AGENCY/DEPARTMENT	DATE GRANT AWARDED	AMOUNT OF GRANT

1. List below the name(s) and address(es) of all public officials/public employees with whom you, members of your immediate family, or any of your employees have a family relationship and who may directly personally benefit financially from the proposed transaction. Identify the State Department/Agency for which the public officials/public employees work. (Attach additional sheets if necessary.)

NAME OF PUBLIC OFFICIAL/EMPLOYEE	ADDRESS	STATE DEPARTMENT/AGENCY

2. List below the name(s) and address(es) of all family members of public officials/public employees with whom you, members of your immediate family, or any of your employees have a family relationship and who may directly personally benefit financially from the proposed transaction. Identify the public officials/public employees and State Department/Agency for which the public officials/public employees work. (Attach additional sheets if necessary.)

NAME OF FAMILY MEMBER	ADDRESS	NAME OF PUBLIC OFFICIAL/ PUBLIC EMPLOYEE	STATE DEPARTMENT/ AGENCY WHERE EMPLOYED

If you identified individuals in items one and/or two above, describe in detail below the direct financial benefit to be gained by the public officials, public employees, and/or their family members as the result of the contract, proposal, request for proposal, invitation to bid, or grant proposal. (Attach additional sheets if necessary.)

Describe in detail below any indirect financial benefits to be gained by any public official, public employee, and/or family members of the public official or public employee as the result of the contract, proposal, request for proposal, invitation to bid, or grant proposal. (Attach additional sheets if necessary.)

List below the name(s) and address(es) of all paid consultants and/or lobbyists utilized to obtain the contract, proposal, request for proposal, invitation to bid, or grant proposal:

NAME OF PAID CONSULTANT/LOBBYIST	ADDRESS

By signing below, I certify under penalty of perjury (in the jurisdiction in which it is executed) that all statements on or attached to this form are true and correct to the best of my knowledge. I further understand that a person who knowingly violates this article shall be subject to civil penalty in an amount of ten thousand dollars ($10,000), or 10 percent of the amount of the contract, whichever is less, to be deposited in the State General Fund. Also, the contract or grant shall be voidable by the awarding agency.

Authorized Signatory Date Jurisdiction in which this Disclosure Statement is executed

The disclosure statement is required to be completed and filed with grant proposals in excess of $25,000 and contracts that meet or exceed the threshold for bid or other formal solicitations under Article 5 of Chapter 4 of Title 41 or any other law that requires formal solicitation procedures for awarding public contracts.

Revised December 2021

ALABAMA DEPARTMENT OF FINANCE
REAL PROPERTY MANAGEMENT
Division of Construction Management

www.dcm.alabama.gov, 334-242-4082, inspections@realproperty.alabama.gov

Department Use Only
Invoice # _____
Date Paid _____
Confirmation # _____

PERMIT FEE & PERMIT RE-INSPECTION FEE CALCULATON WORKSHEET

DCM (BC) # _____ Date _____

Project Name; Owner/Architect/Engineer Project # & Phase/Package # _____

_____

Owner Entity Name _____

Architect/Engineer Firm Name _____

Contractor Company Name _____

Select only ONE of the following:

☐ Basic Permit Fee. Fee is based on awarded contract sum.

☐ Permit Re-Inspection Flat Fee.

Awarded Contract Sum: _____

Email address(es) for Payment Receipt: _____

BASIC PERMIT FEE CALCULATION:

Awarded Contract Sum is less than $1,000: N/A

Awarded Contract Sum is $1,001 - $50,000:

Contract Sum or Shelter Estimate less $1,000= _____/1,000 x $5.00=_____+$15.00=_____

Awarded Contract Sum is $50,001 - $100,000:

Contract Sum or Shelter Estimate less $50,000= _____/1,000 x $4.00=_____+$260.00=_____

Awarded Contract Sum is $100,001 - $500,000:

Contract Sum or Shelter Estimate less $100,000= _____/1,000 x $3.00=_____+$460.00=_____

Awarded Contract Sum is $500,001 and up:

Contract Sum or Shelter Estimate less $500,000= _____/1,000 x $2.00=_____+$1,660.00=_____

PERMIT RE-INSPECTION FEE:

Flat fee of $1,500.00 per occurrence

TOTAL DUE: _____

Basic Permit Fee: Covers all required pre-construction conferences, construction inspections and certificate of substantial completion issuance by the DCM Inspector. This fee is due when a construction contract or self-performance letter is received by DCM and must be paid before the required Pre-Construction Conference is scheduled with the DCM Inspector.

Permit Re-Inspection Fee: May be charged if (A) the contractor has not completed the work required for the particular inspection as detailed in DCM Form B-8: Pre-Construction Conference Checklist, or (B) the inspection is canceled or rescheduled without the required minimum 48 hours notice to all parties.

Make check payable to: "Finance - Construction Management," include the DCM (BC) Project # on the check and attach the fee worksheet. Mail payment to: Finance - Construction Management, P.O. Box 301150, Montgomery, AL 36130-1150.

State agency inter-fund transfer and payments using Public School and College Authority (PSCA) funds: contact Jennie Jones at 334-242-4808 or jennie.jones@realproperty.alabama.gov.

Fees may be paid online at www.dcm.alabama.gov (in which case a completed fee worksheet is not required).

The Basic Permit Fee is subject to Final Reconciliation of Fees at the end of construction.

SECTION 01 1000
SUMMARY

PART 1 GENERAL

1.01 PROJECT

A. Project Name: **22079 - Troy University Wallace Hall Renovation**

B. Owner's Name: Troy University.

C. Architect's Name: Seay Seay and Litchfield, P.C..

D. The Project consists of Interior demolition of select portions of first floor. Full renovation of radio, journalism, and lobby areas. Finish improvements in other areas.. Utilities for this project connect to existing provided in area of work.

E. Construction Time: 182 calendar days from notice to proceed to substantial completion, this is in addition to 30 days for the punch list to be completely accomplished. The contractor shall provide all submittals within 30 days of Notice to Proceed. Contractor has the option to store materials for the project, and bill stored materials when requirements are met per the contract documents, to avoid cost escalation. Owner will not be responsible for cost escalation of project materials. Contractor to notify Architect within the 30 day submittal period if there is a desired substitution due to material delays / shortages and substitution shall be reviewed and subject to approval per general conditions. The contractor will be responsible for coordinating punch list activities around the owners activities if both are occurring at the same time.

F. Notice of Award and Construction Contract submittal: The successful low bidder shall, within 24 hours or one business day from the notice of intent, from the owner to the contractor, to award the conract, prepare & present the complete and executed construction contract, bonds, insurance and all other documents required for the owner to execute the contract, and subsequently issue a notice to proceed to the contractor. Failure to submit these documents within this time may result in the bidder being declared non-responsive and the contract being awarded to the next low bidder.

G. Liquidated Damages: Per the Alabama Division of Construction Management General Conditions or $2000 per day beyond the contract completion date, which ever is more, plus any losses in grant income revenue due to the contractor's failure to complete the project within the contract time.

H. Construction Superintendent: The General Contractor shall provide a full time on site construction superintendent with a minimum of five years experience on a projects of similar size and type. These superintendents shall serve in a supervisory capacity.

I. Construction Project Manager: The General Contractor shall provide a project manager with a minimum of five years experience on projects of similar size and type.

J. Comply with the Following Regulatory Agencies and/or Requirements
   1. Alabama Division of Construction Management
   2. Alabama Fire Marshall
   3. City and or Municipality in which project is located
   4. Alabama Department of Environmental Management
   5. Owner/ Agency/Department
   6. OSHA
   7. The American Disabilities Act
   8. Applicable Federal Agencies

9. Obtain copies of the regulations listed above which are requied by Law to be at the project site and keep at the project site for the use of all parties.

K. Conflicts in the Contract Documents: Where conflicts occur in the contract documents the more expensive option shall be included for the contractor's pricing purposes unless otherwise clarified in writing by the Architect. Prior to execution of the work the Architect shall be consulted of all options, and a decision will be rendered by the Architect.

L. Building Permit and Business License Requirements:
1. The General Contractor will not be required to obtain a Building Permit thru the City of Troy for the project.
2. The General Contractor and all subcontractor's contracted to perform work under the scope of the General Contractor's scope of work will be required to have a business license through the City of Troy.
3. Prior to the bid, Contact the City of Troy, Pike County, and the University for clarification of the requirements of all applicable City to include Fire Department and Building Department, county, and university requirements.

M. BASIS OF DESIGN: When Materials or Products are listed as Basis of Design in the Contract Documents the intent is **not** to limit competition but set a quality standard within the drawings , Specifications, and Addenda. Competition of equal products is encouraged . Refer to the Specifications Section 01 6000 Product Requirements Part 3 EXECUTION, 3.01 Substitution Proceedures.

1.02 CONTRACT DESCRIPTION

A. Contract Type: A single prime contract based on a Stipulated Price as described in Alabama Division of Construction Management Owner/Contractor Agreement

B. Scope of the work shall be as shown in the contract documents prepared by Seay, Seay, & Litchfield, P.C. Dated - September 2026.

C. Refer to Contract Documents for Base Bid and Alternates, Allowances, Contingency Allowances, and Unit Prices.

1.03 USE OF SITE AND MISC. REQUIREMENTS

A. The space available to the contractor for the performance of the work, either exclusively or in conjunction with others performing other construction as part of the project, is as per the owner's approval.
1. The scope of work is limited to the first floor of Wallace Hall. Other areas are off limits to all construction personnel.
2. Portions of the first floor will be occupied during the duration of construction. This will include sound sensitive areas in the TV Studio.

B. Access to site will be limited; obtain owner's approval of proposed routes of access.

C. Keep existing sidewalks, roads, parking lots and drives on site clear and available at all times. Promptly remove mud, dirt, debris etc. from sidewalks, streets and public right-of-way during construction as it occurs.

D. Storage areas on site are very minimal and will be limited to materials that are to be immediately used in the progress of the work. If additional storage is required, then contractor shall secure and be responsible to pay for such off site storage in a fully bonded and insured facility acceptable to the owner, with all items clearly identified as being assigned to this project.

E. Contractors and Vendors are to lock all vehicles when parked and unattended. Do not leave keys in vehicles or equipment when unattended or leave unattended with motor running.

F. The Owner, Representative, Architect and the Architect's consultants as well as Building Authorities will require vehicular site accessibility on a regular basis to conduct business related to the project including performing inspections, observations, etc. The Contractor will maintain reasonably accessible routes for foot traffic through the site.

G. Provide secure temporary barricades, fencing, etc. as indicated to separate the public from construction operations. Compliant safety and/or warning signage is to be provided as well in conjunction with fencing and barricades.

H. Construction operations are not to affect any of the ongoing operations of the Owner throughout the site. Construction equipment is not to be attached to, or swing over existing buildings to remain, public areas, occupied buildings or parking lots, right-of-ways, etc.

I. Parking will not be allowed on site due to space limitations. All contractors will need to make provisions to secure off site parking for their employees.

J. Smoking or other use of other types of tobacco products shall not be permitted on any campus property. Comply with all university policies.

K. The use or presence of alcohol and/or debilitating substances are strictly prohibited on the project site.

L. Comply with the owner's security requirements

M. Signs: Provide signs adequate to direct visitors.

N. Music Devices: No music devices will be permitted on site to include but not limited to radios, tape players, CD players, Ipods, and head phones.

1.04 OTHER PROVISIONS:

A. The contractor shall be responsible for all means, methods, sequencing of work, demolition, and reparations to the property and facilities as required to accomplish the work. This shall include but is not limited to the installation of all equipment, furnishings, and materials.

OWNER'S RESPONSIBILITIES

3.01 OWNER'S REPRESENTATIVE

A. The Owner's Representative will manage the Work of the project and be the point of contact for all communications on behalf of the owner. The Owner's Representative will also coordinate all administrative and procedural requirements. The Owner's Representative will be Robert Burkey unless the Owner gives other written instructions otherwise.

3.02 WORK BY OWNER

A. Owner will award contracts as follows:
   1. Toilet Accessories: Refer to Section 10 2800.
   2. Furniture: Owner furnished Owner installed.
   3. Televisions: Owner furnished, Owner installed.
   4. Television Brackets: Owner furnished, Owner installed.

B. Contractor to coordinate with owner regarding scheduling of installation of owner provided products and materials.

3.03 OWNER OCCUPANCY

A. Owner intends to continue to occupy portions of the existing building during the entire construction period.

B. Owner intends to occupy the Project upon Substantial Completion.

C. Cooperate with Owner to minimize conflict and to facilitate Owner's operations.

D. Schedule the Work to accommodate Owner occupancy.

3.04 CONTRACTOR USE OF SITE AND PREMISES

A. Construction Operations: Limited to affected by the scope of work shown on the drawings. Coordinate with Owner.

B. Provide access to and from site as required by all applicable laws and by Owner:
   1. Emergency Building Exits During Construction: Keep all exits required by code open during construction period; provide temporary exit signs if exit routes are temporarily altered.
   2. Do not obstruct roadways, sidewalks, or other public ways without permit.

C. Existing building spaces may not be used for storage.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 1000

SECTION 01 2000
PRICE AND PAYMENT PROCEDURES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Procedures for preparation and submittal of applications for progress payments.

B. Documentation of changes in Contract Price and Contract Time.

C. Change procedures.

D. Procedures for preparation and submittal of application for final payment.

1.02 RELATED REQUIREMENTS

A. Alabama Division of Construction Management, General Conditions to the Contract for Construction.

1.03 SCHEDULE OF VALUES

A. Form to be used: As required by the Architect, the Alabama Division of Construction Mangagement and Troy University.

B. Electronic media printout including equivalent information will be considered in lieu of standard form specified; submit draft to Architect for approval.

C. Format: Utilize the Table of Contents of this Project Manual. Identify each line item with number and title of the specification Section. Identify site mobilization bonds and insurance and material and labor costs .

D. Revise schedule to list approved Change Orders, with each Application For Payment.
   1. Change Orders should be listed as separate line items included at the end of the schedule of values.
   2. When a Change Order includes multiple items of work, each item of work shall be listed as a separate line item with the approximate percentage complete for each scope of work listed.

E. Submit schedule of values within the timeframe outlined in the General Conditions of the Contract for Construction.

1.04 APPLICATIONS FOR PROGRESS PAYMENTS

A. Comply with all requirements of Article 29 of the General Conditions of the Contract for Construction. Additional requirements/explanations are listed below.

B. Refer to Articles 30 & 31 of the General Conditions of the Contract for Construction.

C. Form to be used: ADCM Application and certificate for payment form C-10.

D. Use data from approved Schedule of Values. Provide dollar value in each column for each line item for portion of work performed and for stored products.
   1. List each authorized Change Order as a separate line item, listing Change Order number and dollar amount as for an original item of Work.

E. Include the following with the application:
   1. Transmittal letter as specified for Submittals in Section 01 3000.
   2. Construction progress schedule, revised and current as specified in Section 01 3000.
   3. Current construction photographs specified in Section 01 3000.

1.05 MODIFICATION PROCEDURES

A. Comply with all requirements of Article 19 of the General Conditions of the Contractor for Construction.

B. Computation of Change in Contract Amount: As specified in the Agreement and Conditions of the Contract.

1.06 APPLICATION FOR FINAL PAYMENT

A. Comply with all requirements of Article 34 of the General Conditions of the Contractor for Construction.

B. Application for Final Payment will not be considered until the following have been accomplished:
   1. All closeout procedures specified in Section 01 7000.
   2. All stipulated requirements stated in the General Conditions of the Contract for Construction.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 2000

SECTION 01 2100
ALLOWANCES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Contingency allowance.

1.02 RELATED REQUIREMENTS

A. Section 01 2000 - Price and Payment Procedures: Additional payment and modification procedures.

1.03 CONTINGENCY ALLOWANCE

A. Refer to Schedule of Allowances for Allowances and monetary amounts of each allowance to be included in the contractor's base bid.

B. The Contractor shall include in his bid proposal all costs of office, job supervision, overhead, profit, and bond on the Contingency Allowances listed in the Schedule of Allowances, because no such costs will be paid to Contractor for work performed under these Contingency Allowances. Only the direct costs of performing work under this provision shall be paid under and charged against the Contingency Allowance; such cost includes costs of materials and delivery, installation labor, payroll taxes and insurance, equipment expense, and the cost of subcontracted work (subcontractor's cost may include a maximum of 15% mark-up for overhead and profit).

C. The Contractor shall include a line item in the Schedule of Values entitled “Contingency Allowance” with values as scheduled below. The estimated value of work completed pursuant to fully executed Contingency Allowance Authorizations may be included in the Contractor’s monthly Applications for Payment. Payments under this Contingency Allowance shall not exceed the net, total of fully executed Contingency Allowance Authorizations.
   1. When a contingency allowance includes multiple items of work, each item of work shall be listed as a separate line item in the schedule of values with the approximate percentage complete for each scope of work listed.

D. At closeout of Contract, funds remaining in Contingency Allowance will be credited to Owner by Change Order along with a credit for OH&P in accordance with Alabama Building Commission requirements. The owner may, at his discretion, transfer balance of any contingency to another allowance.
   1. Credit for overhead and profit (OH&P) on unused contingency allowance shall be fair and reasonable, equal to the amount of OH&P that was applied to the contingency amounts for the purposes of bidding, and in no case less than 5%.

E. An accounting of the costs charged against this Contingency Allowance shall be mutually maintained by the Contractor, Architect, and Owner throughout the course of the project.

F. Contingency Allowances to be executed on the forms attached to this section.

1.04 ALLOWANCES SCHEDULE

A. General Contingency Allowance : Include the stipulated sum of $100,000 (without sales tax included) for purchase, delivery, & installation of:
   1. Unforeseen conditions or minor changes that are necessary for an allowance of $100,000.00 to supplement the work as detailed in the Contract Documents and as determined by the owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 2100

SECTION 01 2200
UNIT PRICE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. List of unit prices, for use in preparing Bids.

B. Measurement and payment criteria applicable to Work performed under a unit price payment method.

1.02 COSTS INCLUDED

A. A unit price is an amount proposed by Bidders and stated on the Bid Form as a price per unit of measurement for materials or services that will be added to or deducted from the Contract Sum by Change Order in the event the estimated quantities of Work required by the Contract Documents are increased or decreased.

B. Unit Prices included on the Bid Form shall include full compensation for all required labor, products, tools, equipment, plant, transportation, services and incidentals; erection, application or installation of an item of the Work; overhead and profit.

C. Refer to individual Specification Sections for construction activities requiring the establishment of unit prices. Methods of measurement and payment for unit prices are specified in those Sections.

D. Schedule: A "Unit Price Schedule" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods described under each unit price.

E. Under the provisions of Article 19 of the General Conditions of the Contract, the Owner reserves the right to negotiate a lower rate at the time of use of a unit price to implement work defined or required under the unit price provisions.

F. The following items of work are anticipated during the performance of this contract; however the exact quantity of each work item may not be determinable prior to bidding. The Contractor shall therefore, include in his Lump Sum Base Bid, an allowance for the following items in the quantities indicated: Allowance Unit Prices include all charges for labor, materials and equipment, shoring, layout, supervision (field and home office), general expenses, insurance, overhead and profit, but not limited to, for the accomplishment of the Allowance item(s). Where quantities of same items of work are defined and are quantified in the bid documents, the allowance quantities indicated hereinafter shall be in addition to those that are indicated. (Example: If the site grading plan indicated new and existing grades, the bidder shall compute the quantity of earthwork required and include that quantity of work in the bid the same as if no "allowance" quantity were specified. If an additional allowance quantity of earthwork is stipulated that stipulated allowance quantity of work shall also be included in addition to the quantity computed from the bidders earthwork "takeoff").

G. The following Unit Prices Quoted are for increases or decreases in the above quantities included in the Lump Sum Base Bid. These Unit Prices include all charges for labor, materials and equipment, shoring, layout, supervision (field and home office), general expenses, insurance, overhead and profit, but not limited to, for the accomplishment of the Allowance item(s).

H. Clarification Note: The Unit Prices quoted by the Contractor shall apply to increases (additive change orders) and to decreases (deductive change orders). This requirement shall supplement the requirements of the General Conditions and Instructions to Bidders. Changes

in the contract amount that are computed using the Stated Allowances and Unit Prices shall be figured at the same unit price whether additive or deductive.

1.03 UNIT QUANTITIES SPECIFIED

A. Quantities indicated in the Bid Form are for bidding and contract purposes only. Quantities and measurements of actual Work will determine the payment amount.

1.04 MEASUREMENT OF QUANTITIES

A. Take all measurements and compute quantities. Measurements and quantities will be verified by Architect.

B. Assist by providing necessary equipment, workers, and survey personnel as required.

C. Measurement by Volume: Measured by cubic dimension using mean length, width and height or thickness.

D. Measurement by Area: Measured by square dimension using mean length and width or radius.

E. Linear Measurement: Measured by linear dimension, at the item centerline or mean chord.

F. The Owner reserves the right to reject the Contractor's measurement of work-in-place that involves use of established unit prices, and will have this Work measured by the Owner's geotechnical consultant or owner's civil engineer.

1.05 PAYMENT

A. Payment for Work governed by unit prices will be made on the basis of the actual measurements and quantities of Work that is incorporated in or made necessary by the Work and accepted by the Architect, multiplied by the unit price.

1.06 SCHEDULE OF UNIT PRICES

A. **UNIT PRICE NO. 1**

1. Removal and Disposal of Friable Asbestos in Existing Drywall Joint Compoud: In addition to the removal and diposal indicated on the plans, the Contractor shall include in his base bid the cost per linear feet of removal and disposal of joint compoud with asbestos. See EMC report. Removal and disposal of joint compoud with asbestos shall be per industry standard and in accordance with requirements of project conditions and geotechnical engineer. The Contractor shall provide a unit figure at a rate of cost per linear feet of removal and replacement. The Contractor shall include in his base bid a cost of 200 linear feet for removal and disposal.
2. If the actual linear feet of removal and replacement in addition to that called for on the plans is more than 200 linear feet as required by the Contract Documents, an amount (dollar for dollar) will be added to the contract amount at this rate for any linear feet in excess.
3. If the actual linear feet of removal and replacement in addition to that called for on the plans is less than 200 linear feet as required by the Contract Documents, an amount (dollar for dollar) will be deducted from the contract amount at this rate for any linear feet in deficiency.
4. Quantities will be verified by the Owner's environmental materials consultant and not by any other means.
5. The contractor shall alert the architect prior to this work being performed to apprise the architect of estimated quantities. If the architect does not receive prior notice, the work in place will not be quantified towards the 200 linear feet.

B. **UNIT PRICE NO. 2**

1. Additional Hat Channels and Gypsum Board: In addition to the demolition and new walls indicated on the plans, the Contractor shall include in his base bid the cost per square feet of additional 7/8" hat channels and 5/8" type X gypsum board (one layer, painted) attached to existing walls to remain. Additional hat channels and gypsum shall be per industry standard and in accordance with spec sections 05 4000, 09 2116, and 09 9123. The Contractor shall provide a unit figure at a rate of cost per square feet. This unit cost shall *include* demolition of existing finishes (where applicable). This unit price shall *exclude* any abatement of joint compound (see Unit Price No. 1). The Contractor shall include in his base bid a cost of 1,000 square feet for this assembly (hat channel & painted .
2. If the actual sqare feet of wall or ceiling demolition in addition to that called for on the plans is more than 1,000 square feet as required by the Contract Documents, an amount (dollar for dollar) will be added to the contract amount at this rate for any square feet in excess.
3. If the actual square feet of wall or ceiling demolition in addition to that called for on the plans is less than 1,000 square feet as required by the Contract Documents, an amount (dollar for dollar) will be deducted from the contract amount at this rate for any square feet in deficiency.
4. The contractor shall alert the architect prior to this work being performed to apprise the architect of estimated quantities. If the architect does not receive prior notice, the work in place will not be quantified towards the 1,000 square feet.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 2200

This page intentionally left blank

SECTION 01 2300
– ALTERNATES

PART 1 – GENERAL

1.01 SECTION INCLUDES

A. Description of Base Bid

B. Description of Alternates

C. Procedures for Pricing Alternates

1.02 BASE BID

A. Base Bid: All items shown on contract documents except items part of additive alternate items or contract options.

1.03 ACCEPTANCE OF ALTERNATES

A. Alternates quoted on Bid Forms will be reviewed and accepted or rejected at Owner's option in accordance with the requirements of the Instruction for Bidders. Accepted alternates will be identified in the Owner-Contractor Agreement.

B. Coordinate related work and modify surrounding work to integrate the work of each alternate.

1.04 SUMMARY

A. Definition: An Alternate is an amount proposed by Bidders and stated on the Bid Form for certain construction activities defined in the Bidding Requirements that may be added or deducted from Base Bid amount if the Owner decides to accept a corresponding change in either the amount of construction to be complete, or in the products, materials, equipment, systems, or installation methods described in Contract Documents.

B. Coordination: Coordinate related work and modify or adjust adjacent work as necessary to ensure that work affected by each accepted Alternate and/or contract option is complete and fully integrated into the project.

C. Schedule: A "Schedule of Alternatives" is included at the end of this Section. Specification Sections referenced in the Schedule contain requirements for materials and methods necessary to achieve the Work described under each Alternate.

D. Include as part of each Alternate, miscellaneous devices, accessory objects and similar items incidental to or required for a complete installation whether or not mentioned as part of the Alternate.

1.05 SCHEDULE OF ALTERNATES

A. **Alternate No. 1 - Acoustic Improvements to Radio Department.**
   1. Includes all labor, demolition, and materials required for the installation, assembly and construction of acoustic improvements as shown on enlarged alternate plans. Acoustic improvements in this alternate include double stud walls, gypsum ceilings on metal stud framing, STC rated doors, and other sound proofing as shown in the alternate plans.

B. **Alternate No. 2 - Environmental Wall Graphics.**
   1. Includes all labor and materials as required to install wall graphics as shown on signage sheets of architectural drawings.

C. **Alternate No. 3 - Interior Storefront in Radio Department:**
   1. Includes all labor, demolition, and materials required for the installation, assembly and construction of larger interior storefront openings, as shown on enlarged alternate plans / elevations.

D. **Alternate No. 4 - Replace Exterior Entry Storefront**
   1. Includes all labor, demolition, and materials required for the installation, assembly and construction of new storefront as shown on the alternate plans / elevations and as specified in section 08 4313.

E. **Alternate No. 5 - Door Resurfacing**
   1. Includes all labor and materials required for the resurfacing of existing doors with vinyl wrap as specified in section 09 7000. Locations of doors to be included are shown on plans.

END OF SECTION 01 2300

SECTION 01 3000
ADMINISTRATIVE REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Preconstruction meeting.

B. Progress meetings.

C. Construction progress schedule.

D. Progress photographs.

E. Coordination drawings.

F. Submittals for review, information, and project closeout.

G. Number of copies of submittals.

H. Submittal procedures.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary:

B. Section 01 7000 - Execution and Closeout Requirements: Additional coordination requirements.

C. Section 01 3001 - Submittals

1.03 PROJECT COORDINATION

A. Project Coordinator: Contractor's Project Manager is responsible for overall project coordination. .

B. Make the following types of submittals to Architect through the Project Coordinator:
   1. Requests for interpretation.
   2. Shop drawings, product data, and samples.
   3. Test and inspection reports.
   4. Design data.
   5. Manufacturer's instructions and field reports.
   6. Applications for payment and change order requests.
   7. Progress schedules.
   8. Coordination drawings.
   9. Correction Punch List and Final Correction Punch List for Substantial Completion.
   10. Closeout submittals.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 PRECONSTRUCTION MEETING

A. Architect will schedule a meeting after notice to proceed.

B. Attendance Required:
   1. Owner.
   2. Architect.
   3. Contractor.
   4. All major sub contractors and suppliers.
   5. Division of Construction Management Representative.

C. Agenda:
   1. As outlined in the Division of Construction Management's Manual of Procedures

D. Architect will record minutes and distribute copies promptly after meeting to participants, with copies to the Contractor, Owner, participants, and those affected by decisions made

3.02 PROGRESS MEETINGS

A. Project Coordinator will make arrangements for meetings, prepare agenda with copies for participants, preside at meetings.

B. Attendance Required: Job superintendent, Contractor's Project Manager, Owner, Architect, and major Subcontractors/Suppliers when necessary/requested by the Owner/Architect/Contractor.

C. Agenda:
   1. Review minutes of previous meetings.
   2. Review of Work progress.
   3. Field observations, problems, and decisions.
   4. Identification of problems that impede, or will impede, planned progress.
   5. Review of submittals schedule and status of submittals.
   6. Maintenance of progress schedule.
   7. Corrective measures to regain projected schedules.
   8. Planned progress during succeeding work period.
   9. Maintenance of quality and work standards.
   10. Effect of proposed changes on progress schedule and coordination.
   11. Review of modifications to project record documents documenting changes made on site since previous progress meeting.
   12. Other business relating to Work.

D. Architect will record minutes and distribute copies promptly after meeting to participants, with copies to Architect and Owner. Contractor will be responsible for distributing minutes to suppliers/Subcontractor and those affected by decisions made.

3.03 CONSTRUCTION PROGRESS SCHEDULE

A. Submit proposed project schedule as outlined in the General Conditions of the Contract for Construction.

B. General Requirements:
   1. Time Frame: Extend schedule from date established for the Notice to Proceed to date of Substantial Completion to date of Final Completion.
   2. Activities: Treat each story or separate area as a separate numbered activity for each principal element of the Work. Comply with the following:
      a. Activity Duration: Define activities so no activity is longer than twenty days, unless specifically allowed by Architect.
      b. Procurement Activities: Include procurement process activities for 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.
      c. Submittal Review Time: Include review and resubmittal times indicated in Division 1 Section "Submittal Procedures" in schedule. Coordinate submittal review times in Contractor's Construction Schedule with Submittals Schedule.
      d. Startup and Testing Time: Include not less than seven days for startup and testing.

e. Substantial Completion: Indicate completion in advance of date established for Substantial Completion, and allow time for Architect's administrative procedures necessary for certification of Substantial Completion.

3. 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.
   a. Phasing: Arrange list of activities on schedule by phase.
   b. Work by Owner: Include a separate activity for each portion of the Work performed by Owner.
   c. Products Ordered in Advance: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   d. Owner-Furnished Products: Include a separate activity for each product. Include delivery date indicated in Division 1 Section "Summary." Delivery dates indicated stipulate the earliest possible delivery date.
   e. Work Restrictions: Show the effect of the following items on the schedule:
      1) Coordination with existing construction.
      2) Limitations of continued occupancies.
      3) Uninterruptible services.
      4) Partial occupancy before Substantial Completion.
      5) Use of premises restrictions.
      6) Provisions for future construction.
      7) Seasonal variations.
      8) Environmental control.
4. Milestones: Include milestones indicated in the Contract Documents in schedule, including, but not limited to, the Notice to Proceed, review inspections by review agencies, Substantial Completion, and Final Completion.
5. 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.
   a. Refer to Division 1 Section "Payment Procedures" for cost reporting and payment procedures.
6. Contract Modifications: For each proposed contract modification and concurrent with its submission, prepare a time-impact analysis using fragments to demonstrate the effect of the proposed change on the overall project schedule.

C. Gantt-Chart Schedule:
1. Submit a comprehensive, fully developed, horizontal Gantt-chart-type, Contractor's Construction Schedule within thirty days of date established from the Notice to Proceed . Base schedule on the Preliminary Construction Schedule and whatever updating and feedback was received since the start of Project.
2. Preparation: Indicate each significant construction activity separately. Identify first workday of each week with a continuous vertical line.
   a. For construction activities that require 3 months or longer to complete, indicate an estimated completion percentage in ten percent increments within time bar.

D. Contractor's Construction Schedule Updating: At monthly intervals, update schedule to reflect actual construction progress, activities, and phasing when applicable. 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.

E. 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.

3.04 REPORTS

A. Daily Construction Reports: Prepare a daily construction report and email to all required parties by noon of the following work day, 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. High and low temperatures and general weather conditions.
5. Accidents.
6. Meetings and significant decisions.
7. Unusual events (refer to special reports).
8. Stoppages, delays, shortages, and losses.
9. Orders and requests of authorities having jurisdiction.
10. Applicable photographs, noting location and condition.

3.05 PRE-CONSTRUCTION PHOTOGRAPHS

A. Before starting construction, take one hundred color photographs and digital video recording of Project site and affected City right-of-ways and surrounding properties and interior existing photos of affected areas from different vantage points, as directed by Architect. Show existing conditions adjacent to property.

3.06 PROGRESS PHOTOGRAPHS

A. Submit photographs with each application for payment, taken not more than 3 days prior to submission of application for payment.

B. Provide photographs of site and construction throughout progress of Work produced by an experienced photographer, who can also be an employee of the contractor, acceptable to Architect.

C. In addition to periodic, recurring views, take photographs of each of the following events:
1. Final completion, minimum of ten (10) photos.

D. Views:
1. Provide non-aerial photographs from four cardinal views at each specified time, until Date of Substantial Completion.
2. Consult with Architect for instructions on views required.
3. Provide factual presentation.

4. Provide correct exposure and focus, high resolution and sharpness, maximum depth of field, and minimum distortion.

E. Digital Photographs: 24 bit color, minimum resolution of 1024 by 768, in JPG format; provide files unaltered by photo editing software.
1. Delivery Medium: Via email.
2. File Naming: Include project identification, date and time of view, and view identification.
3. PDF File: Assemble all photos into printable pages in PDF format, with 2 to 3 photos per page, each photo labeled with file name; one PDF file per submittal.
4. Hard Copy: Printed hardcopy (grayscale) of PDF file and point of view sketch.

3.07 SUBMITTALS FOR REVIEW

A. When the following are specified in individual sections, submit them for review:
1. Product data.
2. Shop drawings.
3. Samples for selection.
4. Samples for verification.

B. Submit to Architect for review for the limited purpose of checking for conformance with information given and the design concept expressed in the contract documents.

C. Samples will be reviewed only for aesthetic, color, or finish selection.

D. After review, provide copies and distribute in accordance with SUBMITTAL PROCEDURES article below and for record documents purposes described in Section 01 7800 - Closeout Submittals.

E. Paper format submittals will not be accepted except where specifically approved by Architect prior to submission.

3.08 SUBMITTALS FOR INFORMATION

A. When the following are specified in individual sections, submit them for information:
1. Design data.
2. Certificates.
3. Test reports.
4. Inspection reports.
5. Manufacturer's instructions.
6. Manufacturer's field reports.
7. Other types indicated.

B. Submit for Architect's knowledge as contract administrator or for Owner. No action will be taken.

3.09 SUBMITTALS FOR PROJECT CLOSEOUT

A. Submit Correction Punch List for Substantial Completion.

B. Submit Final Correction Punch List for Substantial Completion.

C. When the following are specified in individual sections, submit them at project closeout:
1. Project record documents.
2. Operation and maintenance data.
3. Warranties.
4. Bonds.
5. Other types as indicated.

D. Submit for Owner's benefit during and after project completion.

3.10 NUMBER OF COPIES OF SUBMITTALS

A. All Submittals shall be electronic.

3.11 SUBMITTAL PROCEDURES

A. Shop Drawing Procedures:
   1. Prepare accurate, drawn-to-scale, original shop drawing documentation by interpreting the Contract Documents and coordinating related Work.
   2. Generic, non-project specific information submitted as shop drawings do not meet the requirements for shop drawings.

B. Transmit each submittal with a copy of approved submittal form.

C. Transmit each submittal with approved form.

D. Sequentially number the transmittal form. Revise submittals with original number and a sequential alphabetic suffix.

E. Identify Project, Contractor, Subcontractor or supplier; pertinent drawing and detail number, and specification section number, as appropriate on each copy.

F. Apply Contractor's stamp, signed or initialed certifying that review, approval, verification of Products required, field dimensions, adjacent construction Work, and coordination of information is in accordance with the requirements of the Work and Contract Documents. Submittals not including the Contractor's stamp will be returned without review.

G. Deliver submittals to Architect at business address.

H. Schedule submittals to expedite the Project, and coordinate submission of related items.

I. For each submittal for review, allow a minimum of 15 days excluding delivery time to and from the Contractor. Complicated submittals, and those submittals requiring review by architect's consultants or coordination with other trades may required additional review time. Contractor shall provide submittals in sufficient time to allow for review without impacting construction schedule. Contractor to advise Architect when review of submittal by certain dates is critical to the project schedule.

J. Identify variations from Contract Documents and Product or system limitations that may be detrimental to successful performance of the completed Work. Refer to General Conditions of the Contract for Construction regarding variations from Contract Documents.

K. Provide space for Contractor and Architect review stamps.

L. When revised for resubmission, identify all changes made since previous submission.

M. Distribute reviewed submittals as appropriate. Instruct parties to promptly report any inability to comply with requirements.

N. Submittals not requested will not be recognized or processed.

O. Multiple Re-submittals: If a submittals is rejected and then re-submitted, the re-submittal must comply with the contract documents and any previous comments. If the re-submittal is not in compliance and has to be re-submitted again, a charge will be assessed for review of the 1st re-submittal and another charge will be assessed for each subsequent re-submittal review to account for additional review time by the Architect and engineers. The re-submittal fee shall be $250.00 payable to the Architect. Check must accompany the second re-submittal.

END OF SECTION 01 3000

SECTION 01 4000
QUALITY REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. References and standards.

B. Submittals.

C. References and standards.

D. Mock-ups.

E. Control of installation.

F. Tolerances.

G. Testing and inspection agencies and services.

H. Control of installation.

I. Mock-ups.

J. Tolerances.

K. Manufacturers' field services.

L. Defect Assessment.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 6000 - Product Requirements: Requirements for material and product quality.

1.03 REFERENCE STANDARDS

A. ASTM C1077 - Standard Practice for Laboratories Testing Concrete and Concrete Aggregates for Use in Construction and Criteria for Laboratory Evaluation; 2014.

B. ASTM C1093 - Standard Practice for Accreditation of Testing Agencies for Masonry; 2013.

C. ASTM D3740 - Standard Practice for Minimum Requirements for Agencies Engaged in the Testing and/or Inspection of Soil and Rock as Used in Engineering Design and Construction; 2012a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Design Data: Submit for Architect's knowledge as contract administrator for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents, or for Owner's information.

C. Report/Inspection Data: Written reports of each inspection, test or similar service shall include, but not be limited to:
   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 the inspection or test.
   6. Designation of the Work and test method.
   7. Identification of product and Specification Section.
   8. Complete inspection or test data.

9. Test results and an interpretation of test results.
10. Ambient conditions at the time of sample-taking and testing.
11. Comments or professional opinion as to whether inspected or tested Work complies with Contract Document requirements.
12. Name and signature of laboratory inspector.
13. Recommendations on retesting.
14. The independent testing agency shall submit a certified written report of each inspection, test or similar service, to the Architect, in duplicate, unless the Contractor is responsible for the service. If the Contractor is responsible for the service, submit a certified written report of each inspection, test or similar service through the Contractor, in duplicate.
15. Submit additional copies of each written report directly to the governing authority, when the authority so directs.

D. Certificates: When specified in individual specification sections, submit certification by the manufacturer and Contractor or installation/application subcontractor to Architect, in quantities specified for Product Data.
   1. Indicate material or product conforms to or exceeds specified requirements. Submit supporting reference data, affidavits, and certifications as appropriate.
   2. Certificates may be recent or previous test results on material or product, but must be acceptable to Architect.

E. Manufacturer's Instructions: When specified in individual specification sections, submit printed instructions for delivery, storage, assembly, installation, start-up, adjusting, and finishing, for the Owner's information. Indicate special procedures, perimeter conditions requiring special attention, and special environmental criteria required for application or installation.

F. Manufacturer's Field Reports: Submit reports for Architect's benefit as contract administrator or for Owner.
   1. Submit for information for the limited purpose of assessing conformance with information given and the design concept expressed in the contract documents.

1.05 REFERENCES AND STANDARDS

A. For products and workmanship specified by reference to a document or documents not included in the Project Manual, also referred to as reference standards, comply with requirements of the standard, except when more rigid requirements are specified or are required by applicable codes.

B. Conform to reference standard of date of issue current on date of Contract Documents, except where a specific date is established by applicable code.

C. Obtain copies of standards where required by product specification sections.

D. Maintain copy at project site during submittals, planning, and progress of the specific work, until Substantial Completion.

E. Should specified reference standards conflict with Contract Documents, request clarification from Architect before proceeding.

F. Neither the contractual relationships, duties, or responsibilities of the parties in Contract nor those of Architect shall be altered from the Contract Documents by mention or inference otherwise in any reference document.

1.06 TESTING AND INSPECTION AGENCIES AND SERVICES

A. Contractor Responsibilities: The Contractor shall provide inspections, tests and similar quality control services, specified in individual Specification Sections and required by governing authorities, except where they are specifically indicated to be the Owner's responsibility, or are

provided by another identified entity; these services include those specified to be performed by an independent agency and not by the Contractor. Costs for these services shall be included in the Contract Sum.

B. Where the Owner has engaged a testing agency or other entity for testing and inspection of a part of the Work, and the Contractor is also required to engage an entity for the same or related element, the Contractor shall not employ the entity engaged by the Owner, unless otherwise agreed in writing with the Owner.

C. Retesting: The Contractor is responsible for retesting where results of required inspections, tests or similar services prove unsatisfactory and do not indicate compliance with Contract Document requirements, regardless of whether the original test was the Contractor's responsibility.
   1. Cost of retesting construction revised or replaced by the Contractor is the Contractor's responsibility, where required tests were performed on original construction.

D. Associated Services: The Contractor shall cooperate with agencies performing required inspections, tests and similar services and provide reasonable auxiliary services as requested. Notify the agency sufficiently in advance of operations to permit assignment of personnel. Auxiliary services required include but are not limited to:
   1. Providing access to the Work and furnishing incidental labor and facilities necessary to facilitate inspections and tests.
   2. Taking adequate quantities of representative samples of materials that require testing or assisting the agency in taking samples.
   3. Providing facilities for storage and curing of test samples, and delivery of samples to testing laboratories.
   4. Providing the agency with a preliminary design mix proposed for use for materials mixes that require control by the testing agency.
   5. Security and protection of samples and test equipment at the Project site.

E. Owner Responsibilities: The Owner will employ and pay for the services of an independent agency, testing laboratory or other qualified firm to perform services which are specifically noted as the Owner's responsibility. If not specifically noted as the Owner’s responsibility, the Contractor shall provide these services.

F. Coordination: The Contractor and each agency engaged to perform inspections, tests and similar services shall coordinate the sequence of activities to accommodate required services with a minimum of delay. In addition the Contractor and each agency shall coordinate activities to avoid the necessity of removing and replacing construction to accommodate inspections and tests.

G. The Contractor is responsible for scheduling times for inspections, tests, taking samples and similar activities.

PART 3 EXECUTION

2.01 CONTROL OF INSTALLATION

A. Monitor quality control over suppliers, manufacturers, products, services, site conditions, and workmanship, to produce Work of specified quality.

B. Comply with manufacturers' instructions, including each step in sequence.

C. Should manufacturers' instructions conflict with Contract Documents, request clarification from Architect before proceeding.

D. Comply with specified standards as minimum quality for the Work except where more stringent tolerances, codes, or specified requirements indicate higher standards or more precise workmanship.

E. Have Work performed by persons qualified to produce required and specified quality.

F. Verify that field measurements are as indicated on shop drawings or as instructed by the manufacturer.

G. Secure products in place with positive anchorage devices designed and sized to withstand stresses, vibration, physical distortion, and disfigurement.

2.02 MOCK-UPS

A. Tests shall be performed under provisions identified in this section and identified in the respective product specification sections.

B. Assemble and erect specified items with specified attachment and anchorage devices, flashings, seals, and finishes.

C. Accepted mock-ups shall be a comparison standard for the remaining Work.

D. Prior to ordering materials the contractor shall receive written acceptance of the mock up by the Owner and the Architect. Remove mock-up and clear area when directed to do so. Mark up shall remain remain for the entire duration of the work.

2.03 TOLERANCES

A. Monitor fabrication and installation tolerance control of products to produce acceptable Work. Do not permit tolerances to accumulate.

B. Comply with manufacturers' tolerances. Should manufacturers' tolerances conflict with Contract Documents, request clarification from Architect before proceeding.

C. Adjust products to appropriate dimensions; position before securing products in place.

2.04 TESTING AND INSPECTION

A. Testing Agency Duties:
   1. Provide qualified personnel at site. Cooperate with Architect and Contractor in performance of services.
   2. Perform specified sampling and testing of products in accordance with specified standards.
   3. Ascertain compliance of materials and mixes with requirements of Contract Documents.
   4. Promptly notify Architect and Contractor of observed irregularities or non-conformance of Work or products.
   5. Perform additional tests and inspections required by Architect.
   6. Submit reports of all tests/inspections specified.

B. Limits on Testing/Inspection Agency Authority:
   1. Agency may not release, revoke, alter, or enlarge on requirements of Contract Documents.
   2. Agency may not approve or accept any portion of the Work.
   3. Agency may not assume any duties of Contractor.
   4. Agency has no authority to stop the Work.

C. Contractor Responsibilities:
   1. Cooperate with laboratory personnel, and provide access to the Work and to manufacturers' facilities.
   2. Provide incidental labor and facilities:

a. To provide access to Work to be tested/inspected.
b. To obtain and handle samples at the site or at source of Products to be tested/inspected.
c. To facilitate tests/inspections.
d. To provide storage and curing of test samples.

3. Notify Architect and laboratory 24 hours prior to expected time for operations requiring testing/inspection services.
4. When required, employ services of an independent qualified testing laboratory and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.
5. When required, arrange with Owner's agency and pay for additional samples, tests, and inspections required by Contractor beyond specified requirements.

D. Re-testing required because of non-conformance to specified requirements shall be performed by the same agency on instructions by Architect.

E. Re-testing required because of non-conformance to specified requirements shall be paid for by Contractor.

2.05 MANUFACTURERS' FIELD SERVICES

A. When specified in individual specification sections, require material or product suppliers or manufacturers to provide qualified staff personnel to observe site conditions, conditions of surfaces and installation, quality of workmanship, start-up of equipment, test, adjust and balance of equipment as applicable, and to initiate instructions when necessary.

B. Report observations and site decisions or instructions given to applicators or installers that are supplemental or contrary to manufacturers' written instructions.

2.06 DEFECT ASSESSMENT

A. Replace Work or portions of the Work not conforming to specified requirements.

END OF SECTION 01 4000

This page intentionally left blank

SECTION 01 4100
REGULATORY REQUIREMENTS

PART 1 GENERAL

1.01 SUMMARY

A. ICC(IBC) - International Building Code: 2021

B. ICC (IEBC) - International Existing Building Code; 2021

C. ICC (IPC) - International Plumbing Code; 2021

D. ICC(IMC) - International Mechanical Code , 2021

E. ICC IFGC) - International Fuel Gas Code: 2021

F. International Fire Code: 2021

G. National Electric Code (NFPA 70) : 2020

H. ANSI/ASHRAE/IESNA Standard 90.1 - 2013 - Energy Standard for Buildings except low rise Residential

I. ADA Standards for Accessible Design: 2010. This supersedes accessibility requirements contained in the International Building Code and ANSI A117,1

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 4100

This page intentionally left blank

SECTION 01 4217
DEFINITIONS AND STANDARDS

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

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

1.02 DEFINITIONS

A. General: Basic Contract definitions are included in the General Conditions.

B. Indicated refers to graphic representations, notes or schedules on the Drawings, or other Paragraphs or Schedules in Specifications, and similar requirements in Contract Documents. Where terms such as "shown," "noted," "scheduled," and "specified" are used, it is to help locate the reference; no limitation on location is intended except as specifically noted.

C. Directed: Terms such as "directed", "requested", "authorized", "selected", "approved", "required", and "permitted" mean "directed by the Architect", "requested by the Architect", and similar phrases. However, no implied meaning shall be interpreted to extend the Architect's responsibility into the Contractor's area of construction supervision.

D. A.D.A.--American Disabilities Act of July 26, 1991 and all revisions per Alabama Building Commission.

E. Approve: The term "approved," where used in conjunction with the Architect's action on the Contractor's submittals, applications, and requests, is limited to the duties and responsibilities of the Architect as stated in General and Supplementary Conditions. Such approval shall not release the Contractor from responsibility to fulfill Contract requirements unless otherwise provided in the Contract Documents.

F. Furnish: The term "furnish" is used to mean "supply and deliver to the Project site, ready for unloading, unpacking, assembly, installation, and similar operations."

G. Install: The term "install" is used to describe operations at project site including the actual "unloading, unpacking, assembly, erection, placing, anchoring, applying, working to dimension, finishing, curing, protecting, cleaning, and similar operations."

H. Provide: The term "provide" means "to furnish and install, complete and ready for the intended use."

I. Installer: An "Installer" is the Contractor or an entity engaged by the Contractor, either as an employee, subcontractor, or sub-subcontractor for performance of a particular construction activity, including installation, erection, application, and similar operations. Installers are required to be experienced in the operations they are engaged to perform.

J. The term "experienced," when used with the term "Installer" means having a minimum of 5 previous Projects similar in size and scope to this Project, being familiar with the precautions required, and having complied with requirements of the authority having jurisdiction.

K. Project Site is the space available to the Contractor for performance of construction activities, either exclusively or in conjunction with others performing other construction activities as part of the Project. The extent of the Project Site is shown on the Drawings and may or may not be identical with the description of the land upon which the Project is to be built.

L. Testing Laboratories: A "testing laboratory" is an independent entity engaged to perform specific inspections or tests, either at the Project Site or elsewhere, and to report on and, if required, to interpret results of those inspections or tests.

M. Repair- to restore to sound "as new" condition after damage

1.03 SPECIFICATION FORMAT AND CONTENT EXPLANATION

A. Specification Format: These Specifications are organized into Divisions and Sections based on the Construction Specifications Institute's format and MASTERFORMAT numbering system.

B. Specification Content: This Specification uses certain conventions in the use of language and the intended meaning of certain terms, words, and phrases when used in particular situations or circumstances. These conventions are explained as follows:

C. Abbreviated Language: Language used in the Specifications and other Contract Documents is the abbreviated type. Implied words and meanings will be appropriately interpreted. Singular words will be interpreted as plural and plural words interpreted as singular where applicable and where the full context of the Contract Documents so indicates.

D. Imperative and streamlined language is used generally in the Specifications. Requirements expressed in the imperative mood are to be performed by the Contractor. At certain locations in the text, for clarity, subjective language is used to describe responsibilities that must be fulfilled indirectly by the Contractor, or by others when so noted.

1.04 INDUSTRY STANDARDS

A. Applicability of Standards: Except where 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. Such standards are made a part of the Contract Documents by reference.

B. Conflicting Requirements: Where compliance with two or more standards is specified, and they establish different or conflicting requirements for minimum quantities or quality levels, the most stringent requirement will be enforced, unless the Contract Documents indicate otherwise. Refer requirements that are different, but apparently equal, and uncertainties as to which quality level is more stringent to the Architect for a decision before proceeding

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

END OF SECTION 01090 01 4217

SECTION 01 5000
TEMPORARY FACILITIES AND CONTROLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary utilities.

B. Temporary telecommunications services.

C. Temporary sanitary facilities.

D. Temporary Controls: Barriers and enclosures.

E. Security requirements.

F. Vehicular access and parking.

G. Waste removal facilities and services.

H. Project identification sign.

1.02 RELATED REQUIREMENTS

A. Section 01 5100 - Temporary Utilities.

B. Section 01 5500 - Vehicular Access and Parking.

C. All current and applicable standards associated with the Code of Federal Regulations and the Occupational Safety and Health Standards.

1.03 TEMPORARY UTILITIES - SEE SECTION 01 5100

A. Owner will provide the following:
   1. Electrical power and metering, consisting of connection to existing facilities.
   2. Water supply, consisting of connection to existing facilities.

1.04 TELECOMMUNICATIONS SERVICES

A. Provide, maintain, and pay for telecommunications services to field office at time of project mobilization thru completion of the project.

B. Telecommunications services shall include:
   1. Internet Connections: Minimum of one; DSL modem or faster.
   2. Email: Account/address reserved for project use.
   3. Job Telephone.

1.05 TEMPORARY SANITARY FACILITIES

A. Provide and maintain required facilities and enclosures. Provide at time of project mobilization.

B. Maintain daily in clean and sanitary condition.

1.06 BARRIERS

A. Provide barriers to prevent unauthorized entry to construction areas, to prevent access to areas that could be hazardous to workers or the public and to protect existing facilities and adjacent properties from damage from construction operations and demolition.

B. Provide barricades and covered walkways required by governing authorities for public rights-of-way and for public access to existing building.

C. Protect non-owned vehicular traffic, stored materials, site, and structures from damage.

1.07 SECURITY

A. Provide security and facilities to protect Work, existing facilities, and Owner's operations from unauthorized entry, vandalism, or theft.

1.08 VEHICULAR ACCESS AND PARKING - SEE SECTION 01 5500

A. Coordinate access and haul routes with governing authorities and Owner.

B. Provide and maintain access to fire hydrants, free of obstructions.

C. Provide means of removing mud from vehicle wheels before entering streets.

D. Provide temporary parking areas to accommodate construction personnel. When site space is not adequate, provide additional off-site parking.

E. Provide one parking space for Owner use.

F. Provide one parking space for Architect use.

G. Any damage/harm done to the owners property/personal or facility users property/personal as a result of construction of this project due to the fault of the contractor or his employees/subcontractors shall be the responsibility of the Contractor and the Contractor shall be rectify such problems and take corrective action within a reasonable time acceptable to the owner.

1.09 WASTE REMOVAL

A. Provide waste removal facilities and services as required to maintain the site in clean and orderly condition.

B. Provide containers with lids. Remove trash from site periodically.

C. Open free-fall chutes are not permitted. Terminate closed chutes into appropriate containers with lids.

1.10 PROJECT SIGNS

A. Refer to requirements of the General Conditions of the Contract for Construction.

1.11 PROJECT IDENTIFICATION

A. Provide project identification sign of design and construction indicated in the General Conditions of the Contract for Construction.

B. Erect on site at location directed by Architect and Owner.

C. No other signs are allowed without Owner permission except those required by law.

1.12 REMOVAL OF UTILITIES, FACILITIES, AND CONTROLS

A. Remove temporary utilities, equipment, facilities, materials, prior to Date of Substantial Completion inspection.

B. Clean and repair damage caused by installation or use of temporary work.

C. Restore existing facilities used during construction to original condition

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 5000

SECTION 01 5100
TEMPORARY UTILITIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Temporary Utilities: Provision of electricity and water.

1.02 RELATED REQUIREMENTS

A. Section 01 5000 - Temporary Facilities and Controls:
   1. Temporary telecommunications services for administrative purposes.
   2. Temporary sanitary facilities required by law.

1.03 TEMPORARY ELECTRICITY

A. Cost: By Owner.

B. Connect to Owner's existing power service.
   1. Do not disrupt Owner's need for continuous service.
   2. Exercise measures to conserve energy.
   3. Should abuse of this privilege be detected the contractor will be back-charged by the Owner.

C. Provide power outlets for construction operations, with branch wiring and distribution boxes located as required. Provide flexible power cords as required.

D. Permanent convenience receptacles may be utilized during construction.

1.04 TEMPORARY HEATING

A. Provide heating devices and heat as needed to maintain specified conditions for construction operations.

1.05 TEMPORARY COOLING

A. Provide cooling devices and cooling as needed to maintain specified conditions for construction operations.

1.06 TEMPORARY VENTILATION

A. Utilize existing ventilation equipment. Extend and supplement equipment with temporary fan units as required to maintain clean air for construction operations.

1.07 TEMPORARY WATER SERVICE

A. Cost of Water Used: By Owner.

B. Provide and maintain suitable quality water service for construction operations at time of project mobilization.

C. Connect to existing water source.
   1. Exercise measures to conserve water.

D. Should abuse of this privilege be detected the contractor will be back-charged by the Owner.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION - NOT USED

END OF SECTION 01 5100

This page intentionally left blank

SECTION 01 5500
VEHICULAR ACCESS AND PARKING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Access roads.

B. Parking.

C. Construction parking controls.

D. Maintenance.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: For access to site, work sequence, and occupancy.

PART 2 PRODUCTS

PART 3 EXECUTION

3.01 ACCESS ROADS

A. Use of existing on-site streets and driveways for construction traffic is permitted.

B. Tracked vehicles not allowed on paved areas.

C. Provide unimpeded access for emergency vehicles. Maintain 20 foot (6 m) width driveways with turning space between and around combustible materials.

D. Provide and maintain access to fire hydrants free of obstructions.

3.02 PARKING

A. Arrange for temporary parking areas to accommodate use of construction personnel.

B. When site space is not adequate, provide additional off-site parking.

C. Locate as approved by Architect.

3.03 CONSTRUCTION PARKING CONTROL

A. Control vehicular parking to prevent interference with public traffic and parking, access by emergency vehicles, and Owner's operations.

B. Prevent parking on or adjacent to access roads or in non-designated areas.

3.04 MAINTENANCE

A. Maintain traffic and parking areas in a sound condition free of excavated material, construction equipment, products, mud, snow, and ice.

B. Maintain existing paved areas used for construction; promptly repair breaks, potholes, low areas, standing water, and other deficiencies, to maintain paving and drainage in original, or specified, condition.

END OF SECTION 01 5500

This page intentionally left blank

SECTION 01 6000
PRODUCT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. General product requirements.

B. Re-use of existing products.

C. Transportation, handling, storage and protection.

D. Product option requirements.

E. Substitution limitations and procedures.

F. Procedures for Owner-supplied products.

G. Maintenance materials, including extra materials, spare parts, tools, and software.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Lists of products to be removed from existing building.

B. Section 01 4000 - Quality Requirements: Product quality monitoring.

C. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: Requirements for VOC-restricted product categories.

1.03 SUBMITTALS

A. Product Data Submittals: Submit manufacturer's standard published data. Mark each copy to identify applicable products, models, options, and other data. Supplement manufacturers' standard data to provide information specific to this Project.

B. Shop Drawing Submittals: Prepared specifically for this Project; indicate utility and electrical characteristics, utility connection requirements, and location of utility outlets for service for functional equipment and appliances.

C. Sample Submittals: Illustrate functional and aesthetic characteristics of the product, with integral parts and attachment devices. Coordinate sample submittals for interfacing work.
   1. For selection from standard finishes, submit samples of the full range of the manufacturer's standard colors, textures, and patterns.

1.04 SUBMITTAL SCHEDULE

A. At the beginning of the project, generate list of products requirements submittals by the specifications.

B. In the schedule, include the following information for each product:
   1. Specification section for the product.
   2. Type of submittal (i.e. shop drawings, product data, samples, mock-up)
   3. Date submitted (to be filled in during construction)
   4. Action taken by Architect (to be filled in during construction)
   5. Date Approved (to be filled in during construction)
   6. Comments
   7. Critical Relationships

C. Coordinate product submittal schedule with project construction schedule.

D. Submit schedule to Architect for review within 15 days of Notice to Proceed.

E. If necessary, revise schedule as requested by Architect.

F. Schedule will be utilized at each progress meeting to review status of required submittals and coordination with project construction schedule.
   1. Update submittal schedule and submit to Owner and Architect 48 hours prior to each scheduled progress meeting.

1.05 QUALITY ASSURANCE

A. Source Limitations: To the fullest extent possible, provide products of the same kind, from a single source.

B. Each prime Contractor is responsible for providing products and construction methods that are compatible with products and construction methods of other prime or separate Contractors.

C. If a dispute arises between prime Contractors over concurrently selectable, but incompatible products, the Architect will determine which products shall be retained and which are incompatible and must be replaced.

D. Nameplates: Except for required labels and operating data, do not attach or imprint manufacturer's or producer's nameplates or trademarks on exposed surfaces of products which will be exposed to view in occupied spaces or on the exterior.

E. Labels: Locate required product labels and stamps on a concealed surface or, where required for observation after installation, on an accessible surface that is not conspicuous.

PART 2 PRODUCTS

2.01 EXISTING PRODUCTS

A. Do not use materials and equipment removed from existing premises unless specifically required or permitted by the Contract Documents.

B. Existing materials and equipment indicated to be removed, but not to be re-used, relocated, reinstalled, delivered to the Owner, or otherwise indicated as to remain the property of the Owner, become the property of the Contractor; remove from site.

2.02 NEW PRODUCTS

A. Provide new products unless specifically required or permitted by the Contract Documents.

B. DO NOT USE products having any of the following characteristics:
   1. Made using or containing CFC's or HCFC's.
   2. Made of wood from newly cut old growth timber.

C. Where all other criteria are met, Contractor shall give preference to products that:
   1. If used on interior, have lower emissions, as defined in Section 01 6116.
   2. If wet-applied, have lower VOC content, as defined in Section 01 6116.
   3. Have a published GreenScreen Chemical Hazard Analysis.

2.03 PRODUCT SELECTION

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

B. Provide products complete with all accessories, trim, finish, safety guards and other devices and details needed for a complete installation and for the intended use and effect.

C. Standard Products: Where available, provide standard products of types that have been produced and used successfully in similar situations on other projects.

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

E. Where products or manufacturers are specified by name, accompanied by the term "or equal," or "or approved equal" comply with the Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product, unless noted otherwise in specific specification section.

F. Non-Proprietary Specifications: When the Specifications list products or manufacturers that are available and may be incorporated in the Work, but do not restrict the Contractor to use of these products only, the Contractor may propose any available product that complies with Contract requirements. Comply with Contract Document provisions concerning "substitutions" to obtain approval for use of an unnamed product.

G. Descriptive Specification Requirements: Where Specifications describe a product or assembly, listing exact characteristics required, with or without use of a brand or trade name, provide a product or assembly that provides the characteristics and otherwise complies with Contract requirements.

H. Compliance with Standards, Codes and Regulations: Where the Specifications only require compliance with an imposed code, standard or regulation, select a product that complies with the standards, codes or regulations specified.

I. Visual Matching: Where Specifications require matching an established Sample, the Architect's decision will be final on whether a proposed product matches satisfactorily.

J. Where no product available within the specified category matches satisfactorily and also complies with other specified requirements, comply with provisions of the Contract Documents concerning "substitutions" for selection of a matching product in another product category, or for noncompliance with specified requirements.

K. Visual Selection: Where specified product requirements include the phrase "...as selected from manufacturer's standard colors, patterns, textures..." or a similar phrase, select a product and manufacturer that complies with other specified requirements. The Architect will select the color, pattern and texture from the product line selected.

2.04 PRODUCT OPTIONS

A. Products Specified by Naming One or More Manufacturers with a Provision for Substitutions: Submit a request for substitution for any manufacturer not named.

B. Compatibility of Options: When the Contractor is given the option of selecting between two or more products for use on the Project, the product selected shall be compatible with products previously selected, even if previously selected products were also options.

2.05 MAINTENANCE MATERIALS

A. Furnish extra materials, spare parts, tools, and software of types and in quantities specified in individual specification sections.

B. Deliver to Project site; obtain receipt prior to final payment.

PART 3 EXECUTION

3.01 SUBSTITUTION PROCEDURES

A. Architect will consider requests for substitutions only within 30 days after date established in Notice to Proceed unles
   1. Substitutions received after this time period may be considered or rejected at the discretion of the Architect.

B. Document each request with complete data substantiating compliance of proposed substitution with Contract Documents.

C. A request for substitution constitutes a representation that the submitter:
   1. Has investigated proposed product and determined that it meets or exceeds the quality level of the specified product.
   2. Agrees to provide the same warranty for the substitution as for the specified product.
   3. Agrees to coordinate installation and make changes to other Work that may be required for the Work to be complete with no additional cost to Owner.
   4. Waives claims for additional costs or time extension that may subsequently become apparent.
   5. Agrees to reimburse Owner and Architect for review or redesign services associated with re-approval by authorities.

D. Substitutions will not be considered when they are indicated or implied on shop drawing or product data submittals, without separate written request, or when acceptance will require revision to the Contract Documents.

E. Conditions: The Contractor's substitution request will be received and considered by the Architect only when one or more of the following conditions are satisfied, as determined by the Architect; otherwise requests will be returned without action except to record noncompliance with these requirements.
   1. Extensive revisions to Contract Documents are not required.
   2. Proposed changes are in keeping with the general intent of Contract Documents.
   3. The request is timely, fully documented and properly submitted.
   4. The request is directly related to an "or equal" clause or similar language in the Contract Documents.
   5. The specified product or method of construction cannot receive necessary approval by a governing authority, and the requested substitution can be approved.
   6. A substantial advantage is offered the Owner, in terms of cost, time, energy conservation or other considerations of merit
   7. The specified product or method of construction cannot be provided in a manner that is compatible with other materials, and where the Contractor certifies that the substitution will overcome the incompatibility.
   8. The specified product or method of construction cannot be coordinated with other materials, and where the Contractor certifies that the proposed substitution can be coordinated.
   9. The specified product or method of construction cannot provide a warranty required by the Contract Documents and where the Contractor certifies that the proposed substitution provide the required warranty.

F. The Owner reserves the right to reject any substitutions.

3.02 OWNER-SUPPLIED PRODUCTS

A. Owner's Responsibilities:
   1. Arrange for and deliver Owner reviewed shop drawings, product data, and samples, to Contractor.
   2. Arrange and pay for product delivery to site unless specifically noted otherwise.
   3. On delivery, inspect products jointly with Contractor.
   4. Submit claims for transportation damage and replace damaged, defective, or deficient items.
   5. Arrange for manufacturers' warranties, inspections, and service.

B. Contractor's Responsibilities:
   1. Review Owner reviewed shop drawings, product data, and samples.

2. Receive and unload products at site; inspect for completeness or damage jointly with Owner.
3. Handle, store, install and finish products.
4. Repair or replace items damaged after receipt.

3.03 TRANSPORTATION AND HANDLING

A. Package products for shipment in manner to prevent damage; for equipment, package to avoid loss of factory calibration.

B. If special precautions are required, attach instructions prominently and legibly on outside of packaging.

C. Coordinate schedule of product delivery to designated prepared areas in order to minimize site storage time and potential damage to stored materials.

D. Transport and handle products in accordance with manufacturer's instructions.

E. Transport materials in covered trucks to prevent contamination of product and littering of surrounding areas.

F. Promptly inspect shipments to ensure that products comply with requirements, quantities are correct, and products are undamaged.

G. Provide equipment and personnel to handle products by methods to prevent soiling, disfigurement, or damage, and to minimize handling.

H. Arrange for the return of packing materials, such as wood pallets, where economically feasible.

3.04 STORAGE AND PROTECTION

A. Designate receiving/storage areas for incoming products so that they are delivered according to installation schedule and placed convenient to work area in order to minimize waste due to excessive materials handling and misapplication.

B. Store and protect products in accordance with manufacturers' instructions.

C. Store with seals and labels intact and legible.

D. Store sensitive products in weather tight, climate controlled, enclosures in an environment favorable to product.

E. For exterior storage of fabricated products, place on sloped supports above ground.

F. If approved by Owner, provide bonded off-site storage and protection when site does not permit on-site storage or protection.

G. Protect products from damage or deterioration due to construction operations, weather, precipitation, humidity, temperature, sunlight and ultraviolet light, dirt, dust, and other contaminants.

H. Comply with manufacturer's warranty conditions, if any.

I. Cover products subject to deterioration with impervious sheet covering. Provide ventilation to prevent condensation and degradation of products.

J. Store loose granular materials on solid flat surfaces in a well-drained area. Prevent mixing with foreign matter.

K. Prevent contact with material that may cause corrosion, discoloration, or staining.

L. Provide equipment and personnel to store products by methods to prevent soiling, disfigurement, or damage.

M. Arrange storage of products to permit access for inspection. Periodically inspect to verify products are undamaged and are maintained in acceptable condition.

N. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.

O. Schedule delivery to minimize long-term storage at the site and to prevent overcrowding of construction spaces.

P. Coordinate delivery with installation time to ensure minimum holding time for items that are flammable, hazardous, easily damaged, or sensitive to deterioration, theft and other losses.

Q. Store heavy materials away from the Project structure in a manner that will not endanger the supporting construction.

END OF SECTION 01 6000

SECTION 01 6116
VOLATILE ORGANIC COMPOUND (VOC) CONTENT RESTRICTIONS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Requirements for Indoor-Emissions-Restricted products.

B. Requirements for VOC-Content-Restricted products.

C. VOC restrictions for product categories listed below under "DEFINITIONS."

D. All products of each category that are installed in the project must comply; Owner's project goals do not allow for partial compliance.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittal procedures.

B. Section 01 4000 - Quality Requirements: Procedures for testing and certifications.

C. Section 01 6000 - Product Requirements: Fundamental product requirements, substitutions and product options, delivery, storage, and handling.

D. Section 07 9200 - Joint Sealants: Emissions-compliant sealants.

1.03 DEFINITIONS

A. Indoor-Emissions-Restricted Products: All products in the following product categories, whether specified or not:

B. VOC-Content-Restricted Products: All products in the following product categories, whether specified or not:
   1. Interior paints and coatings applied on site.
   2. Interior adhesives and sealants applied on site, including flooring adhesives.

C. VOC-Restricted Products: All products of each of the following categories when installed or applied on-site in the building interior:
   1. Adhesives, sealants, and sealer coatings.
   2. Carpet.
   3. Carpet tile.
   4. Resilient floor coverings.
   5. Paints and coatings.
   6. Insulation.
   7. Gypsum board.
   8. Acoustical ceilings and panels.
   9. Cabinet work.
   10. Composite wood and agrifiber products used either alone or as part of another product.

D. Interior of Building: Anywhere inside the exterior weather barrier.

E. Adhesives: All gunnable, trowelable, liquid-applied, and aerosol adhesives, whether specified or not; including flooring adhesives, resilient base adhesives, and pipe jointing adhesives.

F. Sealants: All gunnable, trowelable, and liquid-applied joint sealants and sealant primers, whether specified or not; including firestopping sealants and duct joint sealers.

G. Inherently Non-Emitting Materials: Products composed wholly of minerals or metals, unless they include organic-based surface coatings, binders, or sealants; and specifically the following:

1. Concrete.
2. Clay brick.
3. Metals that are plated, anodized, or powder-coated.
4. Glass.
5. Ceramics.
6. Solid wood flooring that is unfinished and untreated.

1.04 REFERENCE STANDARDS

A. 40 CFR 59, Subpart D - National Volatile Organic Compound Emission Standards for Architectural Coatings; U.S. Environmental Protection Agency; current edition.

B. ASTM D3960 - Standard Practice for Determining Volatile Organic Compound (VOC) Content of Paints and Related Coatings; 2005 (Reapproved 2013).

C. CARB (SCM) - Suggested Control Measure for Architectural Coatings; California Air Resources Board; 2007.

D. GreenSeal GS-36 - Commercial Adhesives; 2011.

E. SCAQMD 1113 - South Coast Air Quality Management District Rule No.1113; current edition.

F. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Evidence of Compliance: Submit for each different product in each applicable category.

C. Product Data: For each VOC-restricted product used in the project, submit evidence of compliance.

1.06 QUALITY ASSURANCE

A. VOC Content Test Method: 40 CFR 59, Subpart D (EPA Method 24), or ASTM D3960, unless otherwise indicated.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

B. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

1.07 QUALITY ASSURANCE

A. Testing Agency Qualifications: Independent firm specializing in performing testing and inspections of the type specified in this section.

PART 2 PRODUCTS

2.01 MATERIALS

A. VOC-Content-Restricted Products: VOC content not greater than required by the following:
   1. Adhesives, Including Flooring Adhesives: SCAQMD 1168 Rule.
   2. Joint Sealants: SCAQMD 1168 Rule.
   3. Paints and Coatings: Each color; most stringent of the following:
      a. 40 CFR 59, Subpart D.
      b. SCAQMD 1113 Rule.
      c. CARB (SCM).

B. Adhesives and Joint Sealants: Provide only products having volatile organic compound (VOC) content not greater than required by South Coast Air Quality Management District Rule No.1168.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Report of laboratory testing performed in accordance with requirements.

C. Aerosol Adhesives: Provide only products having volatile organic compound (VOC) content not greater than required by GreenSeal GS-36.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Current GreenSeal Certification.

D. Carpet Tile and Adhesive: Provide products having VOC content as specified in Section 09 6813.

E. Composite Wood and Agrifiber Products and Adhesives Used for Laminating Them: Provide products having no added urea-formaldehyde resins.
   1. Evidence of Compliance: Acceptable types of evidence are:
      a. Published product data showing compliance with requirements.

PART 3 EXECUTION

3.01 FIELD QUALITY CONTROL

A. Owner reserves the right to reject non-compliant products, whether installed or not, and require their removal and replacement with compliant products at no extra cost to Owner.

B. Additional costs to restore indoor air quality due to installation of non-compliant products will be borne by Contractor.

END OF SECTION 01 6116

This page intentionally left blank

SECTION 01 7000
EXECUTION AND CLOSEOUT REQUIREMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Examination, preparation, and general installation procedures.

B. Requirements for alterations work, including selective demolition, except removal, disposal, and/or remediation of hazardous materials and toxic substances.

C. Pre-installation meetings.

D. Cutting and patching.

E. Surveying for laying out the work.

F. Cleaning and protection.

G. Starting of systems and equipment.

H. Demonstration and instruction of Owner personnel.

I. Closeout procedures, including Contractor's Correction Punch List, except payment procedures.

J. General requirements for maintenance service.

1.02 RELATED REQUIREMENTS

A. Section 01 1000 - Summary: Limitations on working in existing building; continued occupancy; work sequence; identification of salvaged and relocated materials.

B. Section 01 4000 - Quality Requirements: Testing and inspection procedures.

C. Section 01 5000 - Temporary Facilities and Controls: Temporary exterior enclosures.

D. Section 01 5100 - Temporary Utilities: Temporary heating, cooling, and ventilating facilities.

E. Section 01 5713 - Temporary Erosion and Sediment Control: Additional erosion and sedimentation control requirements.

F. Section 01 7800 - Closeout Submittals: Project record documents, operation and maintenance data, warranties and bonds.

G. Section 02 4100 - Demolition: Demolition of whole structures and parts thereof; site utility demolition.

H. Section 07 8400 - Firestopping.

1.03 REFERENCE STANDARDS

A. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2027.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Survey work: Submit name, address, and telephone number of Surveyor before starting survey work.
   1. On request, submit documentation verifying accuracy of survey work.
   2. Submit a copy of site drawing signed by the Land Surveyor, that the elevations and locations of the work are in conformance with Contract Documents.
   3. Submit surveys and survey logs for the project record.

C. Demolition Plan: Submit demolition plan as specified by OSHA and local authorities.

1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences. Include design drawings and calculations for bracing and shoring.
2. Identify demolition firm and submit qualifications.
3. Include a summary of safety procedures.

D. Cutting and Patching: Submit written request in advance of cutting or alteration that affects:
1. Structural integrity of any element of Project.
2. Integrity of weather exposed or moisture resistant element.
3. Efficiency, maintenance, or safety of any operational element.
4. Visual qualities of sight exposed elements.
5. Work of Owner or separate Contractor.

E. Project Record Documents: Accurately record actual locations of capped and active utilities.

1.05 QUALIFICATIONS

A. For demolition work, employ a firm specializing in the type of work required.

B. For survey work, employ a land surveyor registered in the State in which the Project is located and acceptable to Architect. Submit evidence of Surveyor's Errors and Omissions insurance coverage in the form of an Insurance Certificate.

C. For field engineering, employ a professional engineer of the discipline required for specific service on Project, licensed in the State in which the Project is located.

D. For design of temporary shoring and bracing, employ a Professional Engineer experienced in design of this type of work and licensed in the State in which the Project is located.

1.06 PROJECT CONDITIONS

A. Use of explosives is not permitted.

B. Grade site to drain. Maintain excavations free of water. Provide, operate, and maintain pumping equipment.

C. Protect site from puddling or running water. Provide water barriers as required to protect site from soil erosion.

D. Ventilate enclosed areas to assist cure of materials, to dissipate humidity, and to prevent accumulation of dust, fumes, vapors, or gases.

E. Erosion and Sediment Control: Plan and execute work by methods to control surface drainage from cuts and fills, from borrow and waste disposal areas. Prevent erosion and sedimentation.
1. Provide temporary measures such as berms, dikes, and drains, to prevent water flow.
2. Periodically inspect earthwork to detect evidence of erosion and sedimentation; promptly apply corrective measures.

F. Pollution Control: Provide methods, means, and facilities to prevent contamination of soil, water, and atmosphere from discharge of noxious, toxic substances, and pollutants produced by construction operations. Comply with federal, state, and local regulations.

1.07 COORDINATION

A. Coordinate scheduling, submittals, and work of the various sections of the Project Manual to ensure efficient and orderly sequence of installation of interdependent construction elements, with provisions for accommodating items installed later.

B. Notify affected utility companies and comply with their requirements.

C. Verify that utility requirements and characteristics of new operating equipment are compatible with building utilities. Coordinate work of various sections having interdependent responsibilities for installing, connecting to, and placing in service, such equipment.

D. Coordinate space requirements, supports, and installation of mechanical and electrical work that are indicated diagrammatically on drawings. Follow routing indicated for pipes, ducts, and conduit, as closely as practicable; place runs parallel with lines of building. Utilize spaces efficiently to maximize accessibility for other installations, for maintenance, and for repairs.

E. In finished areas except as otherwise indicated, conceal pipes, ducts, and wiring within the construction. Coordinate locations of fixtures and outlets with finish elements.

F. Coordinate completion and clean-up of work of separate sections.

G. After Owner occupancy of premises, coordinate access to site for correction of defective work and work not in accordance with Contract Documents, to minimize disruption of Owner's activities.

PART 2 PRODUCTS

2.01 PATCHING MATERIALS

A. New Materials: As specified in product sections; match existing products and work for patching and extending work.

B. Type and Quality of Existing Products: Determine by inspecting and testing products where necessary, referring to existing work as a standard.

C. Product Substitution: For any proposed change in materials, submit request for substitution described in Section 01 6000 - Product Requirements.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that existing site conditions and substrate surfaces are acceptable for subsequent work. Start of work means acceptance of existing conditions.

B. Verify that existing substrate is capable of structural support or attachment of new work being applied or attached.

C. Examine and verify specific conditions described in individual specification sections.

D. Take field measurements before confirming product orders or beginning fabrication, to minimize waste due to over-ordering or misfabrication.

E. Verify that utility services are available, of the correct characteristics, and in the correct locations.

F. Prior to Cutting: Examine existing conditions prior to commencing work, including elements subject to damage or movement during cutting and patching. After uncovering existing work, assess conditions affecting performance of work. Beginning of cutting or patching means acceptance of existing conditions.

3.02 PREPARATION

A. Clean substrate surfaces prior to applying next material or substance.

B. Seal cracks or openings of substrate prior to applying next material or substance.

C. Apply manufacturer required or recommended substrate primer, sealer, or conditioner prior to applying any new material or substance in contact or bond.

3.03 PREINSTALLATION MEETINGS

A. When required in individual specification sections, convene a preinstallation meeting at the site prior to commencing work of the section.

B. Require attendance of parties directly affecting, or affected by, work of the specific section.

C. Notify Architect four days in advance of meeting date.

D. Prepare agenda and preside at meeting:
   1. Review conditions of examination, preparation and installation procedures.
   2. Review coordination with related work.

E. Record minutes and distribute copies within two days after meeting to participants, with two copies to Architect, Owner, participants, and those affected by decisions made.

3.04 LAYING OUT THE WORK

A. Verify locations of survey control points prior to starting work.

B. Promptly notify Architect of any discrepancies discovered.

C. Contractor shall locate and protect survey control and reference points.

D. Protect survey control points prior to starting site work; preserve permanent reference points during construction.

E. Promptly report to Architect the loss or destruction of any reference point or relocation required because of changes in grades or other reasons.

F. Replace dislocated survey control points based on original survey control. Make no changes without prior written notice to Architect.

G. Utilize recognized engineering survey practices.

H. Establish a minimum of two permanent bench marks on site, referenced to established control points. Record locations, with horizontal and vertical data, on project record documents.

I. Establish elevations, lines and levels. Locate and lay out by instrumentation and similar appropriate means:
   1. Site improvements including pavements; stakes for grading, fill and topsoil placement; utility locations, slopes, and invert elevations.
   2. Grid or axis for structures.
   3. Building foundation, column locations, ground floor elevations.

J. Periodically verify layouts by same means.

K. Maintain a complete and accurate log of control and survey work as it progresses.

L. Building Lines and Levels: Locate and lay out batter boards for structures, building foundations, column grids and locations, floor levels and control lines and levels required for mechanical and electrical Work.

M. Site Improvements: Locate and lay out site improvements, including pavements, stakes for grading, fill and topsoil placement, utility slopes and invert elevations by instrumentation and similar appropriate means.

N. Existing utilities and equipment: 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. Furnish information necessary to adjust, move or relocate existing structures, utility poles, lines, services or other appurtenances located in, or affected by construction. Coordinate with local authorities having jurisdiction with construction.

3.05 GENERAL INSTALLATION REQUIREMENTS

A. Install products as specified in individual sections, in accordance with manufacturer's instructions and recommendations, and so as to avoid waste due to necessity for replacement.

B. Make vertical elements plumb and horizontal elements level, unless otherwise indicated.

C. Install equipment and fittings plumb and level, neatly aligned with adjacent vertical and horizontal lines, unless otherwise indicated.

D. Make consistent texture on surfaces, with seamless transitions, unless otherwise indicated.

E. Make neat transitions between different surfaces, maintaining texture and appearance.

F. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of alterations work constitutes acceptance of existing conditions.

G. Maintain weatherproof exterior building enclosure except for interruptions required for replacement or modifications; take care to prevent water and humidity damage.
   1. Where openings in exterior enclosure exist, provide construction to make exterior enclosure weatherproof.

H. Remove existing work as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.
   2. Relocate items indicated on drawings.
   3. Where new surface finishes are to be applied to existing work, perform removals, patch, and prepare existing surfaces as required to receive new finish; remove existing finish if necessary for successful application of new finish.
   4. Where new surface finishes are not specified or indicated, patch holes and damaged surfaces to match adjacent finished surfaces as closely as possible.

I. Services (Including but not limited to HVAC, Plumbing, Fire Protection, Electrical, and Telecommunications): Remove, relocate, and extend existing systems to accommodate new construction.
   1. Verify that abandoned services serve only abandoned facilities.
   2. Remove abandoned pipe, ducts, conduits, and equipment , including those above accessible ceilings; remove back to source of supply where possible, otherwise cap stub and tag with identification; patch holes left by removal using materials specified for new construction.

J. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.

K. Adapt existing work to fit new work: Make as neat and smooth transition as possible.
   1. When existing finished surfaces are cut so that a smooth transition with new work is not possible, terminate existing surface along a straight line at a natural line of division and make recommendation to Architect.
   2. Where removal of partitions or walls results in adjacent spaces becoming one, rework floors, walls, and ceilings to a smooth plane without breaks, steps, or bulkheads.
   3. Where a change of plane of 1/4 inch (6 mm) or more occurs in existing work, submit recommendation for providing a smooth transition for Architect review and request instructions.

4. Trim existing wood doors as necessary to clear new floor finish. Refinish trim as required.

L. Patching: Where the existing surface is not indicated to be refinished, patch to match the surface finish that existed prior to cutting. Where the surface is indicated to be refinished, patch so that the substrate is ready for the new finish.

M. Refinish existing surfaces as indicated:
1. Where rooms or spaces are indicated to be refinished, refinish all visible existing surfaces to remain to the specified condition for each material, with a neat transition to adjacent finishes.
2. If mechanical or electrical work is exposed accidentally during the work, re-cover and refinish to match.

N. Clean existing systems and equipment.

O. Remove demolition debris and abandoned items from alterations areas and dispose of off-site; do not burn or bury.

P. Do not begin new construction in alterations areas before demolition is complete.

Q. Comply with all other applicable requirements of this section.

3.06 CUTTING AND PATCHING

A. Whenever possible, execute the work by methods that avoid cutting or patching.

B. See Alterations article above for additional requirements.

C. Perform whatever cutting and patching is necessary to:
1. Complete the work.
2. Fit products together to integrate with other work.
3. Provide openings for penetration of mechanical, electrical, and other services.
4. Match work that has been cut to adjacent work.
5. Repair areas adjacent to cuts to required condition.
6. Repair new work damaged by subsequent work.
7. Remove samples of installed work for testing when requested.
8. Remove and replace defective and non-conforming work.

D. Do not cut and patch structural elements in a manner that would reduce their load-carrying capacity or load-deflection ratio.

E. Obtain approval of the cutting and patching proposal before cutting and patching the following structural elements:
1. Foundation construction.
2. Bearing and retaining walls.
3. Structural concrete.
4. Structural steel.
5. Lintels.
6. Timber and primary wood framing.
7. Structural decking.
8. Stair systems.
9. Miscellaneous structural metals.
10. Exterior curtain wall construction.
11. Equipment supports.
12. Piping, ductwork, vessels and equipment.
13. Structural systems of special construction in Division-13.

F. Contractor to provide insect control and vapor tight at structure (example: exterior cuts - patching of vapor retarder). All openings or penetrations made to be well-sealed from insect or rodents with plaster, “play” sand, copper gauze - contractor to adhere to all applicable fire ratings.

G. Operational and Safety Limitations: Do not cut and patch operating elements or safety related components in a manner that would result in reducing their capacity to perform as intended, or result in increased maintenance, or decreased operational life or safety.

H. Obtain approval of the cutting and patching proposal before cutting and patching the following operating elements or safety related systems:
   1. Primary operational systems and equipment.
   2. Membranes and flashings.
   3. Fire protection systems.
   4. Communication systems.
   5. Electrical wiring systems.

I. Execute work by methods that avoid damage to other work and that will provide appropriate surfaces to receive patching and finishing. In existing work, minimize damage and restore to original condition.

J. Employ skilled and experienced installer to perform cutting for weather exposed and moisture resistant elements, and sight exposed surfaces.

K. Cut rigid materials using masonry saw or core drill. Pneumatic tools not allowed without prior approval.

L. Restore work with new products in accordance with requirements of Contract Documents.

M. Fit work air tight to pipes, sleeves, ducts, conduit, and other penetrations through surfaces.

N. At penetrations of fire rated walls, partitions, ceiling, or floor construction, completely seal voids with fire rated material in accordance with Section 07 8400, to full thickness of the penetrated element.

O. To avoid marring existing finished surfaces, cut or drill from the exposed or finished side into concealed surfaces.

P. Patching:
   1. Finish patched surfaces to match finish that existed prior to patching. On continuous surfaces, refinish to nearest intersection or natural break. For an assembly, refinish entire unit.
   2. Match color, texture, and appearance.
   3. Repair patched surfaces that are damaged, lifted, discolored, or showing other imperfections due to patching work. If defects are due to condition of substrate, repair substrate prior to repairing finish.

3.07 PROGRESS CLEANING

A. Maintain areas free of waste materials, debris, and rubbish. Maintain site in a clean and orderly condition.

B. Remove debris and rubbish from pipe chases, plenums, attics, crawl spaces, and other closed or remote spaces, prior to enclosing the space.

C. Broom and vacuum clean interior areas prior to start of surface finishing, and continue cleaning to eliminate dust.

D. Collect and remove waste materials, debris, and trash/rubbish from site periodically and dispose off-site; do not burn or bury.

3.08 PROTECTION OF INSTALLED WORK

A. Protect installed work from damage by construction operations.

B. Provide special protection where specified in individual specification sections.

C. Provide temporary and removable protection for installed products. Control activity in immediate work area to prevent damage.

D. Provide protective coverings at walls, projections, jambs, sills, and soffits of openings.

E. Protect finished floors, stairs, and other surfaces from traffic, dirt, wear, damage, or movement of heavy objects, by protecting with durable sheet materials.

F. Prohibit traffic or storage upon waterproofed or roofed surfaces. If traffic or activity is necessary, obtain recommendations for protection from waterproofing or roofing material manufacturer.

G. Remove protective coverings when no longer needed; reuse or recycle coverings if possible.

3.09 SYSTEM STARTUP

A. Coordinate schedule for start-up of various equipment and systems.

B. Verify that each piece of equipment or system has been checked for proper lubrication, drive rotation, belt tension, control sequence, and for conditions that may cause damage.

C. Verify tests, meter readings, and specified electrical characteristics agree with those required by the equipment or system manufacturer.

D. Verify that wiring and support components for equipment are complete and tested.

E. Execute start-up under supervision of applicable Contractor personnel and manufacturer's representative in accordance with manufacturers' instructions.

F. When specified in individual specification Sections, require manufacturer to provide authorized representative to be present at site to inspect, check, and approve equipment or system installation prior to start-up, and to supervise placing equipment or system in operation.

G. Submit a written report that equipment or system has been properly installed and is functioning correctly.

3.10 DEMONSTRATION AND INSTRUCTION

A. Demonstrate start-up, operation, control, adjustment, trouble-shooting, servicing, maintenance, and shutdown of each item of equipment at scheduled time, at equipment location.

B. For equipment or systems requiring seasonal operation, perform demonstration for other season within six months.

C. Provide a qualified person who is knowledgeable about the Project to perform demonstration and instruction of owner personnel.

D. Utilize operation and maintenance manuals as basis for instruction. Review contents of manual with Owner's personnel in detail to explain all aspects of operation and maintenance.

E. Prepare and insert additional data in operations and maintenance manuals when need for additional data becomes apparent during instruction.

3.11 ADJUSTING

A. Adjust operating products and equipment to ensure smooth and unhindered operation.

3.12 FINAL CLEANING

A. Execute final cleaning after Substantial Completion but before making final application for payment.

B. Use cleaning materials that are nonhazardous.

C. Clean interior and exterior glass, surfaces exposed to view; remove temporary labels, stains and foreign substances, polish transparent and glossy surfaces, vacuum carpeted and soft surfaces.

D. Remove all labels that are not permanent. Do not paint or otherwise cover fire test labels or nameplates on mechanical and electrical equipment.

E. Clean equipment and fixtures to a sanitary condition with cleaning materials appropriate to the surface and material being cleaned.

F. Clean filters of operating equipment.

G. Clean debris from roofs, gutters, downspouts, scuppers, overflow drains, area drains, drainage systems, and _____.

H. Clean site; sweep paved areas, rake clean landscaped surfaces.

I. Remove waste, surplus materials, trash/rubbish, and construction facilities from the site; dispose of in legal manner; do not burn or bury.

3.13 CLOSEOUT PROCEDURES

A. Accompany Project Coordinator on preliminary inspection to determine items to be listed for completion or correction in the Contractor's Correction Punch List for Contractor's Notice of Substantial Completion.

B. Refer to requirements of General Conditions of the Contract for Construction.

C. Substantial Completion
   1. Notify Architect when work is considered ready for Architect's Substantial Completion inspection.
   2. Submit written certification containing Contractor's Correction Punch List, that Contract Documents have been reviewed, work has been inspected, and that work is complete in accordance with Contract Documents and ready for Architect's Substantial Completion inspection.
   3. Notify Architect of intended date of Substantial Completion as early as is feasibly possible. Architect will schedule Final Inspection of the work with Owner, Architect's Consultants, and the Alabama Building Commission Inspector. Contractor shall coordinate attendance of the Final Inspection by local Fire Department and other code officials requiring attendance.
   4. Upon completion of the Final Inspection, if the work is deemed substantially complete, the Architect will distribute a Certificate of Substantial Completion with "Punch List" of items required to be corrected by the Contractor prior to Final Acceptance of the Work.

D. Final Acceptance
   1. Correct items of work listed in executed Certificates of Substantial Completion.
   2. Notify Architect when work is considered finally complete.
   3. Submit a certified copy of the Architect's final inspection list of items to be completed or corrected, stating that each item has been completed or otherwise resolved for acceptance, and the list has been endorsed and dated by the Architect.
   4. Upon completion of reinspection, the Architect will prepare a certificate of final acceptance, or advise the Contractor of Work that is incomplete or of obligations that have not been fulfilled but are required for final acceptance.
   5. If necessary, reinspection will be repeated until all items of work are completed.
   6. Submit final meter readings for utilities and similar data as of the date of Substantial Completion.

7. Submit evidence of final, continuing insurance coverage complying with insurance requirements.
8. Submit the final payment request with releases and supporting documentation as outlined in the General Conditions of the Contract for Construction.

E. Conduct Substantial Completion inspection and create Final Correction Punch List containing Architect's and Contractor's comprehensive list of items identified to be completed or corrected and submit to Architect.

3.14 MAINTENANCE

A. Provide service and maintenance of components indicated in specification sections.

B. Maintenance Period: As indicated in specification sections or, if not indicated, not less than one year from the Date of Substantial Completion or the length of the specified warranty, whichever is longer.

C. Examine system components at a frequency consistent with reliable operation. Clean, adjust, and lubricate as required.

D. Include systematic examination, adjustment, and lubrication of components. Repair or replace parts whenever required. Use parts produced by the manufacturer of the original component.

E. Maintenance service shall not be assigned or transferred to any agent or subcontractor without prior written consent of the Owner.

END OF SECTION 01 7000

SECTION 01 7419
CONSTRUCTION WASTE MANAGEMENT AND DISPOSAL

PART 1 GENERAL

1.01 WASTE MANAGEMENT REQUIREMENTS

A. Owner requires that this project generate the least amount of trash and waste possible.

B. Employ processes that ensure the generation of as little waste as possible due to error, poor planning, breakage, mishandling, contamination, or other factors.

C. Minimize trash/waste disposal in landfills; reuse, salvage, or recycle as much waste as economically feasible.

D. Methods of trash/waste disposal that are not acceptable are:
   1. Burning on the project site.
   2. Burying on the project site.
   3. Dumping or burying on other property, public or private.
   4. Other illegal dumping or burying.

E. Regulatory Requirements: Contractor is responsible for knowing and complying with regulatory requirements, including but not limited to Federal, state and local requirements, pertaining to legal disposal of all construction and demolition waste materials.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. Section 01 5000 - Temporary Facilities and Controls: Additional requirements related to trash/waste collection and removal facilities and services.

C. Section 01 6000 - Product Requirements: Waste prevention requirements related to delivery, storage, and handling.

D. Section 01 7000 - Execution and Closeout Requirements: Trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

1.03 DEFINITIONS

A. Clean: Untreated and unpainted; not contaminated with oils, solvents, caulk, or the like.

B. Construction and Demolition Waste: Solid wastes typically including building materials, packaging, trash, debris, and rubble resulting from construction, remodeling, repair and demolition operations.

C. Hazardous: Exhibiting the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity or reactivity.

D. Nonhazardous: Exhibiting none of the characteristics of hazardous substances, i.e., ignitibility, corrosivity, toxicity, or reactivity.

E. Nontoxic: Neither immediately poisonous to humans nor poisonous after a long period of exposure.

F. Recyclable: The ability of a product or material to be recovered at the end of its life cycle and remanufactured into a new product for reuse by others.

G. Recycle: To remove a waste material from the project site to another site for remanufacture into a new product for reuse by others.

H. Recycling: The process of sorting, cleansing, treating and reconstituting solid waste and other discarded materials for the purpose of using the altered form. Recycling does not include burning, incinerating, or thermally destroying waste.

I. Return: To give back reusable items or unused products to vendors for credit.

J. Reuse: To reuse a construction waste material in some manner on the project site.

K. Salvage: To remove a waste material from the project site to another site for resale or reuse by others.

L. Sediment: Soil and other debris that has been eroded and transported by storm or well production run-off water.

M. Source Separation: The act of keeping different types of waste materials separate beginning from the first time they become waste.

N. Toxic: Poisonous to humans either immediately or after a long period of exposure.

O. Trash: Any product or material unable to be reused, returned, recycled, or salvaged.

P. Waste: Extra material or material that has reached the end of its useful life in its intended use. Waste includes salvageable, returnable, recyclable, and reusable material.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

PART 3 EXECUTION

2.01 WASTE MANAGEMENT PROCEDURES

A. See Section 01 3000 for additional requirements for project meetings, reports, submittal procedures, and project documentation.

B. See Section 01 5000 for additional requirements related to trash/waste collection and removal facilities and services.

C. See Section 01 6000 for waste prevention requirements related to delivery, storage, and handling.

D. See Section 01 7000 for trash/waste prevention procedures related to demolition, cutting and patching, installation, protection, and cleaning.

2.02 WASTE MANAGEMENT PLAN IMPLEMENTATION

A. Manager: Designate an on-site person or persons responsible for instructing workers and overseeing and documenting results of the Waste Management Plan.

B. Communication: Distribute copies of the Waste Management Plan to job site foreman, each subcontractor, Owner, and Architect.

C. Instruction: Provide on-site instruction of appropriate separation, handling, and recycling, salvage, reuse, and return methods to be used by all parties at the appropriate stages of the project.

D. Meetings: Discuss trash/waste management goals and issues at project meetings.
   1. Prebid meeting.
   2. Preconstruction meeting.
   3. Regular job-site meetings.

E. Facilities: Provide specific facilities for separation and storage of materials for recycling, salvage, reuse, return, and trash disposal, for use by all contractors and installers.

1. Provide containers as required.
2. Provide adequate space for pick-up and delivery and convenience to subcontractors.
3. Keep recycling and trash/waste bin areas neat and clean and clearly marked in order to avoid contamination of materials.

F. Hazardous Wastes: Separate, store, and dispose of hazardous wastes according to applicable regulations.

G. Recycling: Separate, store, protect, and handle at the site identified recyclable waste products in order to prevent contamination of materials and to maximize recyclability of identified materials. Arrange for timely pickups from the site or deliveries to recycling facility in order to prevent contamination of recyclable materials.

H. Reuse of Materials On-Site: Set aside, sort, and protect separated products in preparation for reuse.

I. Salvage: Set aside, sort, and protect products to be salvaged for reuse off-site.

END OF SECTION 01 7419

This page intentionally left blank

SECTION 01 7800
CLOSEOUT SUBMITTALS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Project Record Documents.

B. Operation and Maintenance Data.

C. Warranties and bonds.

1.02 RELATED REQUIREMENTS

A. Section 01 3000 - Administrative Requirements: Submittals procedures, shop drawings, product data, and samples.

B. Section 01 7000 - Execution and Closeout Requirements: Contract closeout procedures.

C. Individual Product Sections: Specific requirements for operation and maintenance data.

D. Individual Product Sections: Warranties required for specific products or Work.

PART 2 PRODUCTS - NOT USED

PART 3 EXECUTION

3.01 CLOSEOUT DOCUMENTS : CONTRACTOR TO PROVIDE ONE PAPER COPY AND ONE DIGITAL COPY.

A. PROJECT RECORD DOCUMENTS -

1. Maintain on site one set of the following record documents; record actual revisions to the Work:
   a. Drawings.
   b. Specifications.
   c. Addenda.
   d. Change Orders and other modifications to the Contract.
   e. Reviewed shop drawings, product data, and samples.
   f. Manufacturer's instruction for assembly, installation, and adjusting.
2. Ensure entries are complete and accurate, enabling future reference by Owner.
3. Store record documents separate from documents used for construction.
4. Record information concurrent with construction progress.
   a. Architect will review record documents with Contractor's project manager after each progress meeting, or at intervals appropriate to the project, to ensure record documents are being kept accurate and up to date with the progress of the project.
5. Specifications: Legibly mark and record at each product section description of actual products installed, including the following:
   a. Manufacturer's name and product model and number.
   b. Product substitutions or alternates utilized.
   c. Changes made by Addenda and modifications.
6. Record Drawings: Contractor to provide **one paper copy and one digital copy**. All noted changes to be clouded.

B. **OPERATION AND MAINTENANCE DATA -**

1. Source Data: For each product or system, list names, addresses and telephone numbers of Subcontractors and suppliers, including local source of supplies and replacement parts.
2. Product Data: Mark each sheet to clearly identify specific products and component parts, and data applicable to installation. Delete inapplicable information.

3. Drawings: Supplement product data to illustrate relations of component parts of equipment and systems, to show control and flow diagrams. Do not use Project Record Documents as maintenance drawings.
4. Typed Text: As required to supplement product data. Provide logical sequence of instructions for each procedure, incorporating manufacturer's instructions.

C. OPERATION AND MAINTENANCE DATA FOR MATERIALS AND FINISHES
1. For Each Product, Applied Material, and Finish:
   a. Product data, with catalog number, size, composition, and color and texture designations.
   b. Information for re-ordering custom manufactured products.
2. Instructions for Care and Maintenance: Manufacturer's recommendations for cleaning agents and methods, precautions against detrimental cleaning agents and methods, and recommended schedule for cleaning and maintenance.
3. Additional information as specified in individual product specification sections.
4. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
5. Provide a listing in Table of Contents for design data, with tabbed fly sheet and space for insertion of data.

D. OPERATION AND MAINTENANCE DATA FOR EQUIPMENT AND SYSTEMS
1. For Each Item of Equipment and Each System:
   a. Description of unit or system, and component parts.
   b. Identify function, normal operating characteristics, and limiting conditions.
   c. Include performance curves, with engineering data and tests.
   d. Complete nomenclature and model number of replaceable parts.
2. Where additional instructions are required, beyond the manufacturer's standard printed instructions, have instructions prepared by personnel experienced in the operation and maintenance of the specific products.
3. Operating Procedures: Include start-up, break-in, and routine normal operating instructions and sequences. Include regulation, control, stopping, shut-down, and emergency instructions. Include summer, winter, and any special operating instructions.
4. Maintenance Requirements: Include routine procedures and guide for preventative maintenance and trouble shooting; disassembly, repair, and reassembly instructions; and alignment, adjusting, balancing, and checking instructions.
5. Provide servicing and lubrication schedule, and list of lubricants required.
6. Include manufacturer's printed operation and maintenance instructions.
7. Include sequence of operation by controls manufacturer.
8. Provide original manufacturer's parts list, illustrations, assembly drawings, and diagrams required for maintenance.
9. Provide list of original manufacturer's spare parts, current prices, and recommended quantities to be maintained in storage.
10. Include test and balancing reports.
11. Additional Requirements: As specified in individual product specification sections.

E. ASSEMBLY OF OPERATION AND MAINTENANCE MANUALS
1. Assemble operation and maintenance data into durable manuals for Owner's personnel use, with data arranged in the same sequence as, and identified by, the specification sections.

2. Where systems involve more than one specification section, provide separate tabbed divider for each system.
3. Prepare instructions and data by personnel experienced in maintenance and operation of described products.
4. Prepare data in the form of an instructional manual.
5. Binders: Commercial quality, 8-1/2 by 11 inch (216 by 280 mm) three D side ring binders with durable plastic covers; 4 inch (____ mm) maximum ring size. When multiple binders are used, correlate data into related consistent groupings.
6. Cover: Identify each binder with typed or printed title OPERATION AND MAINTENANCE INSTRUCTIONS; identify title of Project; identify subject matter of contents.
7. Project Directory: Title and address of Project; names, addresses, and telephone numbers of Architect, Consultants, Contractor and subcontractors, with names of responsible parties.
8. Tables of Contents: List every item separated by a divider, using the same identification as on the divider tab; where multiple volumes are required, include all volumes Tables of Contents in each volume, with the current volume clearly identified.
9. Dividers: Provide tabbed dividers for each separate product and system; identify the contents on the divider tab; immediately following the divider tab include a description of product and major component parts of equipment.
10. Text: Manufacturer's printed data, or typewritten data on 24 pound paper.
11. Drawings: Provide with reinforced punched binder tab. Bind in with text; fold larger drawings to size of text pages.
12. Arrange content by systems under section numbers and sequence of Table of Contents of this Project Manual.
13. Contents: Prepare a Table of Contents for each volume, with each product or system description identified, in three parts as follows:
    a. Part 1: Directory, listing names, addresses, and telephone numbers of Architect, Contractor, Subcontractors, and major equipment suppliers.
    b. Part 2: Operation and maintenance instructions, arranged by system and subdivided by specification section. For each category, identify names, addresses, and telephone numbers of Subcontractors and suppliers. Identify the following:
        1) Significant design criteria.
        2) List of equipment.
        3) Parts list for each component.
        4) Operating instructions.
        5) Maintenance instructions for equipment and systems.
        6) Maintenance instructions for special finishes, including recommended cleaning methods and materials, and special precautions identifying detrimental agents.
    c. Part 3: Project documents and certificates, including the following:
        1) Shop drawings and product data.
14. Table of Contents: Provide title of Project; names, addresses, and telephone numbers of Architect , Consultants, and Contractor with name of responsible parties; schedule of products and systems, indexed to content of the volume.

F. WARRANTIES AND BONDS
1. Obtain warranties and bonds, executed in duplicate by responsible Subcontractors, suppliers, and manufacturers, within 10 days after completion of the applicable item of work. Except for items put into use with Owner's permission, leave date of beginning of time of warranty until Date of Substantial completion is determined.
2. Verify that documents are in proper form, contain full information, and are notarized.

3. Co-execute submittals when required.
4. Retain warranties and bonds until time specified for submittal.
5. Manual: Bind in commercial quality 8-1/2 by 11 inch (216 by 279 mm) three D side ring binders with durable plastic covers.
6. Cover: Identify each binder with typed or printed title WARRANTIES AND BONDS, with title of Project; name, address and telephone number of Contractor and equipment supplier; and name of responsible company principal.
7. Table of Contents: Neatly typed, in the sequence of the Table of Contents of the Project Manual, with each item identified with the number and title of the specification section in which specified, and the name of product or work item.
8. Separate each warranty or bond with index tab sheets keyed to the Table of Contents listing. Provide full information, using separate typed sheets as necessary. List Subcontractor, supplier, and manufacturer, with name, address, and telephone number of responsible principal.
9. Reinstatement of Warranty: When Work covered by a warranty has failed and been corrected by replacement or rebuilding, reinstate the warranty by written endorsement. The reinstated warranty shall be equal to the original warranty with an equitable adjustment for depreciation.
10. Replacement Cost: Upon determination that Work covered by a warranty has failed, replace or rebuild the Work to an acceptable condition complying with requirements of Contract Documents. The Contractor is responsible for the cost of replacing or rebuilding defective Work regardless of whether the Owner has benefited from use of the Work through a portion of its anticipated useful service life.
11. Owner's Recourse: Written warranties made to the Owner are in addition to implied warranties, and shall not limit the duties, obligations, rights and remedies otherwise available under the law, nor shall warranty periods be interpreted as limitations on time in which the Owner can enforce such other duties, obligations, rights, or remedies.

END OF SECTION 01 7800

SECTION 02 4100
DEMOLITION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Selective demolition of built site elements.

B. Abandonment and removal of existing utilities and utility structures.

C. See Hazardous Materials Report by EMC following this section.
   1. Prior to this project, abatement of asbestos containing ceiling tiles were completed. This project no longer contains the contaminated ceiling tiles noted in EMC report.

1.02 RELATED REQUIREMENTS

A. Section 01 2200 - Unit Prices

B. Section 01 5000 - Temporary Facilities and Controls: Site fences, security, protective barriers, and waste removal.

C. Section 01 5713 - Temporary Erosion and Sediment Control.

D. Section 01 6000 - Product Requirements: Handling and storage of items removed for salvage and relocation.

E. Section 01 7000 - Execution and Closeout Requirements: Project conditions; protection of bench marks, survey control points, and existing construction to remain; reinstallation of removed products; temporary bracing and shoring.

F. Section 31 1000 - Site Clearing: Vegetation and existing debris removal.

1.03 REFERENCE STANDARDS

A. 29 CFR 1926 - Safety and Health Regulations for Construction; Current Edition.

B. NFPA 241 - Standard for Safeguarding Construction, Alteration, and Demolition Operations; 2027.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Site Plan: Showing:
   1. Areas for temporary construction and field offices.

C. Demolition Plan: Submit demolition plan to governing authorities as specified by OSHA and local authorities.
   1. Indicate extent of demolition, removal sequence, bracing and shoring, and location and construction of barricades and fences.
   2. Identify demolition firm and submit qualifications.
   3. Include a summary of safety procedures.

D. Project Record Documents: Accurately record actual locations of capped and active utilities and subsurface construction.

PART 2 PRODUCTS -- NOT USED

PART 3 EXECUTION

3.01 SCOPE

A. Remove existing elements, refer to Architectural, Mechanical, Plumbing, and Electrical Drawings.

B. Visit site prior to bid and verify all existing conditions, existing structures, finishes, and location of work area.

3.02 GENERAL PROCEDURES AND PROJECT CONDITIONS

A. Comply with other requirements specified in Section 01 7000.

B. Comply with applicable codes and regulations for demolition operations and safety of adjacent structures and the public.
   1. Obtain required permits.
   2. Use of explosives is not permitted.
   3. Take precautions to prevent catastrophic or uncontrolled collapse of structures to be removed; do not allow worker or public access within range of potential collapse of unstable structures.
   4. Provide, erect, and maintain temporary barriers and security devices.
   5. Use physical barriers to prevent access to areas that could be hazardous to workers or the public.
   6. Conduct operations to minimize effects on and interference with adjacent structures and occupants.
   7. Do not close or obstruct roadways or sidewalks without permit.
   8. Conduct operations to minimize obstruction of public and private entrances and exits; do not obstruct required exits at any time; protect persons using entrances and exits from removal operations.
   9. Obtain written permission from owners of adjacent properties when demolition equipment will traverse, infringe upon or limit access to their property.
   10. Buildings Occupancy: The adjacent portion of the existing building will be occupied. Work may be accomplished during normal hours. Notify the owner 48 hours in advance if any demolition will result in excessive noise or vibration which may be sensed in the area. Contractor to seal off all work areas and maintain fire exiting for the building.

C. Do not begin removal until receipt of notification to proceed from Owner.

D. Protect existing structures and other elements that are not to be removed (including adjacent buildings).
   1. Provide bracing and shoring.
   2. Prevent movement or settlement of adjacent structures.
   3. Stop work immediately if adjacent structures appear to be in danger.

E. Minimize production of dust due to demolition operations; do not use water if that will result in ice, flooding, sedimentation of public waterways or storm sewers, or other pollution.

F. If hazardous materials are discovered during removal operations, stop work and notify Architect and Owner; hazardous materials include regulated asbestos containing materials, lead, PCB's, and mercury.

3.03 EXISTING UTILITIES

A. Coordinate work with utility companies; notify before starting work and comply with their requirements; obtain required permits.

B. Protect existing utilities to remain from damage.

C. Do not disrupt public utilities without permit from authority having jurisdiction.

D. Do not close, shut off, or disrupt existing life safety systems that are in use without at least 7 days prior written notification to Owner.

E. Do not close, shut off, or disrupt existing utility branches or take-offs that are in use without at least 3 days prior written notification to Owner.

F. Locate and mark utilities to remain; mark using highly visible tags or flags, with identification of utility type; protect from damage due to subsequent construction, using substantial barricades if necessary.

G. Remove exposed piping, valves, meters, equipment, supports, and foundations of disconnected and abandoned utilities.

3.04 SELECTIVE DEMOLITION FOR ALTERATIONS

A. Drawings showing existing construction and utilities are based on casual field observation and existing record documents only.
   1. Verify that construction and utility arrangements are as indicated.
   2. Report discrepancies to Architect before disturbing existing installation.
   3. Beginning of demolition work constitutes acceptance of existing conditions that would be apparent upon examination prior to starting demolition.

B. Remove existing building and site elements as indicated and as required to accomplish new work.
   1. Remove items indicated on drawings.

C. Services (Including but not limited to HVAC, Plumbing, and Electrical): Remove existing systems and equipment as indicated.
   1. Maintain existing active systems that are to remain in operation; maintain access to equipment and operational components.
   2. Where existing active systems serve occupied facilities but are to be replaced with new services, maintain existing systems in service until new systems are complete and ready for service.
   3. Verify that abandoned services serve only abandoned facilities before removal.

D. Protect existing work to remain.
   1. Prevent movement of structure; provide shoring and bracing if necessary.
   2. Perform cutting to accomplish removals neatly and as specified for cutting new work.
   3. Repair adjacent construction and finishes damaged during removal work.
   4. Patch as specified for patching new work.

3.05 DEBRIS AND WASTE REMOVAL

A. Remove debris, junk, and trash from site.

B. Leave site in clean condition, ready for subsequent work.

C. Clean up spillage and wind-blown debris from public and private lands.

D. All demolished materials shall become the property of the Contractor and shall be removed from the site by the Contractor unless noted otherwise in Contract Documents.

E. The Contractor shall select haul routes, obtain required approval of local authorities, and conduct its operations in such manner as to insure minimum interference with roads, street, sidewalks, and neighboring buildings and facilities and so that there is no interference with the normal operations of the building.

F. The Contractor shall obtain all necessary permits and comply with all statutes, ordinances, codes and regulations applicable to the work to be performed.

G. The Contractor shall take all precautions necessary to assure that the work will be performed in a manner that will not endanger the public, any workman, or any property in the vicinity of the work.

H. The Contractor shall take such actions as shall be necessary to assure that members of the public will have safe passage on the public streets around the area of demolition, and construct such fencing, barricades and obstacles as will prevent unauthorized entry to the work site.

END OF SECTION 02 4100

Wallace Hall

111 International Blvd.

Asbestos Survey (1st – 3rd Floors)

Troy University

600 University Ave.
Troy, Alabama 36082

Prepared By:

Environmental-Materials Consultants, Inc.
2027 Chestnut Street
Montgomery, Alabama. 36106

April 29, 2024

EMC, INC.

EMC Project No. MA-4552

EMC, INC.

April 24, 2024

Robert N. Burkey
Troy University
Facilities - Melton Carter Drive
Troy, AL 36082

Subject: Pre-Renovation Asbestos Survey
Troy University - Wallace Hall (1st – 3rd floors)
Troy, Alabama 36082
EMC Project No. MA-4552

Dear Mr. Burkey:

EMC has performed a pre-renovation asbestos survey and associated testing for the above referenced facility located in Troy, Alabama. This report presents our findings.

Background Information

It is EMC's understanding that Troy University proposes to renovate Wallace Hall, located on Troy's campus in Troy, AL. EPA's NESHAP regulations require that an asbestos survey be performed so that any asbestos-containing building materials within the structure can be properly addressed prior to and/or during renovations.

Asbestos Survey

On April 10, 2024, EMC personnel performed a tour of the building, noting materials that are considered suspect for asbestos. During the site visit EMC recorded the general locations of twenty-six (26) building materials that are considered suspect to contain asbestos.

Bulk samples for asbestos analysis were obtained from the structure in general accordance with EPA recommendations. The suspect materials were separated into homogenous sampling areas (HSA). A homogeneous sampling area (HSA) is defined as being a material that is the same in type, color, texture and applied or installed during the same time of construction or renovation. The EPA's recommended procedures involve representative sample site selection within sampling areas. After sampling, the bulk samples were forwarded to EMSL Analytical in Smyrna, Georgia. The NVLAP lab code for EMSL's Smyrna lab is 101048-1. The sampling work was performed by Mr. Trent Hill an accredited asbestos inspector (Alabama Accreditation Number AIN0224708327) and Ms. Jennifer Klepac Passineau an accredited asbestos inspector (Alabama Accreditation Number AIN0224812CE30).

The bulk samples were analyzed by polarized light microscopy (PLM) coupled with dispersion staining. This technique is used to identify asbestos fibers by their shape and unique optical properties. The analyses identified four (4) asbestos-containing materials (ACM) and one (1) material with a trace of asbestos..

Material	General Location	Asbestos
9" floor tile, greenish-gray	various locations throughout the building, exposed and under carpet	4% chrysotile
mastic, black	associated with the 9" floor tile	3% chrysotile
spray-applied acoustical ceiling finish	found in library portion of the 2nd and 3rd floors	2% chrysotile
2'X2' ceiling tile, pinhole flower pattern	found in various locations throughout building and above the suspended ceiling	3% chrysotile 3% amosite
joint compound	throughout building	<1% chrysotile

A summarization of the analytical results is provided in the tables included with this report. Specific data for each sample analysis is shown on the enclosed analytical data sheets and chain-of-custody form.

Asbestos Comments

The EPA defines an asbestos-containing material as one containing greater than 1% asbestos. Regulated asbestos-containing materials (RACM) are those materials containing greater than 1% asbestos and can include both friable and non-friable forms. EPA's NESHAP regulations requires that all RACM be properly removed and disposed if renovation activities may disturb them. Therefore, the 2'x 2' ceiling tile (pinhole, flower pattern), and spray-applied ceiling finish are both friable asbestos-containing materials and must be removed prior to any renovation activities that may impact them. The analyses also identified one (1) material, joint compound, with a trace of asbestos.

The floor tiles and flooring mastics are classified as Category I non-friable ACMs. These materials are regulated under NESHAP when they have become friable or will be subject to sanding, grinding, cutting or abrading. This also includes removing with spud bars, hammers, and/or other chiseling type tools.

The EPA considers the wallboard and joint compound as a multi-layered system. If the overall composite analysis of such materials results in less than 1% asbestos, then this material is not regulated under NESHAP and can be disposed as a solid waste during renovation activities. However, the contractor(s) must be aware of asbestos being present, even in trace amounts.

OSHA requires employers to protect their workers from airborne asbestos exposure when asbestos materials are disturbed.

The Alabama Department of Environmental Management (ADEM) requires that all asbestos wastes be disposed in a permitted landfill.

OSHA considers removal of the identified friable ACMs to be Class I asbestos work and non-friable ACMs to be Class II asbestos work, both of which require establishment of regulated areas, supervision by a competent person, worker training, adherence to specified work practices, and respiratory protection (or documentation that it is not required)

Limitations

EMC's observations, sampling, and testing were limited to exposed materials within the interior of the building and which were safely accessible. EMC did not perform major and/or exploratory demolition

activities to walls, flooring materials, ceilings, or insulations to observe and sample underlying materials. EMC made a reasonable attempt to locate all suspect building materials. However, EMC cannot state that all suspect materials were identified and sampled. If additional suspect materials are encountered during the renovation activities, and are not mentioned or discussed in this report, then additional sampling and testing may be warranted. Determination of whether a suspect material contains asbestos was generally based on analyses of the minimum number of samples allowed by the EPA's AHERA regulations. Because of variations in the composition of some materials, and our inability to visually identify those variations, it is possible that not all asbestos-containing materials were identified. This report has been prepared for the use of Seay, Seay and Litchfield, Troy University and/or their representatives. No other warranties are expressed or implied.

We appreciate the opportunity to provide this service. Please do not hesitate to contact us if you have questions about EMC's work.

Jennifer Klepac Passineau
Sr. Project Manager

Trent S. Hill, REM, CESCO
Owner/President

REGISTERED ENVIRONMENTAL MANAGER
TRENT S.
HILL
REM
12432

enclosures

EMC, INC.
2027 Chestnut Street, Montgomery, Alabama 36106, 334-265-4000

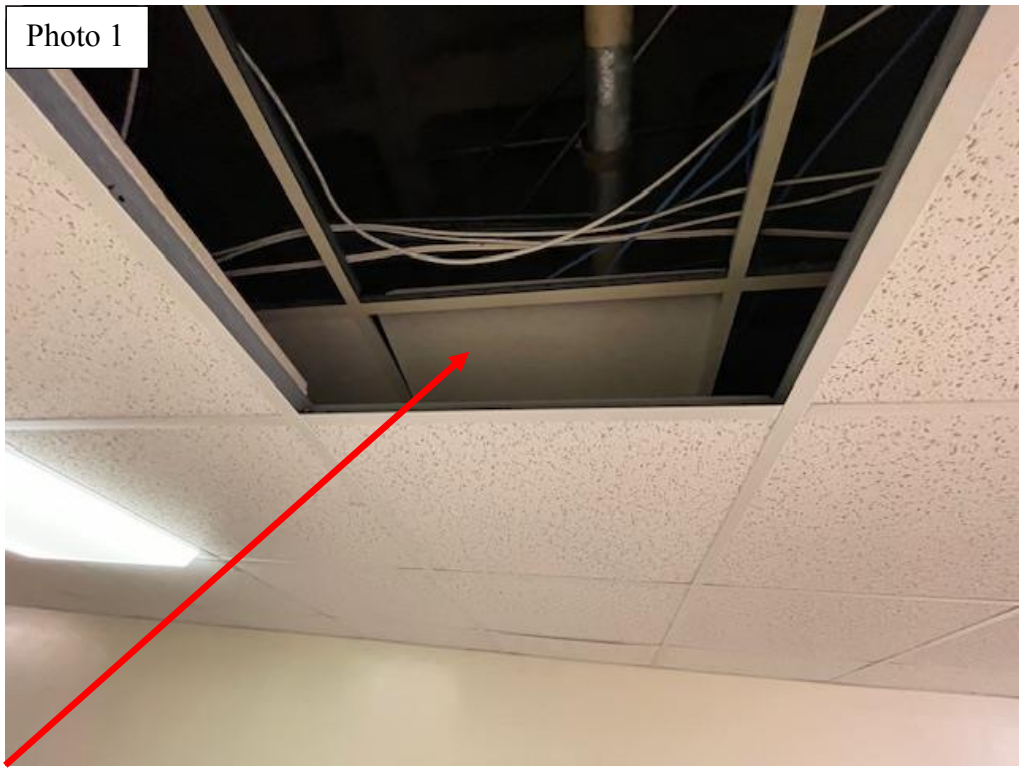
ASBESTOS SURVEY SUMMARY

SS&L
Troy University – Wallace Hall
Troy, Alabama
EMC Project Number MA-4552
April 10, 2024

EMC HSA#	Material Description	General Location	Asbestos
4552-01 4552-01a	12” floor tile, beige with tan and white mottling mastic, yellow	1st floor hallway outside of elevator and various locations throughout 3rd floor	none detected none detected
4552-02 **4552-02a**	**9” floor tile, greenish-gray** **mastic, black**	**under carpet and exposed in various locations throughout the building (1st, 2nd, and 3rd floors)**	**4% Chrysotile** **3% Chrysotile**
4552-03	cove base adhesive, brown	throughout building (samples collected from 1st floor)	none detected
4552-04	2’x2’ ceiling tile, pinholes and short gouges	1st and 3rd floor	none detected
4552-05	**2’x2’ ceiling tile, flower pattern**	**throughout building and above suspended ceiling throughout**	**3% Amosite** **3% Chrysotile**
4552-06 **4552-06a**	wallboard, gray **joint compound, white**	**throughout building**	**<1% Chrysotile**
4552-07 4552-07a	12” floor tile, black with white specks adhesive, yellow	entrance to tv studio and throughout tv studio	none detected none detected
4552-08	2’x2’ ceiling tile, pinholes and extra short gouges	suite 159 and suite 141	none detected
4552-09	2’x2’ ceiling tile, blister pattern	suite 146	none detected
4552-10	1’x1’ acoustical tile	office in suite 123	none detected
4552-11 4552-11a	glue dots, brown associated with HSA 10 insulation	office in suite 123	none detected none detected
4552-12 4552-12a	12” floor tile, beige adhesive, yellow	along perimeter walls, in front of windows of library (2nd and 3rd floors)	none detected none detected
4552-13	**spray-applied acoustical ceiling finish**	**2nd and 3rd floor (center portions of each floor) applied on waffle pattern concrete deck**	**2% Chrysotile**
4552-14	cove base adhesive, tan	throughout 2nd and 3rd floor	none detected
4552-15 4552-15a	12” floor tile, white adhesive, yellow	central staircase, bottom floor	none detected none detected
4552-16 4552-16a 4552-16b	12” floor tile, jade green adhesive, yellow floor leveler, gray	accent tile throughout 3rd floor	none detected none detected none detected
4552-17	2’x4’ ceiling tile, pinholes	3rd floor hallway	none detected

Materials shown in bold are asbestos-containing materials.
General location information is provided to assist in identifying the material and may not list all locations where the material exists.
The samples were analyzed by polarized light microscopy (PLM) coupled with dispersion staining.
Reported asbestos percentages are visual estimations made by the microscopist.

Photo 1



View of suspended ceiling above a lower suspended ceiling. The upper suspended ceiling is a 2"x2' ceiling tile with a pinhole "flower" pattern (HSA 05). HSA 05 contains 3% Amosite and 3% Chrysotile.

Photo 2



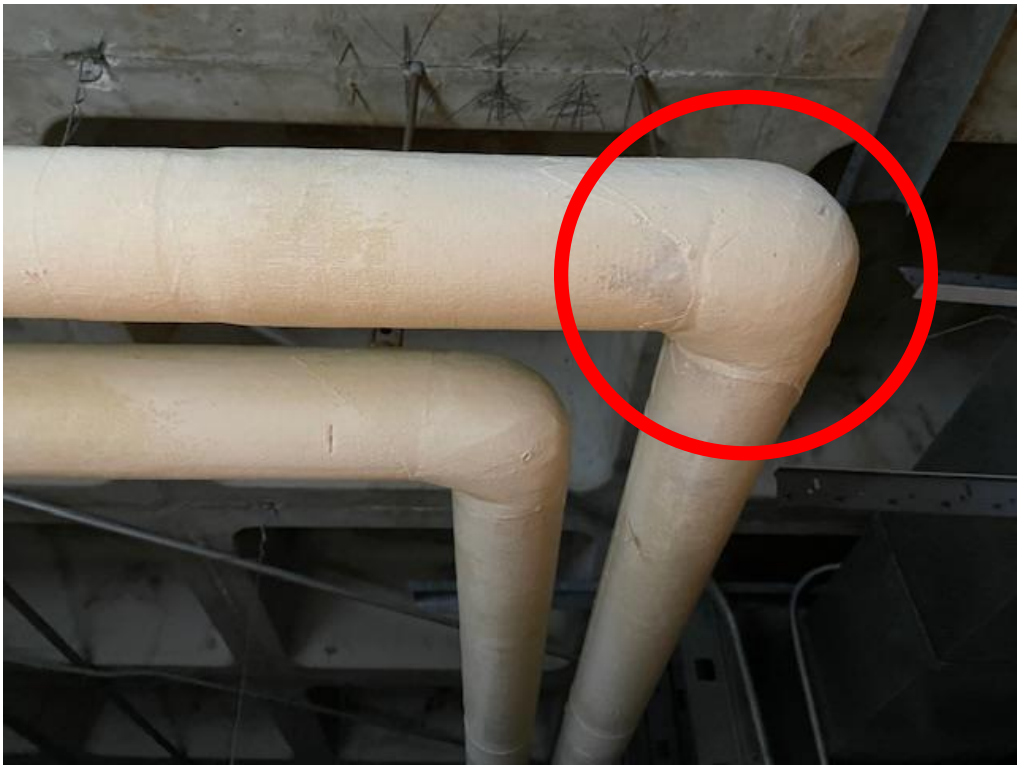
View of 9-inch greenish-gray floor tile (HSA 02). HSA 02 under carpet and exposed in various locations throughout the building (1st, 2nd, and 3rd floors). HSA 02 floor tile contains 4% Chrysotile and the associated black masic (HSA 02a) contains 3% Chrysotile.



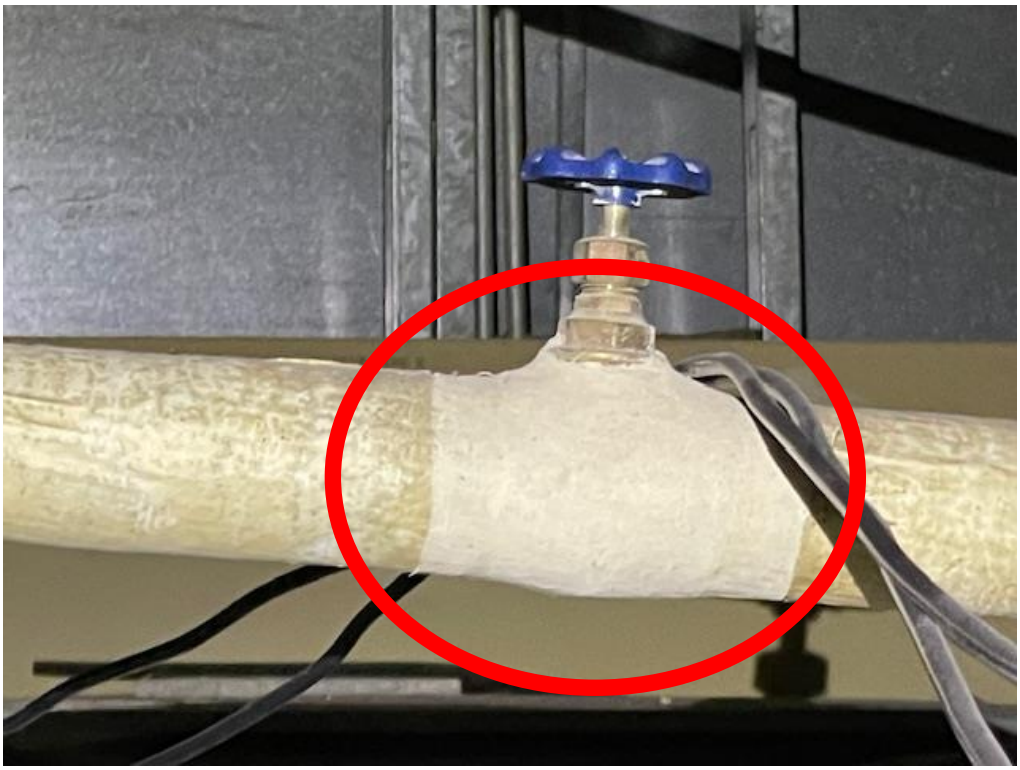
Waffle pattern concrete deck ceiling found on 2nd and 3rd floors of library.



View of spray-applied acoustical ceiling finish (HSA 13) on the waffle pattern ceiling deck.



Cementitious pipe mud elbows found above suspended ceilings.



View of a cementitious valve fitting.



Cementitious pipe mud elbows found in pipe chase between bathrooms.



Cementitious pipe mud elbows found in pipe chase between bathrooms.

EMSL Analytical, Inc.

2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080
Tel/Fax: (770) 956-9150 / (770) 956-9181
http://www.EMSL.com / atlantalab@emsl.com

EMSL Order:	072403471
Customer ID:	ENVI40
Customer PO:	4552
Project ID:	

Attention:	Jennifer Passineau	**Phone:**	(334) 265-4000
	Environmental Materials Consultants	**Fax:**	(334) 265-4043
	2027 Chestnut Street	**Received Date:**	04/15/2024 9:25 AM
	Montgomery, AL 36106	**Analysis Date:**	04/15/2024
		Collected Date:	04/10/2024
Project:	MA-4552/Wallace Hall		

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4552-01-01-Floor Tile *072403471-0001*	1st floor - 12" FT Beige with tan & white mottling	Gray Non-Fibrous Homogeneous	HA: 01	100% Non-fibrous (Other)	None Detected
4552-01-01-Mastic *072403471-0001A*	1st floor - 12" FT Beige with tan & white mottling	Yellow Non-Fibrous Homogeneous	HA: 01	100% Non-fibrous (Other)	None Detected
4552-01-02-Floor Tile *072403471-0002*	3rd floor - 12" FT Beige with tan & white mottling	Gray Non-Fibrous Homogeneous	HA: 01	100% Non-fibrous (Other)	None Detected
4552-01-02-Mastic *072403471-0002A*	3rd floor - 12" FT Beige with tan & white mottling	Yellow Non-Fibrous Homogeneous	HA: 01	100% Non-fibrous (Other)	None Detected
4552-02-01-Floor Tile *072403471-0003*	1st floor janitorial closet - 9" FT greenish gray	Gray Non-Fibrous Homogeneous	HA: 02	96% Non-fibrous (Other)	4% Chrysotile
4552-02-01-Mastic *072403471-0003A*	1st floor janitorial closet - 9" FT greenish gray	Black Non-Fibrous Homogeneous	HA: 02	97% Non-fibrous (Other)	3% Chrysotile
4552-02-02-Floor Tile *072403471-0004*	2nd floor janitorial closet - 9" FT greenish gray		HA: 02		Positive Stop (Not Analyzed)
4552-02-02-Mastic *072403471-0004A*	2nd floor janitorial closet - 9" FT greenish gray		HA: 02		Positive Stop (Not Analyzed)
4552-03-01 *072403471-0005*	1st floor - Cove base adhesive, brown	Brown Non-Fibrous Homogeneous	HA: 03	100% Non-fibrous (Other)	None Detected
4552-03-02 *072403471-0006*	1st floor - Cove base adhesive, brown	Brown Non-Fibrous Homogeneous	HA: 03	100% Non-fibrous (Other)	None Detected
4552-04-01 *072403471-0007*	1st floor - 2'X2' CT pinholes and short gouges	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool HA: 04	35% Non-fibrous (Other)	None Detected
4552-04-02 *072403471-0008*	3rd floor - 2'X2' CT pinholes and short gouges	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool HA: 04	35% Non-fibrous (Other)	None Detected

Initial report from: 04/15/2024 15:36:06

EMSL Analytical, Inc.
2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080
Tel/Fax: (770) 956-9150 / (770) 956-9181
http://www.EMSL.com / atlantalab@emsl.com

EMSL Order:	072403471
Customer ID:	ENVI40
Customer PO:	4552
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4552-04-03 *072403471-0009*	3rd floor - 2'X2' CT pinholes and short gouges	Gray Fibrous Homogeneous	20% Min. Wool HA: 04	75% Non-fibrous (Other)	2% Amosite 3% Chrysotile
4552-05-01 *072403471-0010*	1st floor - 2'X2' CT pinholes flower pattern	Gray Fibrous Homogeneous	20% Min. Wool HA: 05	74% Non-fibrous (Other)	3% Amosite 3% Chrysotile
4552-05-02 *072403471-0011*	2nd floor - 2'X2' CT pinholes flower pattern		HA: 05		Positive Stop (Not Analyzed)
4552-06-01-Joint Compound *072403471-0012*	throughout - wallboard & joint compound	White Non-Fibrous Homogeneous	HA: 06	100% Non-fibrous (Other)	<1% Chrysotile
4552-06-01-Drywall *072403471-0012A*	throughout - wallboard & joint compound	Gray Non-Fibrous Homogeneous	HA: 06	100% Non-fibrous (Other)	None Detected
4552-06-02-Joint Compound *072403471-0013*	throughout - wallboard & joint compound	White Non-Fibrous Homogeneous	HA: 06	100% Non-fibrous (Other)	<1% Chrysotile
4552-06-02-Drywall *072403471-0013A*	throughout - wallboard & joint compound	Gray Non-Fibrous Homogeneous	HA: 06	100% Non-fibrous (Other)	None Detected
4552-06-03-Joint Compound *072403471-0014*	throughout - wallboard & joint compound	White Non-Fibrous Homogeneous	HA: 06	100% Non-fibrous (Other)	<1% Chrysotile
4552-06-03-Drywall *072403471-0014A*	throughout - wallboard & joint compound	Gray Non-Fibrous Homogeneous	HA: 06	100% Non-fibrous (Other)	None Detected
4552-06-04-Joint Compound *072403471-0015*	throughout - wallboard & joint compound	White Non-Fibrous Homogeneous	HA: 06	100% Non-fibrous (Other)	<1% Chrysotile
4552-06-04-Drywall *072403471-0015A*	throughout - wallboard & joint compound	Gray Non-Fibrous Homogeneous	HA: 06	100% Non-fibrous (Other)	None Detected
4552-07-01 *072403471-0016*	tv studio entrance - 12" FT black with white specks	Black Non-Fibrous Homogeneous	HA: 07	100% Non-fibrous (Other)	None Detected
4552-07-02-Floor Tile *072403471-0017*	tv studio - 12" FT black with white specks	Black Non-Fibrous Homogeneous	HA: 07	100% Non-fibrous (Other)	None Detected
4552-07-02-Mastic *072403471-0017A*	tv studio - 12" FT black with white specks	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected

Initial report from: 04/15/2024 15:36:06

EMSL Analytical, Inc.
2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080
Tel/Fax: (770) 956-9150 / (770) 956-9181
http://www.EMSL.com / atlantalab@emsl.com

EMSL Order:	072403471
Customer ID:	ENVI40
Customer PO:	4552
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
			HA: 07		
4552-08-01 *072403471-0018*	room 141A - 2'X2' CT pinholes and xs gouges	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool	35% Non-fibrous (Other)	None Detected
			HA: 08		
4552-08-02 *072403471-0019*	outside room 159A - 2'X2' CT pinholes and xs gouges	Gray Fibrous Homogeneous	60% Cellulose 5% Min. Wool	35% Non-fibrous (Other)	None Detected
			HA: 08		
4552-09-01 *072403471-0020*	suite 146 - 2'X2' CT blister pattern	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 09		
4552-09-02 *072403471-0021*	suite 146 - 2'X2' CT blister pattern	Gray Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 09		
4552-10-01 *072403471-0022*	suite 123 - 1'x1' acoustical tile	Gray Fibrous Homogeneous	20% Cellulose 40% Min. Wool	40% Non-fibrous (Other)	None Detected
			HA: 10		
4552-10-02 *072403471-0023*	suite 123 - 1'x1' acoustical tile	Gray Fibrous Homogeneous	20% Cellulose 40% Min. Wool	40% Non-fibrous (Other)	None Detected
			HA: 10		
4552-11-01-Glue *072403471-0024*	suite 123 - glue dots, brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 11		
4552-11-01-Insulation *072403471-0024A*	suite 123 - glue dots, brown	Gray Fibrous Homogeneous	20% Cellulose 40% Min. Wool	40% Non-fibrous (Other)	None Detected
			HA: 11		
4552-11-02-Glue *072403471-0025*	suite 123 - glue dots, brown	Brown Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 11		
4552-11-02-Insulation *072403471-0025A*	suite 123 - glue dots, brown	Gray Fibrous Homogeneous	20% Cellulose 40% Min. Wool	40% Non-fibrous (Other)	None Detected
			HA: 11		
4552-12-01-Floor Tile *072403471-0026*	window bump-out - 12" FT, beige tile	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 12		
4552-12-01-Mastic *072403471-0026A*	window bump-out - 12" FT, beige tile	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 12		
4552-12-02-Floor Tile *072403471-0027*	window bump-out - 12" FT, beige tile	Tan Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 12		
4552-12-02-Mastic *072403471-0027A*	window bump-out - 12" FT, beige tile	Yellow Non-Fibrous Homogeneous		100% Non-fibrous (Other)	None Detected
			HA: 12		

Initial report from: 04/15/2024 15:36:06

EMSL Analytical, Inc.
2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080
Tel/Fax: (770) 956-9150 / (770) 956-9181
http://www.EMSL.com / atlantalab@emsl.com

EMSL Order:	072403471
Customer ID:	ENVI40
Customer PO:	4552
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4552-13-01 *072403471-0028*	2nd floor by stairwell - spray applied acoustical ceiling finish	White Non-Fibrous Homogeneous	HA: 13	98% Non-fibrous (Other)	2% Chrysotile
4552-13-02 *072403471-0029*	2nd floor mid room - spray applied acoustical ceiling finish		HA: 13		Positive Stop (Not Analyzed)
4552-13-03 *072403471-0030*	2nd floor at entry - spray applied acoustical ceiling finish		HA: 13		Positive Stop (Not Analyzed)
4552-14-01 *072403471-0031*	2nd floor - tan cove base adhesive	Brown/Tan Non-Fibrous Homogeneous	HA: 14	100% Non-fibrous (Other)	None Detected
4552-14-02 *072403471-0032*	3rd floor - tan cove base adhesive	Brown/Tan Non-Fibrous Homogeneous	HA: 14	100% Non-fibrous (Other)	None Detected
4552-15-01-Floor Tile *072403471-0033*	bottom landing of stairwell - 12" FT withe	Gray Non-Fibrous Homogeneous	HA: 15	100% Non-fibrous (Other)	None Detected
4552-15-01-Mastic *072403471-0033A*	bottom landing of stairwell - 12" FT withe	Yellow Non-Fibrous Homogeneous	HA: 15	100% Non-fibrous (Other)	None Detected
4552-15-02-Floor Tile *072403471-0034*	bottom landing of stairwell - 12" FT withe	Gray Non-Fibrous Homogeneous	HA: 15	100% Non-fibrous (Other)	None Detected
4552-15-02-Mastic *072403471-0034A*	bottom landing of stairwell - 12" FT withe	Yellow Non-Fibrous Homogeneous	HA: 15	100% Non-fibrous (Other)	None Detected
4552-16-01-Floor Tile *072403471-0035*	3rd floor accent tile - 12" FT jade green with darker mottling	Green Non-Fibrous Homogeneous	HA: 16	100% Non-fibrous (Other)	None Detected
4552-16-01-Mastic *072403471-0035A*	3rd floor accent tile - 12" FT jade green with darker mottling	Yellow Non-Fibrous Homogeneous	HA: 16	100% Non-fibrous (Other)	None Detected
4552-16-02-Floor Tile *072403471-0036*	3rd floor accent tile - 12" FT jade green with darker mottling	Green Non-Fibrous Homogeneous	HA: 16	100% Non-fibrous (Other)	None Detected
4552-16-02-Mastic *072403471-0036A*	3rd floor accent tile - 12" FT jade green with darker mottling	Yellow Non-Fibrous Homogeneous	HA: 16	100% Non-fibrous (Other)	None Detected
4552-16-02-Leveler *072403471-0036B*	3rd floor accent tile - 12" FT jade green with darker mottling	Gray Non-Fibrous Homogeneous	HA: 16	100% Non-fibrous (Other)	None Detected

Initial report from: 04/15/2024 15:36:06

EMSL Analytical, Inc.

2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080

Tel/Fax: (770) 956-9150 / (770) 956-9181

http://www.EMSL.com / atlantalab@emsl.com

EMSL Order:	072403471
Customer ID:	ENVI40
Customer PO:	4552
Project ID:	

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4552-17-01 *072403471-0037*	3rd floor - 2'X4' CT pinholes	Gray Fibrous Homogeneous	60% Cellulose 10% Min. Wool HA: 17	30% Non-fibrous (Other)	None Detected
4552-17-02 *072403471-0038*	3rd floor - 2'X4' CT pinholes	Gray Fibrous Homogeneous	60% Cellulose 10% Min. Wool HA: 17	30% Non-fibrous (Other)	None Detected

Analyst(s)

Erricka Edwards (51)

Violedah Melissa Richardson

Violedah Richardson, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations. The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 “Interim Method”) but augmented with procedures outlined in the 1993 (”final”) version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis. Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc Smyrna, GA NVLAP Lab Code 101048-1

Initial report from: 04/15/2024 15:36:06

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

072403471

3GP6-7AW2-GW66

Client Information
Environmental Materials Consultants
Montgomery, AL
ENVI40

Project Overview

Client	SS&L
PO Number	4552
Project Name	Wallace Hall
Project ID	MA-4552
Bill To	ENVI40
Report To Contact	Jennifer Passineau
Report To Email	jpassineau@emcinc.net
Special Instructions	STOP ON 1ST POSITIVE

Project Site

Building Type	Commercial
Address	111 International Blvd, Troy
City	
State	AL
Zip	36081

Testing Laboratory
Atlanta
Smyrna, GA 30080

Asbestos Bulk

HA	Sample ID	Material	Location	Date/Time Collected	Test Method	TAT	Notes
01	4552-01-01	12" FT Beige with tan & white mottling	1st floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
01	4552-01-02	12" FT Beige with tan & white mottling	3rd floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
02	4552-02-01	9" FT greenish gray	1st floor janitorial closet	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
02	4552-02-02	9" FT greenish gray	2nd floor janitorial closet	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
03	4552-03-01	Cove base adhesive, brown	1st floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
03	4552-03-02	Cove base adhesive, brown	1st floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
04	4552-04-01	2'X2' CT pinholes and short gouges	1st floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
04	4552-04-02	2'X2' CT pinholes and short gouges	3rd floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
04	4552-04-03	2'X2' CT pinholes and short gouges	3rd floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
05	4552-05-01	2'X2' CT pinholes flower pattern	1st floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
05	4552-05-02	2'X2' CT pinholes flower pattern	2nd floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
06	4552-06-01	wallboard & joint compound	throughout	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
06	4552-06-02	wallboard & joint compound	throughout	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
06	4552-06-03	wallboard & joint compound	throughout	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
06	4552-06-04	wallboard & joint compound	throughout	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	

OrderID: 072403471

Page 1 Of 3

HA	Sample ID	Material	Location	Date/Time Collected	Test Method	TAT	Notes
07	4552-07-01	12" FT black with white specks	tv studio entrance	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
07	4552-07-02	12" FT black with white specks	tv studio	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
08	4552-08-01	2'X2' CT pinholes and xs gouges	room 141A	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
08	4552-08-02	2'X2' CT pinholes and xs gouges	outside room 159A	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
09	4552-09-01	2'X2' CT blister pattern	suite 146	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
09	4552-09-02	2'X2' CT blister pattern	suite 146	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
10	4552-10-01	1'x1' acoustical tile	suite 123	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
10	4552-10-02	1'x1' acoustical tile	suite 123	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
11	4552-11-01	glue dots, brown	suite 123	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
11	4552-11-02	glue dots, brown	suite 123	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
12	4552-12-01	12" FT, beige tile	window bump-out	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
12	4552-12-02	12" FT, beige tile	window bump-out	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
13	4552-13-01	spray applied acoustical ceiling finish	2nd floor by stairwell	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
13	4552-13-02	spray applied acoustical ceiling finish	2nd floor mid room	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
13	4552-13-03	spray applied acoustical ceiling finish	2nd floor at entry	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
14	4552-14-01	tan cove base adhesive	2nd floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
14	4552-14-02	tan cove base adhesive	3rd floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
15	4552-15-01	12" FT withe	bottom landing of stairwell	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
15	4552-15-02	12" FT withe	bottom landing of stairwell	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
16	4552-16-01	12" FT jade green with darker mottling	3rd floor accent tile	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
16	4552-16-02	12" FT jade green with darker mottling	3rd floor accent tile	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	

EMSL ANALYTICAL, INC.
LABORATORY • PRODUCTS • TRAINING

3GP6-7AW2-GW66

HA	Sample ID	Material	Location	Date/Time Collected	Test Method	TAT	Notes
17	4552-17-01	2'X4' CT pinholes	3rd floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	
17	4552-17-02	2'X4' CT pinholes	3rd floor	Apr 10, 2024 4:30 PM	PLM EPA 600	24 Hour	

Apr 11, 2024
Sampled By / Date

Apr 11, 2024
Relinquished By / Date

4/15/24 9:25 EH
Received (Lab) / Date

Page 3 Of 3

OrderID: 072403471

EMSL Analytical, Inc.

2205 Corporate Plaza Parkway SE, Suite 200 Smyrna, GA 30080

Tel/Fax: (770) 956-9150 / (770) 956-9181

http://www.EMSL.com / atlantalab@emsl.com

EMSL Order:	072403691
Customer ID:	ENVI40
Customer PO:	4552
Project ID:	

Attention:	Jennifer Passineau	**Phone:**	(334) 265-4000
	Environmental Materials Consultants	**Fax:**	(334) 265-4043
	2027 Chestnut Street	**Received Date:**	04/22/2024 9:20 AM
	Montgomery, AL 36106	**Analysis Date:**	04/22/2024
		Collected Date:	04/19/2024
Project:	MA-4552/Wallace Hall (1st - 3rd floors)		

Test Report: Asbestos Analysis of Bulk Materials via AHERA Method 40CFR 763 Subpart E Appendix E supplemented with EPA 600/R-93/116 using Polarized Light Microscopy

			Non-Asbestos		Asbestos
Sample	**Description**	**Appearance**	**% Fibrous**	**% Non-Fibrous**	**% Type**
4552-04-04 *072403691-0001*	1st floor - 2'x2' CT pinholes and short gouges	Gray Fibrous Homogeneous	60% Cellulose HA: 04	40% Non-fibrous (Other)	None Detected
4552-04-05 *072403691-0002*	3rd floor - 2'x2' CT pinholes and short gouges	Gray Fibrous Homogeneous	60% Cellulose HA: 04	40% Non-fibrous (Other)	None Detected

Analyst(s)

Anthony Sanaie (2)

Violedah Melissa Richardson

Violedah Richardson, Laboratory Manager
or Other Approved Signatory

EMSL maintains liability limited to cost of analysis. Interpretation and use of test results are the responsibility of the client. This report relates only to the samples reported above, and may not be reproduced, except in full, without written approval by EMSL. EMSL bears no responsibility for sample collection activities or analytical method limitations . The report reflects the samples as received. Results are generated from the field sampling data (sampling volumes and areas, locations, etc.) provided by the client on the Chain of Custody. Samples are within quality control criteria and met method specifications unless otherwise noted. The above analyses were performed in general compliance with Appendix E to Subpart E of 40 CFR (previously EPA 600/M4-82-020 “Interim Method”) but augmented with procedures outlined in the 1993 (”final”) version of the method. This report must not be used by the client to claim product certification, approval, or endorsement by NVLAP, NIST or any agency of the federal government. Non-friable organically bound materials present a problem matrix and therefore EMSL recommends gravimetric reduction prior to analysis . Unless requested by the client, building materials manufactured with multiple layers (i.e. linoleum, wallboard, etc.) are reported as a single sample. Estimation of uncertainty is available on request.

Samples analyzed by EMSL Analytical, Inc Smyrna, GA NVLAP Lab Code 101048-1

Initial report from: 04/22/2024 13:01:44

EMSL ANALYTICAL, INC.
LABORATORY•PRODUCTS•TRAINING

072403691

Y6WQ-WPE7-26RT

Client Information
Environmental Materials Consultants
Montgomery, AL
ENVI40

Project Overview

Client	Troy University
PO Number	4552
Project Name	Wallace Hall (1st - 3rd floors)
Project ID	MA-4552
Bill To	ENVI40
Report To Contact	Jennifer Passineau
Report To Email	jpassineau@emcinc.net
Special Instructions	Stop on Positive

Project Site

Building Type	Commercial
Address	Wallace Hall, Troy
City	
State	AL
Zip	

Testing Laboratory
Atlanta
Smyrna, GA 30080

Asbestos Bulk

HA	Sample ID	Material	Location	Date/Time Collected	Test Method	TAT	Notes
04	4552-04-04	2'x2' CT pinholes and short gouges	1st floor	Apr 19, 2024 2:17 PM	PLM EPA 600	24 Hour	
04	4552-04-05	2'x2' CT pinholes and short gouges	3rd floor	Apr 19, 2024 2:17 PM	PLM EPA 600	24 Hour	

Jennifer Passineau
Apr 19, 2024
Sampled By / Date

Jennifer Passineau
Apr 19, 2024
Relinquished By / Date

4/22/24 9:20 EM
Received (Lab) / Date

Page 1 Of 1

OrderID: 072403691

SECTION 03 5400
SELF-LEVELING CAST UNDERLAYMENTS (LATICRETE® SUPERCAP® SC500-SERIES)

PART I – GENERAL

1.01 SUMMARY

A. All self-leveling shall be done with LATICRETE SUPERCAP Underlayments or approved equal by addendum; pumpable and/or pourable, low-alkali, premium self-leveling underlayments used to finish concrete slabs, precast or cast-in-place, and/or level uneven floor surfaces. Apply them over existing concrete flooring at locations shown on plans before installing new resilient flooring system as specified. Floor covering adhesives that are suitable for concrete can be used on LATICRETE SUPERCAP Underlayments.

B. LATICRETE SUPERCAP Underlayments shall be installed using the LATICRETE SUPERCAP Mobile Blending Unit (MBU)is a high-output, computer controlled, self-contained, truck-mounted system which allows for rapid installation and keeps dusty materials outside, eliminating OSHA-regulated crystalline silica dust that would be otherwise generated from the handling of powder materials inside the building.

C. Moisture testing shall be done on floors to receive underlayment to determine if the use of a moisture vapor barrier is necessary. If determined necessary, Vapor Ban E Coating shall be applied in these areas or portions thereof by Unit Price. Refer to Unit Prices Section 01 2200 for additional requirements. The flooring manufacturer / applicator shall test the floor by their own requirements and methods at no additional cost to the owner.

1.02 SECTION INCLUDES

A. LATICRETE SUPERCAP SC500, Self-Leveling Cement Underlayments

B. LATICRETE Primer Plus

C. LATICRETE Vapor Ban E

1.03 ENVIRONMENTAL PERFORMANCE REQUIREMENTS

A. Environmental Performance Criteria: The following criteria are required for products included in this section.
   1. Refer to Division 1 for additional requirements:
      a. Adhesive products must meet or exceed the VOC limits of South Coast Air Quality Management District Rule (SCAQMD) #1168 and Bay Area Air Quality Management District (BAAQMD) Reg. 8, Rule 51.

1.04 SUBMITTALS

1) Material Safety Data Sheets for all applicable products.

B. Submit proof of warranty.

C. Submit Health Product Declarations (HPD) for each material.

D. For alternate materials, at least ten (10) days before bid date approved by architect by addendum, submit independent laboratory test results confirming compliance with specifications listed in Part 2 - Products. Gypsum underlayments will not be considered under any circumstances.

1.05 QUALITY ASSURANCE

A. Installation of LATICRETE SUPERCAP Underlayments must be by a qualified applicator using specialized mixing equipment and tools approved by the manufacturer. Contact Joseph Rizzo @ 475-228-2020, jrizzo@laticrete.com - manufacturer's representative.

B. LATICRETE SUPERCAP SC500 is to be applied at 1/8” to 3” average depth (3 – 76 mm) can be installed up to 4” depth. Consult Technical Services at +1.866.704.2247 for average depths outside of these ranges.

C. Finished floor goods may be installed as soon as 16 hours after application over SC500, subject to site conditions and type of flooring materials. Liquid membranes and coatings such as urethane cement may be installed no sooner than 7 days after aplication over SC500. Always refer to finished floor manufacturer’s recommendations regarding installation instructions, restrictions, moisture conditions and compatibility. Always test performance suitability and compatibility of finished floor systems prior to their application. Sample surfaces should be installed as a field test so as to be representative of entire surface and tested for intended use.

D. LATICRETE SUPERCAP Underlayments are cement-based product and, as with any cementitious material, slight variations in color can occur as a function of job-site conditions. Some water-marks similar to veins in stone are a natural result of a pour/spread/smooth installation process.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials in their unopened packages and protect from moisture. Protect liquids from freezing and from excessive heat. Store off the floor on dry pallets or equivalent. LATICRETE SUPERCAP SC500 materials are packaged in bulk sacks and should be used within 6 months of the date of manufacture. LATICRETE SUPERCAP SC500 is additionally packaged in 50 LB plastic bags and should be used within 1 year of the date of manufacture.

B. Use all means necessary to protect the materials of the section before, during and after installation and to protect the installed work and materials of all other trades.

1.07 SITE CONDITIONS

A. LATICRETE SUPERCAP Underlayments are cementitious materials. Observe the basic rules of concrete work. Substrate temperature should be a minimum of 40□ F (4□ C) during the application and the ambient temperature maintained at 50□–90□ F (10□–32□ C).

B. Install quickly if floor is warm and follow hot weather precautions available from LATICRETE SUPERCAP Technical Service Department or www.laticretesupercap.com. Never mix with cement or additives other than LATICRETE SUPERCAP approved products.

C. During application and curing, LATICRETE SUPERCAP Underlayments should not be exposed to rapid air movement, especially if area is heated or cooled. Air flow from HVAC systems in areas of application should be directed away from the floor during application of LATICRETE SUPERCAP Underlayments and at least 24 hours after work is completed.

1.08 PRE-INSTALLATION CONSIDERATIONS

A. Applicator must review TDS-230 - LATICRETE SUPERCAP Substrate Preparation and Primer Guide, available at www.laticretesupercap.com. Applicator must show proof of manufacturers approval. Approved applicator JEFFCO concrete contractors @ 205-345-3443

B. Review finished floor goods recommendations for substrate moisture limitations. Flooring adhesive and floor goods manufacturers may separately specify maximum allowable moisture vapor emission rates or concrete relative humidity. If the concrete slab measures above these limits than a moisture vapor control system is required. If a moisture mitigation system is required, LATICRETE Vapor Ban E must be installed on the concrete slab prior to installation of LATICRETE SUPERCAP Underlayment.
   1. Refer to Section 01 2200 Unit Prices for additional requirements.

1.09 WARRANTY

A. The Contractor warrants the work of this Section to be in accordance with the Contract Documents and free from faults and defects in materials and workmanship for a period of 10 years. The underlayment manufacturer shall provide a written ten (10) year warranty, reference LATICRETE Warranty Data Sheet LSC-DS030.10S for complete details and requirements.

PART 2 – PRODUCTS

2.01 MATERIALS MANUFACTURER

A. LATICRETE INTERNATIONAL, 1 Laticrete Park North, Bethany, CT 06524-3423 USA Toll Free (866) 704-2247 Fax (203) 393-1948 www.laticretesupercap.com

2.02 MATERIALS – BASIS OF DESIGN

A. Calcium Aluminate Based Self-Leveling Cement Underlayment: LATICRETE SUPERCAP SC500.
   1. Compressive Strength: 4200 PSI (28.9 MPa) after 28 days, tested to ASTM C1708.

B. Underlayment Primer: LATICRETE SUPERCAP Primer Plus.
   1. Acrylic Primer for all underlayments and substrate types shall be as recommended by the Underlayment manufacturer.

C. Moisture Vapor Control (Moisture Mitigation): LATICRETE Vapor Ban E
   1. Applicable Standard ASTM F3010: If required to meet this standard, minimum thickness of moisture vapor control must be 12 mils.
   2. Moisture Vapor Emission Rate (MVER) Reduction: from ≤25 lbs/1000-ft2/24hr (1415 µg/(s • m)) to below 3 lbs/1000-ft2/24hr (170 µg/(s • m)) per ASTM F1869, at 12 mils minimum thickness. Concrete Substrate Humidity: up to 100% RH / 14 pH, per ASTM F2170. VOC Content: <10 g/L, UL GREENGUARD Gold Certified.
   3. Tensile Bond Strength (to concrete substrate): 410 PSI (2.8 MPa) minimum in 7 days per ASTM C1583.

D. Water: Clean, Potable, and Cool.

2.03 MIX DESIGNS

A. LATICRETE SUPERCAP SC500 is supplied in bulk supersacks and 50 lb bags.

B. Super Sacks – Pre-condition LATICRETE SUPERCAP underlayment materials to approved application temperature, typically between 50–90°F (10–32°C). Materials for LATICERETE SUPERCAP SC500 are to be blended by qualified LATICRETE SUPERCAP Applicators with the mobile blending unit that mixes LATICRETE SUPERCAP underlayment materials onsite at street level to manufacturer specifications.
   a. Mix bulk sacked, engineered materials and water, utilizing computerized remote-controlled, self-contained mobile blending units, precisely weighing and mixing materials into a uniformly consistent, highly fluid mixture.
   b. Utilize established recipes (mix designs) programmed into computer controlled batch mixing procedure to achieve the specified fluid consistency for mobile blending unit delivery to placement areas.

C. 50 lb bags only to be used in small areas that are unfeasible or impractical for the MBU to reach – Pre-condition LATICRETE SUPERCAP SC500 to approved application temperature, between 50–90°F (10–32°C). Add the entire bag to 3.7 quarts (3.5 ℓ) to 4.5 quarts of clean, cool water and mix with a high speed drill (650 RPM). CAUTION: DO NOT OVER WATER OR OVER MIX. OVER WATERING WILL CAUSE BLEEDING OR SAND SEGREGATION. Mix

thoroughly for approximately 1 ½ – 2 minutes to obtain a uniform, lump-free consistency; scrape container's sides and remix to incorporate remaining powder. If a multiple bag mix is performed, additional mix time may be required to obtain a lump-free, uniform mix.

PART 3 – EXECUTION

3.01 GENERAL

A. Refer to LATICRETE SUPERCAP SC500, LATICRETE SUPERCAP Primer Plus, and LATICRETE VAPOR BAN E product data sheets at www.laticrete.com for current product installation instructions.

B. Concrete Slab Finishing in accordance with ACI 117 (Straight Edge Method).

C. Provide ventilation to promote curing and reduce humidity.

D. Do NOT install underlayment over moving cracks in substrate.

3.02 INSPECTION

A. Verify that installed work of other trades is complete to the point where work of this Section may properly commence.

B. Verify conformance to Field Conditions specified by this Section and to manufacturer instructions.

C. Examine the areas and conditions where the Underlayment is to be installed and notify the architect of conditions detrimental to the proper and timely completion of the work. Verify that substrate surfaces are protected from weather, wind, water and clean, dry, unfrozen, do not contain petroleum byproducts, or other compounds detrimental to underlayment material bond to substrate. Do not proceed with the work until unsatisfactory conditions are corrected to permit proper installation of the work.

D. Beginning work constitutes acceptance of site conditions and responsibility for defective installation caused by prior observable conditions.

3.03 PREPARATION

A. Substrate finishing or remedial method for cast underlayment:

SUBSTRATE PREPARATION – Refer to TDS-230 - LATICRETE Substrate Preparation and Primer Guide, available at www.laticretesupercap.com

1. Concrete:
   a. Concrete is acceptable substrates per LATICRETE SUPERCAP TDS230.
   b. New Slab: Bull Float to minimum FF15. No finishing or hard troweling is needed prior to LATICRETE SUPERCAP underlayment application.
   c. Existing Slab: Existing slab areas not receiving Vapor Ban E shall be brush blasted to ICRI CSP 1-2. Existing slab areas to receive Vapor Ban E shall be brush blasted to be mechanically profiled to ICRI CSP 3.
   d. Weak or Contaminated Surfaces: If the substrate surface is weak or contaminated, mechanically clean to ICRI CSP-3 by shot blasting, scarifying or grinding. If the substrate surface is suspected of having bond breakers core testing of the slab is recommended to confirm depth and type of contamination.
   e. Do not acid etch or use chemicals to clean the substrates.
2. Cleaning:
   a. Remove dirt, wax, sealers, curing compounds, efflorescence, and other unsuitable surface conditions not part of concrete matrix that may inhibit the underlayment bond to the surface.

b. Vacuum surfaces to pick up remaining dust and debris.
c. Where removal of existing bond breaking substances is impractical, conform to manufacturer's instructions for application of bonding agent before installation of cementitious underlayment.

3. All cracks in the subfloor shall be repaired to minimize telegraphing through the Underlayment. See Section 3.02 B.
4. Substrate temperature should be a minimum of 40 degrees F (4 degrees C) during the application and the ambient temperature maintained at 50 degrees – 90 degrees F (10 degrees – 32 degrees C).
5. LATICRETE SUPERCAP SC500 may be installed on concrete having up to 100% relative humidity (RH) per ASTM F2170, however, the finished flooring and adhesive manufacturers' guidelines must be followed (see below). Do not install LATICRETE SUPERCAP products when there is standing water or visible moisture on the slab. It is important to note that concrete slabs may be dry enough to successfully install LATICRETE SUPERCAP SC500; however, concrete slab may not be dry enough to meet moisture conditions required for finish flooring, and in that case LATICRETE Vapor Ban E may be used.
   a. Concrete slabs should be tested for appropriate moisture conditions in accordance with the finish flooring manufactures specifications prior to installing LATICRETE SUPERCAP. LATICRETE Primer Plus primer and self-leveling underlayments are not moisture mitigation systems. When a moisture mitigation system is needed use LATICRETE Vapor Ban E. Refer to Moisture Mitigation System section and DS-061.0 for more information. Refer to Section 01 2200 Unit Prices for additional requirements
6. Surface bond strength of the substrate should be no less than 100 PSI (0.7 MPa) per ASTM C1583 or ICRI Guideline No. 03739 for the application of all LATICRETE SUPERCAP SC500. Weak or contaminated surfaces must be mechanically cleaned by shot blasting, Never use chemicals to clean the substrate. If installing LATICRETE Vapor Ban E, per ASTM F3010, concrete slab to receive LATICRETE Vapor Ban E must have a tensile pull-off strength of 200 PSI (1.4 MPa) or greater when tested in accordance with ASTM C1583.
7. LATICRETE Vapor Ban E (as required): Apply to concrete substrates using squeegee and paint roller achieving a minimum thickness of 12 mils. ILATICRETE Vapor Ban E is only approved for concrete substrates.
8. Containment: Close and seal floor openings and install dams at edges of floor area to receive treatment as necessary to contain self-leveling underlayment while in plastic state.
9. Concrete Floor Flatness and Floor Levelness Benchmarks: Use a digital level device to determine elevations on a 4x4 foot grid, depending on tolerances, to establish and set self-adhering LEVEL PEGS at heights to indicate installation depths and top surface of underlayment application or other approved method.
10. Joint Preparation:
    a. Expansion and Isolation Joints: Honor through underlayment by marking with screws or similar and saw cutting after self leveling application..
    b. Static (Non-Moving) Saw Cuts and Control Joints: Fill with joint sealer under provisions of Section 03 30 00.
    c. Other Static (Non-Moving) Joints: Patch and repair using cementitious patching product.
    d. Dynamic (Active) Cracks: Bring to Architects attention for direction.
11. Priming:

a. Maintain adequate ventilation during and following primer application to promote faster drying.
   1) Insufficient drying time, low temperatures, and high humidity may result insufficient drying, poor film formation, and pinholes in surface.
   2) Do not apply at surface temperatures below 40 degrees F (4 degrees C).
b. LATICRETE Primer Plus: Dilute primer concentrate with water according to the ratios given in LATICRETE Primer Plus Data Sheet.
   1) Apply to substrates using stiff broom, roller or spray as instructed by manufacturer.
   2) Roll, spray, or broom to uniform film thickness over prepared substrate. Avoid puddling and allow surface film to become dry to touch, typically 3 - 5 hours after application. For best results, and while primer is still fresh, it should be lightly brushed to ensure a complete, uniform film has been applied.
   3) Primer also to be installed over areas applied with Vapor Ban E as per manufacturer's written instructions.

3.04 REFERENCE STANDARDS

A. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

B. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.

C. ASTM F3010 - Standard Practice for Two-Component Resin Based Membrane-Forming Moisture Mitigation Systems for Use Under Resilient Floor Coverings; 2018.

3.05 INSTALLATION OF UNDERLAYMENT

A. Install underlayment in accordance with manufacturer's instructions, and after installation of moisture vapor mitigation and underlayment primer.

B. Mixing: Measure components and mechanically mix, as recommended by the manufacturer.

C. Substrate temperature must be a minimum 40°F (4°C) during application and air temperature maintained between 50–90°F (10–32°C). Protect areas from direct sunlight and exposure to weather.

D. Pump or pour LATICRETE SUPERCAP SC500 onto substrate at an average thickness ranging between 1/8" to 3" (3–76 mm) for all surfaces may be placed onto substrate up to 4” in thickness. Wood substrates require a minimum thickness of 3/4" (19 mm). If using the LATICRETE SUPERCAP Mobile Blending Unit (MBU) for high output, zero interior dust application, the installer shall be a LATICRETE-approved applicator, qualified to operate the MBU.

E. Immediately following placement lightly smooth the surface and pour lines. When not using level pegs the use of a gauge rake will assist in controlling material depth.

F. Adequate ventilation should be provided to ensure uniform drying.

G. Do not expose LATICRETE SUPERCAP SC500 to rolling dynamic loads, such as forklifts or scissor lifts, for at least 72 hours after installation.

H. Proper application is the responsibility of the user.

I. Place underlayment before partition installation if construction schedule allows.

J. If a fine, feathered edge is desired, steel trowel the edge after initial set, but before it is completely hard.

3.06 CURING

A. Once underlayment starts to set, prohibit foot traffic until final set has been reached.

B. Air cure in accordance with manufacturer's instructions.

C. Provide continuous ventilation and adequate heat until walkable; provide mechanical ventilation if necessary.

D. Remove and replace underlayment areas that evidence lack of bond with substrate, including areas that emit a "hollow" sound when tapped.

E. Do not install floor coverings over underlayment until all conditions required by the floor covering manufacturer have been met. Floor covering manufacturer’s requirements may vary greatly.

3.07 PROTECTION

A. Protect against direct sunlight, heat, weather and wind; prevent rapid drying to avoid shrinkage and cracking during the curing process.

B. Protect underlayment from traffic as follows:
   1. Do not permit foot traffic over underlayment surfaces for 2 to 4 hours, 24 hours for trade traffic.
   2. Do not permit trade vehicle traffic for 72 hours.
   3. Standing water is to be removed by squeegee or other acceptable method daily.

3.08 FIELD QUALITY CONTROL

A. Field flow tests should be performed by contractor on site periodically to ensure mix is homogeneous and free from separation.

B. Field visits by LATICRETE SUPERCAP personnel are for the purpose of making technical recommendations only and not for supervising or providing quality control on the jobsite.

END OF SECTION 03 5400

This page intentionally left blank

SECTION 04 2000
UNIT MASONRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Concrete Block.

B. Clay Facing Brick.

C. Mortar and Grout.

D. Reinforcement and Anchorage.

E. Lintels.

1.02 RELATED REQUIREMENTS

A. Section 05 5000 - Metal Fabrications: Loose steel lintels.

B. Section 07 8401 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

C. Section 07 8400 - Firestopping: Firestopping at penetrations of fire-rated masonry and at top of fire-rated walls.

1.03 REFERENCE STANDARDS

A. TMS 402/602 - Building Code Requirements and Specification for Masonry Structures; 2016.

B. ACI 530.1/ASCE 6/TMS 602 - Specification For Masonry Structures; American Concrete Institute International; 2008.

C. ASTM A615/A615M - Standard Specification for Deformed and Plain Carbon-Steel Bars for Concrete Reinforcement; 2020.

D. ASTM C67 - Standard Test Methods for Sampling and Testing Brick and Structural Clay Tile; 2014.

E. ASTM C90 - Standard Specification for Loadbearing Concrete Masonry Units; 2014.

F. ASTM C91/C91M - Standard Specification for Masonry Cement; 2012.

G. ASTM C129 - Standard Specification for Nonloadbearing Concrete Masonry Units; 2011.

H. ASTM C140/C140M - Standard Test Methods of Sampling and Testing Concrete Masonry Units and Related Units; 2014.

I. ASTM C150/C150M - Standard Specification for Portland Cement; 2015.

J. ASTM C270 - Standard Specification for Mortar for Unit Masonry; 2014a.

K. ASTM C476 - Standard Specification for Grout for Masonry; 2010.

L. ASTM C780 - Standard Test Method for Preconstruction and Construction Evaluation of Mortars for Plain and Reinforced Unit Masonry; 2012.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data for masonry units, fabricated wire reinforcement, mortar, and masonry accessories.

C. Shop Drawings: Indicate pertinent dimensions, materials, anchorage, size and type of fasteners, and accessories for brickwork support system.

D. Manufacturer's Certificate: Certify that masonry units meet or exceed specified requirements.

E. Fire Rated Assemblies: Conform to applicable code for _____ requirements for fire rated masonry construction.

F. Special Procedure Submittals
   1. Certificates: Submit documentation, signed by manufacturers, that products in tested wall
   2. Certificates: Provide Manufacturer's written certification that components are compatible with all adjacent materials that come into contract with the materials during construction and throughout the life of the building including insulation and attached membranes.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Deliver, handle, and store masonry units by means that will prevent mechanical damage and contamination by other materials.

PART 2 PRODUCTS

2.01 CONCRETE MASONRY UNITS

A. Concrete Block: Comply with referenced standards and as follows:
   1. Size: Standard units with nominal face dimensions of 16 by 8 inches (400 by 200 mm) and nominal depths as indicated on drawings for specific locations.
   2. Special Shapes: Provide non-standard blocks configured for corners.
   3. Load-Bearing Units: ASTM C90, normal weight.
      a. Hollow block, as indicated.
      b. Exposed Faces: Manufacturer's standard color and texture where indicated.
   4. Non-Loadbearing Units: ASTM C129.
      a. Hollow block.
   5. Bullnosed CMU: Provide radiused edge exposed CMU at outside vertical corners.

2.02 MORTAR AND GROUT MATERIALS

A. Portland Cement: ASTM C150/C150M, Type I; color as required to produce approved color sample.

B. Hydrated Lime: ASTM C207, Type S.

C. Grout Aggregate: ASTM C404.

2.03 REINFORCEMENT AND ANCHORAGE

A. Manufacturers:
   1. Dur-O-Wal: www.dur-o-wal.com.
   2. Hohmann & Barnard, Inc: www.h-b.com.
   3. WIRE-BOND: www.wirebond.com/#sle.

B. Reinforcing Steel: ASTM A615/A615M Grade 60 (420) deformed billet bars.

C. Joint Reinforcement: Use ladder type joint reinforcement where vertical reinforcement is involved and truss type elsewhere, unless otherwise indicated. Size to provide not more than 1 inch (25 mm) and not less than 1/2 inch of mortar coverage from masonry face. Some coursing may not align and will need 2 parts.

D. Flexible Anchors: 2-piece anchors that permit differential movement between masonry and building frame, sized to provide not more than 1 inch (25 mm) and not less than 1/2 inch (13 mm) of mortar coverage from masonry face.
   1. Steel frame: Crimped wire anchors for welding to frame, 0.25 inch (6.3 mm) thick, with trapezoidal wire ties 0.1875 inch (4.75 mm) thick, hot dip galvanized to ASTM A 153/A 153M, Class B.

2.04 ACCESSORIES

A. Preformed Control Joints: Polyvinyl chloride material. Provide with corner and tee accessories, fused joints.
   1. Manufacturers:
      a. Dur-O-Wal: www.dur-o-wal.com.
      b. Hohmann & Barnard, Inc; _____: www.h-b.com/#sle.
      c. WIRE-BOND: www.wirebond.com/#sle.
      d. Substitutions: See Section 01 6000 - Product Requirements.

B. Joint Filler: Closed cell polyvinyl chloride; oversized 50 percent to joint width; self expanding; maximum lengths available.

C. Cleaning Solution: Non-acidic, not harmful to masonry work or adjacent materials.

2.05 MORTAR AND GROUT MIXES

A. Mortar for Unit Masonry: ASTM C270, using the Proportion Specification.
   1. Masonry below grade and in contact with earth: Type S.
   2. Exterior, loadbearing masonry: Type S.
   3. Exterior, non-loadbearing masonry: Type S.
   4. Interior, loadbearing masonry: Type S.

B. Grout: ASTM C476. Consistency required to fill completely volumes indicated for grouting; fine grout for spaces with smallest horizontal dimension of 2 inches (50 mm) or less; coarse grout for spaces with smallest horizontal dimension greater than 2 inches (50 mm). Provide 28 day compressive strength indicated on drawings.

C. Mixing: Use mechanical batch mixer and comply with referenced standards.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field conditions are acceptable and are ready to receive masonry.

B. Verify that related items provided under other sections are properly sized and located.

C. Verify that built-in items are in proper location, and ready for roughing into masonry work.

3.02 PREPARATION

A. Direct and coordinate placement of metal anchors supplied for installation under other sections.

B. Provide temporary bracing during installation of masonry work. Maintain in place until building structure provides permanent bracing.

3.03 COLD AND HOT WEATHER REQUIREMENTS

A. Maintain materials and surrounding air temperature to minimum 40 degrees F (5 degrees C) prior to, during, and 48 hours after completion of masonry work.

B. Maintain materials and surrounding air temperature to maximum 90 degrees F (32 degrees C) prior to, during, and 48 hours after completion of masonry work.

3.04 COURSING

A. Establish lines, levels, and coursing indicated. Protect from displacement.

B. Maintain masonry courses to uniform dimension. Form vertical and horizontal joints of uniform thickness.

C. Concrete Masonry Units:
   1. Bond: Running.

2. Coursing: One unit and one mortar joint to equal 8 inches (200 mm).
3. Mortar Joints: Concave.

3.05 PLACING AND BONDING

A. Lay hollow masonry units with face shell bedding on head and bed joints.

B. Buttering corners of joints or excessive furrowing of mortar joints is not permitted.

C. Remove excess mortar and mortar smears as work progresses.

D. Interlock intersections and external corners, except for units laid in stack bond.

E. Do not shift or tap masonry units after mortar has achieved initial set. Where adjustment must be made, remove mortar and replace.

F. Perform job site cutting of masonry units with proper tools to provide straight, clean, unchipped edges. Prevent broken masonry unit corners or edges.

G. Cut mortar joints flush where wall tile is scheduled or resilient base is scheduled.

H. Isolate masonry partitions from vertical structural framing members with a control joint as indicated.

I. Isolate top joint of masonry partitions from horizontal structural framing members and slabs or decks with compressible joint filler.

3.06 CAVITY MORTAR CONTROL

A. Do not permit mortar to drop or accumulate into cavity air space or to plug weep/cavity vents.

B. For cavity walls, build inner wythe ahead of outer wythe to accommodate accessories.

C. Install cavity mortar control panels continuously throughout exterior masonry cavities during construction of exterior wythe, complying with manufacturer's installation instructions. Verify that airspace width is no more than 3/8 inch (9 mm) greater than panel thickness. Install horizontally between joint reinforcement. Stagger end joints in adjacent rows. Fit to perimeter construction and penetrations without voids.

D. Install cavity mortar diverter at base of cavity and at other flashing locations as recommended by manufacturer to prevent mortar droppings from blocking weep/cavity vents.

3.07 REINFORCEMENT AND ANCHORAGE - GENERAL

A. Unless otherwise indicated on drawings or specified under specific wall type, install horizontal joint reinforcement 16 inches (400 mm) on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of opening.

C. Lap joint reinforcement ends minimum 6 inches (150 mm).

D. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Unless otherwise indicated on drawings or closer spacing is indicated under specific wall type, space anchors at maximum of 36 inches (900 mm) horizontally and 24 inches (600 mm) vertically.

E. Cut or interrupt joint reinforcement at control and expansion joints, unless otherwise indicated.

3.08 REINFORCEMENT AND ANCHORAGES - CAVITY WALL MASONRY

A. Install horizontal joint reinforcement 16 inches (400 mm) on center.

B. Place masonry joint reinforcement in first and second horizontal joints above and below openings. Extend minimum 16 inches (400 mm) each side of openings.

C. Lap joint reinforcement ends minimum 6 inches (150 mm).

D. Fasten anchors to structural framing and embed in masonry joints as masonry is laid. Space anchors at maximum of 24 inches (600 mm) horizontally and 16 inches (400 mm) vertically.

3.09 MASONRY FLASHINGS

A. Whether or not specifically indicated, install masonry flashing to divert water to exterior at all locations where downward flow of water will be interrupted.
   1. Extend flashings full width at such interruptions and at least 6 inches (152 mm), minimum, into adjacent masonry or turn up at least 8 inches (203 mm), minimum, to form watertight pan at non-masonry construction.

3.10 GROUTED COMPONENTS

A. Reinforce bond beams with 2, No. ____ (M____) bars, 1 inch (25 mm) from bottom web.

B. Lap splices minimum 24 bar diameters.

C. Support and secure reinforcing bars from displacement. Maintain position within 1/2 inch (13 mm) of dimensioned position.

D. Place and consolidate grout fill without displacing reinforcing.

E. At bearing locations, fill masonry cores with grout for a minimum 12 inches (300 mm) either side of opening.

3.11 CONTROL AND EXPANSION JOINTS

A. Do not continue horizontal joint reinforcement through control or expansion joints.

3.12 BUILT-IN WORK

A. As work progresses, install built-in metal door frames and other items to be built into the work and furnished under other sections.

B. Install built-in items plumb, level, and true to line.

C. Bed anchors of metal door and glazed frames in adjacent mortar joints. Fill frame voids solid with grout.
   1. Fill adjacent masonry cores with grout minimum 12 inches (300 mm) from framed openings.

D. Do not build into masonry construction organic materials that are subject to deterioration.

3.13 TOLERANCES

A. Maximum Variation from Alignment of Columns: 1/4 inch (6 mm).

B. Maximum Variation From Unit to Adjacent Unit: 1/16 inch (1.6 mm).

C. Maximum Variation from Plane of Wall: 1/4 inch in 10 ft (6 mm/3 m) and 1/2 inch in 20 ft (13 mm/6 m) or more.

D. Maximum Variation from Plumb: 1/4 inch (6 mm) per story non-cumulative; 1/2 inch (13 mm) in two stories or more.

E. Maximum Variation from Level Coursing: 1/8 inch in 3 ft (3 mm/m) and 1/4 inch in 10 ft (6 mm/3 m); 1/2 inch in 30 ft (13 mm/9 m).

F. Maximum Variation of Mortar Joint Thickness: Head joint, minus 1/4 inch, plus 3/8 inch (minus 6.4 mm, plus 9.5 mm).

G. Maximum Variation from Cross Sectional Thickness of Walls: 1/4 inch (6 mm).

3.14 CUTTING AND FITTING

A. Cut and fit for chases. Coordinate with other sections of work to provide correct size, shape, and location.

B. Obtain approval prior to cutting or fitting masonry work not indicated or where appearance or strength of masonry work may be impaired.

3.15 FIELD QUALITY CONTROL

A. An independent testing agency will perform field quality control tests, as specified in Section 01 4000 - Quality Requirements.

B. Clay Masonry Unit Tests: Test each variety of clay masonry in accordance with ASTM C67 requirements, sampling 5 randomly chosen units for each 50,000 installed.

C. Concrete Masonry Unit Tests: Test each variety of concrete unit masonry in accordance with ASTM C140/C140M for conformance to requirements of this specification.

D. Mortar Tests: Test each type of mortar in accordance with ASTM C780, testing with same frequency as masonry samples.

3.16 CLEANING

A. Remove excess mortar and mortar droppings.

B. Replace defective mortar. Match adjacent work.

C. Clean soiled surfaces with cleaning solution.

D. Use non-metallic tools in cleaning operations.

3.17 PROTECTION

A. Without damaging completed work, provide protective boards at exposed external corners that are subject to damage by construction activities.

END OF SECTION 04 2000

SECTION 05 4000
COLD-FORMED METAL FRAMING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Formed steel stud exterior wall and interior wall framing.

B. Exterior sheathing (gypsum sheathing) in locations where sheathing attaches to cold form framing (not on wood).

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Wood blocking and miscellaneous framing.

B. Section 07 9005 - Joint Sealers.

C. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.

1.03 REFERENCE STANDARDS

A. AISI S100-12 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2012.

B. AISI SG02-1 - North American Specification for the Design of Cold-Formed Steel Structural Members; American Iron and Steel Institute; 2001 with 2004 supplement. (replaced SG-971)

C. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.

D. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

E. ASTM C955 - Standard Specification for Load-Bearing (Transverse and Axial) Steel Studs, Runners (Tracks), and Bracing or Bridging for Screw Application of Gypsum Panel Products and Metal Plaster Bases; 2011c.

F. ASTM C1007 - Standard Specification for Installation of Load Bearing (Transverse and Axial) Steel Studs and Related Accessories; 2011a.

G. ASTM C1177/C1177M - Standard Specification for Glass Mat Gypsum Substrate for Use as Sheathing; 2013.

H. AWS D1.1/D1.1M - Structural Welding Code - Steel; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with work of other sections that is to be installed in or adjacent to the metal framing system, including but not limited to structural anchors, cladding anchors, utilities, insulation, and firestopping.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on standard framing members; describe materials and finish, product criteria, and limitations.

C. Shop Drawings: Indicate component details, framed openings, bearing, anchorage, loading, welds, and type and location of fasteners, and accessories or items required of related work.
   1. Indicate stud.
   2. Describe method for securing studs to tracks and for bolted framing connections.
   3. Provide details and calculations for factory-made framing connectors.

D. Manufacturer's Installation Instructions: Indicate special procedures, conditions requiring special attention .

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Metal Framing:
   1. Clarkwestern Dietrich Building Systems LLC: www.clarkdietrich.com.
   2. Marino; ____: www.marinoware.com/#sle.
   3. The Steel Network, Inc; _____: www.SteelNetwork.com/#sle.
   4. Substitutions: See Section 01 6000 - Product Requirements.

B. Framing Connectors and Accessories:
   1. Same manufacturer as metal framing.
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.02 FRAMING SYSTEM

A. Provide primary and secondary framing members, bridging, bracing, plates, gussets, clips, fittings, reinforcement, and fastenings as required to provide a complete framing system.

B. Deliver to site in largest practical sections.

2.03 FRAMING MATERIALS

A. Studs and Track: ASTM C955; studs formed to channel, "C", or "Sigma" shape with punched web; U-shaped track in matching nominal width and compatible height.

B. Framing Connectors: Factory-made, formed steel sheet.
   1. Material: ASTM A653/A653M SS Grade 33 and 40 (minimum), with G90/Z275 hot dipped galvanized coating for base metal thickness less than 10 gage, 0.1345 inch (3.42 mm), and factory punched holes and slots.
   2. Structural Performance: Maintain load and movement capacity required by applicable code, when evaluated in accordance with AISI S100-12.
   3. Fixed Connections: Provide non-movement connections for tie-down to foundation, floor-to-floor tie-down, roof-to-wall tie-down, joist hangers, gusset plates, and stiffeners.
   4. Rafters: Unpunched structural studs with properties indicated on drawings.

2.04 WALL SHEATHING (GYPSUM SHEATHING)

A. Sheathing: Glass mat faced gypsum; ASTM C 1177/C 1177M, square, 5/8 inch Type X fire-resistant (16 mm Type X fire-resistant). Comply with all governing authorities.

2.05 ACCESSORIES

A. Bracing, Furring, Bridging: Formed sheet steel, match stud thickness unless noted on drawings; finish to match framing components.

2.06 FASTENERS

A. Self-Drilling, Self-Tapping Screws, Bolts, Nuts and Washers: Hot dip galvanized per ASTM A153/A153M.

B. Anchorage Devices: Powder actuated.

C. Anchorage Devices: Power actuated.

D. Welding: In conformance with AWS D1.1, when noted on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify field measurements and adjust installation as required.

3.02 INSTALLATION OF STUDS

A. Install components in accordance with manufacturers' instructions and ASTM C1007 requirements.

B. Align floor and ceiling tracks; locate to wall layout. Secure in place with fasteners at maximum 24 inches (600 mm) on center. Coordinate installation of sealant with floor and ceiling tracks.

C. Construct corners using minimum of three studs. Install double studs at wall openings, door and window jambs.

D. Install load bearing studs full length in one piece. Splicing of studs is not permitted.

E. Install load bearing studs, brace, and reinforce to develop full strength and achieve design requirements.

F. Install intermediate studs above and below openings to align with wall stud spacing.

G. Attach cross studs to studs for attachment of fixtures anchored to walls.

H. Install framing between studs for attachment of mechanical and electrical items, and bridging to prevent stud rotation and buckling.

I. Touch-up field welds and damaged galvanized surfaces with primer.

3.03 WALL SHEATHING (GYPSUM SHEATHING)

A. Wall Sheathing: Secure with long dimension perpendicular to wall studs, with ends over firm bearing and staggered, using self-tapping screws.
   1. Provide steel diagonal bracing at corners.

END OF SECTION 05 4000

This page intentionally left blank

SECTION 06 1000
ROUGH CARPENTRY

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Non-structural dimension lumber framing.
B. Rough opening framing for doors, windows, and roof openings.
C. Concealed blocking for miscellaneous items.
D. Sheathing.
E. Preservative treated wood materials.
F. Fire retardant treated wood materials.
G. Toilet accessories.
H. Miscellaneous framing and sheathing.
I. Communications and electrical room mounting boards.
J. Concealed wood blocking, nailers, and supports.
K. Miscellaneous wood nailers, furring, and grounds.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.
B. Section 05 5400 - Cold Form Metal Framing
C. Section 09 2116 - Gypsum Board Assemblies: Gypsum-based sheathing.
D. Section 09 8000 - Gypsum Cement Underlayment

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.
B. ASTM A153/A153M - Standard Specification for Zinc Coating (Hot-Dip) on Iron and Steel Hardware; 2009.
C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.
D. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.
E. ASTM D2898 - Standard Practice for Accelerated Weathering of Fire-Retardant-Treated Wood for Fire Testing; 2010 (Reapproved 2024).
F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.
G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.
H. AWC (WFCM) - Wood Frame Construction Manual for One- and Two-Family Dwellings; 2015.
I. AWPA U1 - Use Category System: User Specification for Treated Wood; 2012.
J. PS 1 - Structural Plywood; 2009.
K. PS 20 - American Softwood Lumber Standard; 2010.
L. SPIB (GR) - Grading Rules; 2014.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide technical data on wood preservative materials and application instructions.

C. Structural Composite Lumber: Submit manufacturer's published structural data including span tables, marked to indicate which sizes and grades are being used; if structural composite lumber is being substituted for dimension lumber or timbers, submit grading agency structural tables marked for comparison.

D. Manufacturer's Certificate: Certify that wood products supplied for rough carpentry meet or exceed specified requirements.

E. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

1.05 DELIVERY, STORAGE, AND HANDLING

A. General: Cover wood products to protect against moisture. Support stacked products to prevent deformation and to allow air circulation.

B. Fire Retardant Treated Wood: Prevent exposure to precipitation during shipping, storage, or installation.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

PART 2 PRODUCTS

2.01 GENERAL REQUIREMENTS

A. Dimension Lumber: Comply with PS 20 and requirements of specified grading agencies.
   1. Species: Southern Pine, unless otherwise indicated.
   2. If no species is specified, provide any species graded by the agency specified; if no grading agency is specified, provide lumber graded by any grading agency meeting the specified requirements.
   3. Grading Agency: Any grading agency whose rules are approved by the Board of Review, American Lumber Standard Committee (www.alsc.org) and who provides grading service for the species and grade specified; provide lumber stamped with grade mark unless otherwise indicated.

2.02 DIMENSION LUMBER FOR CONCEALED APPLICATIONS

A. Grading Agency: Southern Pine Inspection Bureau, Inc; SPIB (GR).

B. Sizes: Nominal sizes as indicated on drawings, S4S.

C. Moisture Content: S-dry or MC19.

D. Stud Framing (2 by 2 through 2 by 6 (50 by 50 mm through 50 by 150 mm)):
   1. Species: Douglas Fir-Larch or Spruce, Pine, Fir (South)
   2. Grade: No. 2.

E. Joist, Rafter, and Small Beam Framing (2 by 6 through 4 by 16 (50 by 150 mm through 100 by 400 mm)):
   1. Species: Southern Pine.
   2. Grade: No. 2.

F. Miscellaneous Framing, Blocking, Nailers, Grounds, and Furring:

1. Lumber: S4S, No. 2 or Standard Grade.
2. Boards: Standard or No. 3.

2.03 CONSTRUCTION PANELS

A. Wall Sheathing, 3/4": Pressure Treated Plywood, PS 1, Grade C-C, Exterior Exposure.

B. Communications and Electrical Room Mounting Boards: PS 1 A-D plywood, or medium density fiberboard; 3/4 inch (19 mm) thick; flame spread index of 25 or less, smoke developed index of 450 or less, when tested in accordance with ASTM E84.

2.04 ACCESSORIES

A. Fasteners and Anchors:
1. Metal and Finish: Hot-dipped galvanized steel complying with ASTM A153/A153M for high humidity and preservative-treated wood locations, unfinished steel elsewhere. Provide proof of long term compatability with fire retardant treatment.

B. Die-Stamped Connectors: Hot dipped galvanized steel, sized to suit framing conditions. Provide proof of long term compatability with fire retardant treatment.

C. Joist Hangers: Hot dipped galvanized steel, sized to suit framing conditions.

2.05 FACTORY WOOD TREATMENT

A. Treated Lumber and Plywood: Comply with requirements of AWPA U1 - Use Category System for wood treatments determined by use categories, expected service conditions, and specific applications.
1. Fire-Retardant Treated Wood: Mark each piece of wood with producer's stamp indicating compliance with specified requirements.
2. Preservative-Treated Wood: Provide lumber and plywood marked or stamped by an ALSC-accredited testing agency, certifying level and type of treatment in accordance with AWPA standards.

B. Fire Retardant Treatment:
1. Manufacturers:
a. Arch Wood Protection, Inc; ____: www.wolmanizedwood.com/#sle.
b. Hoover Treated Wood Products, Inc; ____: www.frtw.com/#sle.
c. Koppers, Inc; ____: www.koppers.com/#sle.
2. Exterior Type: AWPA U1, Category UCFB, Commodity Specification H, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes both before and after accelerated weathering test performed in accordance with ASTM D2898.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Do not use treated wood in direct contact with the ground.
3. Interior Type A: AWPA U1, Use Category UCFA, Commodity Specification H, low temperature (low hygroscopic) type, chemically treated and pressure impregnated; capable of providing a maximum flame spread index of 25 when tested in accordance with ASTM E84, with no evidence of significant combustion when test is extended for an additional 20 minutes.
a. Kiln dry wood after treatment to a maximum moisture content of 19 percent for lumber and 15 percent for plywood.
b. Treat rough carpentry items as indicated .

c. Do not use treated wood in applications exposed to weather or where the wood may become wet.

C. Preservative Treatment:
1. Manufacturers:
a. Arch Wood Protection, Inc; ____: www.wolmanizedwood.com/#sle.
b. Viance, LLC; ____: www.treatedwood.com.
c. Osmose, Inc: www.osmose.com.
2. Preservative Pressure Treatment of Lumber Above Grade: AWPA U1, Use Category UC3B, Commodity Specification A using waterborne preservative.
a. Kiln dry lumber after treatment to maximum moisture content of 19 percent.
b. Treat lumber in contact with roofing, flashing, or waterproofing.
c. Treat lumber in contact with masonry or concrete.
d. Treat lumber less than 18 inches (450 mm) above grade.

PART 3 EXECUTION

3.01 PREPARATION

A. Where wood framing bears on cementitious foundations, install full width sill flashing continuous over top of foundation, lap ends of flashing minimum of 4 inches (100 mm) and seal.

B. Coordinate installation of rough carpentry members specified in other sections.

3.02 INSTALLATION - GENERAL

A. Select material sizes to minimize waste.

B. Reuse scrap to the greatest extent possible; clearly separate scrap for use on site as accessory components, including: shims, bracing, and blocking.

C. Where treated wood is used on interior, provide temporary ventilation during and immediately after installation sufficient to remove indoor air contaminants.

3.03 FRAMING INSTALLATION

A. Set structural members level, plumb, and true to line. Discard pieces with defects that would lower required strength or result in unacceptable appearance of exposed members.

B. Make provisions for temporary construction loads, and provide temporary bracing sufficient to maintain structure in true alignment and safe condition until completion of erection and installation of permanent bracing.

C. Install structural members full length without splices unless otherwise specifically detailed.

D. Comply with member sizes, spacing, and configurations indicated, and fastener size and spacing indicated, but not less than required by applicable codes, AWC (WFCM) Wood Frame Construction Manual, and _____.

E. Construct double joist headers at floor and ceiling openings and under wall stud partitions that are parallel to floor joists; use metal joist hangers unless otherwise detailed.

F. Provide bridging at joists in excess of 8 feet (2.3 m) span as detailed. Fit solid blocking at ends of members.

G. Frame wall openings with two or more studs at each jamb; support headers on cripple studs.

3.04 BLOCKING, NAILERS, AND SUPPORTS

A. Provide framing and blocking members as indicated or as required to support finishes, fixtures, specialty items, and trim.

B. In framed assemblies that have concealed spaces, provide solid wood fireblocking as required by applicable local code, to close concealed draft openings between floors and between top story and roof/attic space; other material acceptable to code authorities may be used in lieu of solid wood blocking.

C. In walls, provide blocking attached to studs as backing and support for wall-mounted items, unless item can be securely fastened to two or more studs or other method of support is explicitly indicated.

D. Where ceiling-mounting is indicated, provide blocking and supplementary supports above ceiling, unless other method of support is explicitly indicated.

E. Specifically, provide the following non-structural concealed framing and blocking:
   1. Cabinets and shelf supports.
   2. Wall brackets.
   3. Handrails.
   4. Grab bars.
   5. Towel and bath accessories.
   6. Wall-mounted door stops.
   7. Chalkboards and marker boards.
   8. Wall paneling and trim.
   9. Joints of rigid wall coverings that occur between studs.
   10. Interior Wall Plaques.
   11. Mirror attachment clips.
   12. Acoustical Wall Panels.
   13. Audio/Visual Equipment.
   14. Electrical Equipment/Fixtures/Panels.
   15. Mechanical.
   16. Plumbing Equipment/Fixtures.
   17. Fire Extinguisher cabinets.

3.05 ROOF-RELATED CARPENTRY

A. Coordinate installation of roofing carpentry with deck construction, framing of roof openings, and roofing assembly installation.

B. Provide wood curb at all roof openings except where prefabricated curbs are specified and where specifically indicated otherwise. Form corners by alternating lapping side members.

3.06 INSTALLATION OF CONSTRUCTION PANELS

A. Communications and Electrical Room Mounting Boards: Secure with screws to studs with edges over firm bearing; space fasteners at maximum 24 inches (610 mm) on center on all edges and into studs in field of board.
   1. At fire-rated walls, install board over wall board indicated as part of the fire-rated assembly.
   2. Where boards are indicated as full floor-to-ceiling height, install with long edge of board parallel to studs.
   3. Install adjacent boards without gaps.
   4. Size and Location: As indicated on drawings.

3.07 TOLERANCES

A. Framing Members: 1/4 inch (6 mm) from true position, maximum.

B. Variation from Plane (Other than Floors): 1/4 inch in 10 feet (2 mm/m) maximum, and 1/4 inch in 30 feet (7 mm in 10 m) maximum.

3.08 CLEANING

A. Waste Disposal: Comply with the requirements of Section 01 7419 - Construction Waste Management and Disposal.
   1. Comply with applicable regulations.
   2. Do not burn scrap on project site.
   3. Do not burn scraps that have been pressure treated.
   4. Do not send materials treated with pentachlorophenol, CCA, or ACA to co-generation facilities or “waste-to-energy” facilities.

B. Do not leave any wood, shavings, sawdust, etc. on the ground or buried in fill.

C. Prevent sawdust and wood shavings from entering the storm drainage system.

END OF SECTION 06 1000

SECTION 06 4100
ARCHITECTURAL PLASTIC LAMINATE CASEWORK

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Specially fabricated cabinet units.

B. Cabinet hardware.

C. Preparation for installing utilities.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 06 1000 - Rough Carpentry: Support framing, grounds, and concealed blocking.

C. Section 12 3600 - Countertops.

D. Section 12 3553 Wood Laboratory Casework.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. ANSI A208.2 - American National Standard for Medium Density Fiberboard for Interior Use; 2009.

C. BHMA A156.9 - American National Standard for Cabinet Hardware; Builders Hardware Manufacturers Association; 2010 (ANSI/BHMA A156.9).

D. GSA CID A-A-1936 - Adhesive, Contact, Neoprene Rubber; Federal Specifications and Standards; Revision A, 1996.

E. NEMA LD 3 - High-Pressure Decorative Laminates; National Electrical Manufacturers Association; 2005.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting not less than one week before starting work of this section; require attendance by all affected installers.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate materials, component profiles, fastening methods, jointing details, and accessories. Provide 1/2" scaled floor plans, elevations, and 1/2" scaled sections of all cabinets.
   1. Minimum Scale of Detail Drawings: 1-1/2 inch to 1 foot (1:8).

C. Samples: Submit actual samples of architectural cabinet construction, minimum 12 inches (300 mm) square, illustrating proposed cabinet, drawer, door, and shelf unit substrate and finish.

D. Samples: Submit actual sample items of proposed pulls, hinges, shelf standards, and locksets, demonstrating hardware design, quality, and all finishes and project colors. Provide as part of 1.05 C.

1.06 QUALITY ASSURANCE

A. Fabricator Qualifications: Company specializing in fabricating the products specified in this section with minimum five years of documented experience.

1. Company with at least one project in the past 3 years with value of woodwork within 20 percent of cost of woodwork for this Project.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Protect units from moisture damage.

1.08 FIELD CONDITIONS

A. During and after installation of custom cabinets, maintain temperature and humidity conditions in building spaces at same levels planned for occupancy.

B. Verify all project conditions prior to fabrication.

C. Coordinate with all trades.

PART 2 PRODUCTS

2.01 CABINETS

A. Plastic Laminate Faced Cabinets: Equal to Case System, Basis of Design. Provide custom cabinets where manufacturer's standard is not available. Substitutions per specifications.

B. Casework
1. Finish - Exposed Exterior Surfaces: Decorative laminate.
2. Finish - Exposed Interior Surfaces: Decorative laminate.
3. Finish - Concealed Surfaces: Manufacturer's Option - see para. 2.02
4. Door and Drawer Front Edge , shelves, cabinet body edge. Profiles: 3 mm thick, factory adhered PVC edging.
5. Casework Construction Type: Frameless.
6. Cabinet Design Series: As indicated on drawings.
7. Adjustable Shelf Loading: 50 lbs. per sq. ft..
   a. Deflection: L/144.
8. Cabinet Style: Flush overlay.
9. Cabinet Doors and Drawer Fronts: Flush style.
10. Drawer Construction: Provide a four sided drawer box that is made of 1/2 inch thick industrial particle board; finish same as semi exposed. Provide doweled and glued joints and 1/2 inch thick mechanically fastened bottom. Provide Plastic laminate drawer face with thermally fused 3 MM PVC edging. Blind screw front of drawer box into plastic laminate drawer face.

2.02 LAMINATE MATERIALS

A. Manufacturers:
1. Formica Corporation; ____: www.formica.com.
2. Panolam Industries International, Inc; ____: www.nevamar.com.
3. Wilsonart, LLC; ____: www.wilsonart.com.
4. Substitutions: See Section 01 6000 - Product Requirements.

B. Thermally Fused Laminate (TFL): NEMA LD 3, Type VGL laminate panels.

C. High Pressure Decorative Laminate (HPDL): NEMA LD 3, types as recommended for specific applications.

D. Provide specific types as scheduled.
1. Horizontal Surfaces unless noted otherwise: HGS, 0.048 inch (1.22 mm) nominal minimum thickness, colors as scheduled, finish as scheduled. If plastic laminate tops are

shown on the drawings, provide as a part of this section with 1-inch thick minimum MDF or partical board, .048-inch laminate top 3 mm pvc edge, .020-inch backer board.

2. Vertical Surfaces and all exposed surfaces: VGS, 0.028 inch (0.71 mm) nominal minimum thickness, colors as scheduled, finish as scheduled.
3. Cabinet Liner: CLS, 0.020 inch (0.51 mm) nominal thickness, through color, colors as scheduled, finish as scheduled.
4. Laminate Backer: BKL, 0.020 inch (0.51 mm) nominal thickness, undecorated; for application to concealed backside of panels faced with high pressure decorative laminate.

2.03 ACCESSORIES

A. Adhesive: Type recommended by fabricator to suit application.

B. Plastic Edge Banding: Extruded PVC, flat shaped; smooth finish; of width to match component thickness. Factory adhere,
   1. Color: As selected by Architect from manufacturer's standard range.
   2. Provide 3 mm at all cabinet face edges, door edges, drawer front edges, shelves edges, and any other exposed edges.

C. Bolts, Nuts, Washers, Lags, Pins, and Screws: Of size and type to suit application; galvanized or chrome-plated finish in concealed locations and stainless steel or chrome-plated finish in exposed locations.

D. Concealed Joint Fasteners: Threaded steel.

2.04 HARDWARE

A. Hardware: BHMA A156.9, types as recommended by fabricator for quality grade specified.

B. Adjustable Shelf Supports: Standard side-mounted system using multiple holes for pin supports and coordinated self rests, for nominal 1 inch (25 mm) spacing adjustments. Finish to be selected by architect from manufacturer's standard finishes.

C. Drawer and Door Pulls: "U" shaped wire pull, steel, 4 inch centers ("U" shaped wire pull, 100 mm centers). ADA compliant. Finish to be selected by architect from manufacturer's standard finishes.

D. Drawer Slides:
   1. Type: 3/4 extension , 100 lb. load graded, epoxy coated , roller bearing.
   2. Mounting: Bottom mounted.
   3. Stops: Integral type.
   4. Features: **Provide soft closing/stay closed type.**
   5. Products:
      a. Accuride International, Inc; ____: www.accuride.com.
      b. Grass America Inc; ____: www.grassusa.com.
      c. Hettich America, LP; _____: www.hettichamerica.com.
      d. Knape & Vogt Manufacturing Company; _____: www.knapeandvogt.com.
      e. Substitutions: See Section 01 6000 - Product Requirements.

E. Hinges: five knuckle -, BHMA No. __A156.9____, steel in manufacturers colors as selected by architect; 09 inches thick minimum, instutional grade. Doors over 48 inches in height shall have a minimum of three hinges, less than that height shall have two hinges (European hinges will not be accepted).

F. Magnetic door catches in number required to hold doors in closed position.

G. Pilaster standards and shelf clips for adjustable shelves. Match color of cabinet interior. Recess into cabinet sides. or contractor's option to provide injection moulded clear plastic shelf clips with a double pin engagement at 32 mm on center. Shall have 3/4 inch anti tip locking tabs,

2.05 FABRICATION

A. Assembly: Shop assemble cabinets for delivery to site in units easily handled and to permit passage through building openings.

B. Edging: Fit shelves, doors, and exposed edges with specified edging. Do not use more than one piece for any single length.

C. Fitting: When necessary to cut and fit on site, provide materials with ample allowance for cutting. Provide matching trim for scribing and site cutting.

D. Plastic Laminate: Apply plastic laminate finish in full uninterrupted sheets consistent with manufactured sizes. Fit corners and joints hairline; secure with concealed fasteners. Slightly bevel arises. Locate counter butt joints minimum 2 feet (600 mm) from sink cut-outs.
   1. Apply laminate backing sheet to reverse side of plastic laminate finished surfaces.

E. Provide cutouts for plumbing fixtures. Verify locations of cutouts from on-site dimensions. Seal cut edges.

F. The architectural casework wood contractor shall coordinate their manufacturing and installation to accomodate the plumbing, mechanical, elecrical, and countertops for all rquirements to complete the project installation to include but not limited to sinks, pipes, conduit, troughs, overflows, neutralization cartridges, traps, umbilicals, fixtures, switches, outltets, tombstone outlets, receptacles, etc. as specified and or shown on contract documents. Job verify all wall and floor conditions prior to fabrication; make adjustments per architects prior written approval.`

2.06 MANUFACTURERS/PRODUCTS:

A. Acceptable Products:
   1. Case Systems
   2. TMI Systems
   3. Cahalan Woodworks, Moody Al 205-640-2779
   4. Alco - Montgomery Al - 334-264-3938
   5. Stevens Industries
   6. Substitutions: See 01 6000 - Product Requirements

2.07 FIRE RETARDANT TREATED MATERIALS

A. Fire-Retardant-Treated Materials, General: Where fire-retardant-treated materials are indicated, use materials that are acceptable to authorities having jurisdiction and with fire-test-response characteristics specified as determined by testing indentical products per test method indicated by a qualified testing agency.
   1. Use treated materials that comply with requirements of referenced quality standard. Do not use materials that are warped, discolored, or otherwise defective.
   2. Use fire-retardant-treatment formulations that do not bleed through or otherwise adversely affect finishes. Do not use colorants to distinguish treated materials from untreated materials.
   3. Identify fire-retardant-treated materials with appropriate classification marking of qualified testing agency in the form of removable paper label or imprint on surfaces that will be concealed from view after installation.

B. Fire-Retardant-Treated Lumber and Plywood: Products with a flame-spread index of 25 or less when tested according to ASTM E84, 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.
   2. For items indicated to receive a stained or natural finish, use organic resin chemical formulation.

C. Fire-Retardant Fiberboard: MDF panels complying with ANSI A208.2, made from softwood fibers, synthetic resins, and fire-retardant chemicals mixed together at time of panel manufacture to achieve flame-spread index of 25 or less and smoke-developed index of 200 or less per ASTM.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify adequacy of backing and support framing.

B. Verify location and sizes of utility rough-in associated with work of this section.

C. Verify all existing conditions.

3.02 INSTALLATION

A. Set and secure custom cabinets in place, assuring that they are rigid, plumb, and level.

B. Use fixture attachments in concealed locations for wall mounted components.

C. Use concealed joint fasteners to align and secure adjoining cabinet units.

D. Carefully scribe casework abutting other components, with maximum gaps of 1/32 inch (1 mm). Do not use additional overlay trim for this purpose.

E. Secure cabinets to floor using appropriate angles and anchorages.

F. Countersink anchorage devices at exposed locations. Conceal with solid wood plugs of species to match surrounding wood; finish flush with surrounding surfaces.

3.03 ADJUSTING

A. Adjust installed work.

B. Adjust moving or operating parts to function smoothly and correctly.

3.04 CLEANING

A. Clean casework, counters, shelves, hardware, fittings, and fixtures.

END OF SECTION 06 4100

This page intentionally left blank

SECTION 07 2118
THERMAL INSULATION - OPEN CELL FOAMED-IN-PLACE INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Spray-in-place semi-rigid open cell ½ pound polyurethane foam insulation in various assemblies, to provide an air barrier and improved thermal resistance.

B. Ceilings: Provide a minimum R-Value of 38. Place between/over existing 2x rafters. Provide complete insulated envelope within insulated wall perimeter.

C. Refer to Drawings for additional requirements.

1.02 RELATED SECTIONS

A. Section 06 10 00 - Rough Carpentry.

B. Section 07 80 00 - Fire protection.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
1. ASTM C 423 - Standard Test Method for Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
2. ASTM C 518 - Standard Test Method for Steady-State Thermal Transmission Properties by Means of the Heat Flow Meter Apparatus.
3. ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.
4. ASTM E 96 - Standard Test Methods for Water Vapor Transmission of Materials.
5. ASTM E 283 - Standard Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen.
6. ASTM E 2178: Standard Test Method for Air Permeance of Building Materials
7. ASTM E 413 - Classification for Rating Sound Insulation.
8. ASTM D 1622 Standard Test Method for Apparent Density of Rigid Cellular Plastics
9. ASTM E 119 Standard Test Methods for Fire Tests of Building Construction and Materials
10. ASTM E 970 Standard Test Method for Critical Radiant Flux of Exposed Attic Floor Insulation Using a Radiant Heat Energy Source
11. CAN/ULC S774-09 Standard Laboratory Guide for the Determination of Volatile Organic Compound Emissions from Polyurethane Foam
12. ASTM D 1621 Standard Test Method for Compressive Properties of Rigid Cellular Plastics
13. ASTM D 1623 Standard Test Method for Tensile and Tensile Adhesion Properties of Rigid Cellular Plastics
14. ASTM D 1929 Standard Test Method for Determining Ignition Temperature of Plastics

B. National Fire Protection Association (NFPA):
1. NFPA 286 Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth
2. NFPA 285 Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Wall Assemblies Containing Combustible Components

C. International Code Council – International Residential Code:
1. Section 103.7 - Alternate Materials and Methods.
2. 2012, 2015, 2018, 2021 IRC Section R314 - Foam Plastic Insulation.

3. 2012, 2015, 2018, 2021 IRC Section R316 - Foam Plastic Insulation.
4. Section 806.4 – Unvented Attic Assemblies.

D. International Code Council – International Building Code:
1. Section 104.11 Alternative materials, design and methods of construction and equipment.
2. Section 2603 Foam Plastic Insulation.

1.04 SUBMITTALS

A. Submit under provisions of Section 013000.

B. Before commencing work, submit in accordance with local code.
1. Submit technical data sheets and samples as required by local code officials.
2. Submit the technical data sheet from the manufacturer showing the test results from the ASTM E84 (Surface Burning Characteristics).

C. Product Data: Manufacturer's data sheets on each product to be used, including:
1. Preparation instructions and recommendations.
2. Storage and handling requirements and recommendations.
3. Installation methods.

1.05 QUALITY ASSURANCE

A. Installer Qualifications:
1. Contractor performing work under this section shall be authorized by HUNTSMAN BUILDING SOLUTIONS or approved equal in the art of applying spray polyurethane foam insulation.
2. Provide current HUNTSMAN BUILDING SOLUTIONS or approved equal Authorized Contractor Certificate.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Materials shall be delivered in manufacturer’s original containers clearly labelled with manufacturer’s name, product identification, safety information, net weight of contents and expiration date.

B. Material shall be stored in a safe manner and where the temperatures are in the limits specified by the material manufacturer.

C. Empty containers shall be removed from site on a daily basis.

D. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

B. Ventilate insulation application area in accordance with the Spray Foam Coalition’s Guidance on best practices for the installation of Spray Polyurethane Foam.

C. Protect workers as recommended by the Spray Foam Coalition’s Guidance on best practices for the installation of Spray Polyurethane Foam.

D. Protect adjacent surfaces, windows, equipment and site areas from damage of overspray.

1.08 WARRANTY

A. Manufacturer's Warranty: HUNTSMAN BUILDING SOLUTIONS or approved equal, warrants spray-in-place urethane foam insulation, when installed by certified contractors using factory-trained applicators and applied in accordance with the Installation Instructions, will perform as stated in the Product Technical Data Sheet.
   1. This warranty is in effect throughout the life of the building provided the original purchaser registers with the Warranty Department of the Manufacturer within thirty days of occupancy.
   2. Manufacturer's sole responsibility under this Limited Lifetime Warranty shall be to repair or replace any defective Product at the cost of the material only.
   3. Manufacturer shall not be responsible for labor cost or any other costs whatsoever related to, or in connection with the removal or installation of either the original or replacement product.
   4. Refer to www.huntsmanbuildingsolutions.com for full warranty terms.

PART 2 PRODUCTS

2.01 ENVIRONNEMENTAL REQUIREMENTS

A. The product shall have a generic industry Environmental Product Declaration (EPD).

2.02 MANUFACTURERS

A. Acceptable Manufacturer:
   HUNTSMAN BUILDING SOLUTIONS
   3315 East Division Street, Arlington, TX 76011
   Phone No: (855) 942-7273
   Email: architect@huntsmanbuilds.com
   Web: http://www.huntsmanbuildingsolutions.com

B. Substitutions: Equivalent as judged by Architect

2.03 SPRAY FOAM INSULATION

A. Spray Applied Semi Rigid Polyurethane Foam Insulation System: Open Cell ½ pound Foam Product: *SEAL*ECTION® 500 **(Basis of Design)** or approved equal.
   1. Manufactured by HUNTSMAN BUILDING SOLUTIONS, Arlington, TX.
   2. Product Approval:
      a. International Code Council Evaluation Services Report #1172.
         1) Approved for building types I, II, III, IV, & V
      b. Passed NFPA 286 in accordance with IBC 803.2.
      c. CCMC Evaluation # 12697-R.
   3. Installation:
      a. Use on Ceiling / Underside of Roof:
         1) Up to 9-1/2 inches (241mm) between and over the joists in an attic floor. All foam surfaces must be covered by one of the following intumescent coatings:
            (a) Blazelok™ IB4: 5 dry mils (0.13mm) [9 wet mils (0.23mm)]
            (b) Andek Fireguard: 10 dry mils (0.25mm) [20 wet mils (0.51mm)]
            (c) No-Burn® Plus XD: 6 dry mils (0.15mm) [10 wet mils (0.25mm)]
   4. Physical Properties:

Density	ASTM D1622	0.45 - 0.5 lb/ft³	7.2 - 8 Kg/m³

Thermal Resistance	ASTMC518, at 1''	R-3.81	0,67
Compressive strength	ASTM D1621	0.7 psi	4.8 KPa
Tensile strength	ASTM D1623	5.6 psi	38.6 KPa
Air Permeance	ASTM E 283 3.5'' @ 75 Pa	0.001 L/s· m²	
Air Permeance	ASTM E 2178-13 3.5'' @ 50 Pa 3.5'' @ 100 Pa 3.5'' @ 300 Pa	0.001 L/s· m² 0.003 L/s· m² 0.008 L/s· m²	
VOC	CAN/ULC S774	1 day	
Spontaneous Ignition Temperature	ASTM D1929	560oC	1040oF
Water vapour permeance	ASTM E96 3.5'' 5.5'' 7'' 10''	 6.33 perms 4.03 perms 3.17 perms 2.20 perms	 362 ng/Pa s.m² 231 ng/Pa s.m² 181 ng/Pa s.m² 126 ng/Pa s.m²
Noise Reduction Coefficient (NRC)	ASTM C423	0.75	
Sound Transmission Class	ASTM E413	49 - 51	

(STC)		
Surface Burning Characteristics	ASTM E84	Class 1
Flame Spread Index	ASTM E84	21
Smoke Development	ASTM E84	216
Commercial Fire Resistance	ASTM E 119	1 hour load bearing
Commercial Fire Resistance	NFPA 285	Assembly Passed
Attic Floor Uncoated Thickness	ASTM 970	14''

5. Equipment used to apply the foam insulation shall have fixed ratio positive displacement pumps and approved by foam manufacturer.
6. Equipment used to apply the Water Based intumescing coating shall be an airless sprayer approved by the manufacturer.

2.04 ACCESSORY PRODUCTS

A. Water Based intumescing coating:
   1. Product: BLAZELOK™ IB4, Distributed by HUNTSMAN BUILDING SOLUTIONS, Manufactured by ICP Group.
   2. Product: BLAZELOK™ TBX, Distributed by HUNTSMAN BUILDING SOLUTIONS, Manufactured by ICP Group.
   3. DC 315 Distributed by HUNTSMAN BUILDING SOLUTIONS, Manufactured by International Fireproof Technology Inc.
   4. Product: No-Burn® plus XD, Manufactured by No-Burn Inc.
   5. Product: Andek Fireguard, manufactured by Andek Corporation.

B. Primers:
   1. Product: Adbond manufactured by Adfast or Thermo-Prime by HUNTSMAN BUILDING SOLUTIONS:
      a. Application: Follow manufacturer's application recommendations.
      b. Recommended for oily surfaces and galvanized steel like Z-bar, PVC, curtain walls and steel decks.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Commencement of work outlined in this section shall be deemed as acceptance of existing work and conditions.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Apply only when surfaces and environmental conditions are within limits prescribed by the material manufacturer.

C. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

D. It is recommended to install primer on oily surfaces and galvanized steel

3.03 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Apply as recommended by manufacturer to thickness as indicated on drawings.
   1. Equipment used to apply the foam insulation shall have fixed ratio positive

C. displacement pumps approved by foam manufacturer.

3.04 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Substantial Completion.

END OF SECTION 07 2118

SECTION 07 2100
THERMAL INSULATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Spray foam insulation in cavity of exterior stud walls - Refer to Section 07 2118 Spray Foam Insulation (Open Cell). and Section 07 2119 Spray Foam Insulation (Closed Cell)

B. Sound Batt insulation in cavity of interior stud walls. Refer to Partition Types.

C. Batt Insulation in cavity of Exterior stud walls, where shown. R-21

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 05 4000 - Cold-Formed Metal Framing: Board insulation as wall sheathing.

C. Section 06 1000 - Rough Carpentry: Supporting construction for batt insulation.

D. Section 07 2118 - Spray Foam Insulation - Open Cell

E. Section 07 2119 - SPRAY FOAM INSULATION: Close Cell

F. Section 07 2726 - Weather Barriers : Separate air barrier and vapor retarder materials.

G. Section 07 8401 - Firestopping: Insulation as part of fire-rated through-penetration assemblies.

H. Section 09 2116 - Gypsum Board Assemblies:

1.03 REFERENCE STANDARDS

A. ASTM C552 - Standard Specification for Cellular Glass Thermal Insulation; 2015.

B. ASTM C578 - Standard Specification for Rigid, Cellular Polystyrene Thermal Insulation; 2015a.

C. ASTM C612 - Standard Specification for Mineral Fiber Block and Board Thermal Insulation; 2014.

D. ASTM C665 - Standard Specification for Mineral-Fiber Blanket Thermal Insulation for Light Frame Construction and Manufactured Housing; 2012.

E. ASTM C1289 - Standard Specification for Faced Rigid Cellular Polyisocyanurate Thermal Insulation Board; 2014.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

G. ASTM E96/E96M - Standard Test Methods for Water Vapor Transmission of Materials; 2014.

H. ASTM E136 - Standard Test Method for Assessing Combustibility of Materials Using a Vertical Tube Furnace at 750°C; 2019a.

I. NFPA 255 - Standard Method of Test of Surface Burning Characteristics of Building Materials; National Fire Protection Association; 2006.

J. NFPA 285 - Standard Fire Test Method for Evaluation of Fire Propagation Characteristics of Exterior Non-Load-Bearing Wall Assemblies Containing Combustible Components; 2012.

K. UL 723 - Standard for Test for Surface Burning Characteristics of Building Materials; Underwriters Laboratories Inc.; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on product characteristics, performance criteria, and product limitations.

C. Manufacturer's Installation Instructions: Include information on special environmental conditions required for installation and installation techniques.

1.05 FIELD CONDITIONS

A. Do not install insulation adhesives when temperature or weather conditions are detrimental to successful installation.

PART 2 PRODUCTS

2.01 APPLICATIONS

A. Insulation in cavity of interior metal stud walls. Sound Batt insulation unfaced.

B. Insulation in cavity of exterior metal stud walls where shown, Batt Insulation R-21 unfaced.

2.02 BATT INSULATION MATERIALS

A. Sound Attenuation Batt Fiberglass Insulation for interior partitions : NFPA 101, Class A rated interior finish. Flexible preformed batt , complying with ASTM C 665; E 136, ASTM 665; Type 1, friction fit. Equal to Owens Corning, Pink Next Gen Sound Attenuation Batt (SAB). Refer to Partition types.
   1. Flame Spread Index: Less than 25, when tested in accordance with ASTM E84.
   2. Smoke Developed Index: Less than 50, when tested in accordance with ASTM E84.
   3. Combustibility: Non-combustible, when tested in accordance with ASTM E136, except for facing, if any.
   4. Facing: Unfaced.
   5. Provide in thickness as required to fill stud for **interior metal stud walls** continuous from floor to structure above unless specifically noted otherwise. Provide insulated envelope for sound isolation. Coordinate with all trades. Refer to partition types. Provide 6 1/2 inch thick batts in 6 inch stud cavities and 3 1/2 inch thick batts for 3 5/8 inch stud cavities.
   6. Provide insulation in interior wall cavaties in thickness of cavity for full height of wall.
   7. Manufacturers:
      a. CertainTeed Corporation; _____: www.certainteed.com/#sle.
      b. Johns Manville; _____: www.jm.com/#sle.
      c. Owens Corning Corp: www.owenscorning.com. **Basis of Design**, see paragraph 2.03, A.
   8. Substitutions: See Section 01 6000 - Product Requirements.

B. Fiber Glass unfaced Batt Insulation , R-21 minimum - 5 1/2" thick, for exterior metal stud wall cavities, equal to Owens Corning Pink High Density Eco-Touch. ASTM 665, Type 1 ,ASTM 136, ASTM 518, ASTM E84, ASTM E96. Refer to drawings for location. Flame spread less that 25 and smoke development less than 50.
   1. Substitutions: See Section 01 6000 - Product Requirements

2.03 ACCESSORIES

A. Wire Ties:
   1. Provide wire ties or other acceptable applications as required to hold batt insulation in place where gypsum wall board or other materials are not present at assembly. At underside of roof decking attach by methods required to secure batt insulation in place and comply with applicable UL numbers.

B. Wire Mesh: Galvanized steel, hexagonal wire mesh, acceptable if meeting all applicable UL design requirements. Refer to drawings for locations.

C. Adhesive: Type recommended by insulation manufacturer for application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate, adjacent materials, and insulation materials are dry and that substrates are ready to receive insulation.

B. Verify substrate surfaces are flat, free of honeycomb, fins, irregularities, or materials or substances that may impede adhesive bond.

3.02 BATT INSTALLATION

A. Install insulation in accordance with manufacturer's instructions for all locations specified. .

B. Trim insulation neatly to fit spaces. Insulate miscellaneous gaps and voids.

C. Install wire ties or other methods as approved to hold insulation batts in place where - refer to 2.04.

3.03 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for additional requirements.

3.04 PROTECTION

A. Do not permit installed insulation to be damaged prior to its concealment.

END OF SECTION 07 2100

This page intentionally left blank

SECTION 07 9005
JOINT SEALERS

PART 1 GENERAL

1.01 RELATED REQUIREMENTS

A. Section 07 2726 - Fluid Applied Membrane Air Barriers.

B. Division 8 - Doors, storefront and louvers

C. Section : Glazing sealants and accessories.

D. Section 09 2116 - Gypsum Board Assemblies

1.02 REFERENCE STANDARDS

A. ASTM C834 - Standard Specification for Latex Sealants; 2017.

B. ASTM C919 - Standard Practice for Use of Sealants in Acoustical Applications; 2012.

C. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

D. SCAQMD 1168 - South Coast Air Quality Management District Rule No.1168; current edition.

1.03 SUBMITTALS

A. See Section , for submittal procedures.

B. Manufacturer's Installation Instructions: Indicate .

1.04 QUALITY ASSURANCE

A. Maintain of referenced document covering installation requirements on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the Products specified in this section with minimum years experience.

C. Applicator Qualifications: Company specializing in performing the work of this section .

1.05 MOCK-UP

A. Provide mock-up of sealant joints in conjunction with under provisions of Section .

B. Refer to 01 4000 and 01 1000

1.06 FIELD CONDITIONS

A. Maintain temperature and humidity recommended by the sealant manufacturer during and after installation.

1.07 WARRANTY

A. See Section , for additional warranty requirements.

B. Correct defective work within a the specified warranty periods.
   1. Unless noted otherwise, provide manufacturer's standard 10 year material warranty.
   2. Provide additional manufacturer's warranties listed for specific products.

C. Provide General Contractor's Project Joint Sealant Warranty at the back of this specification section. Warranty to be signed by the Joint Sealant Contractor and General Contractor.

D. Warranty: Include coverage for installed sealants and accessories which fail to achieve airtight seal, exhibit loss of adhesion or cohesion, or do not cure.

E. Refer to sealant types for additional warranty requirements.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Silicone Sealants:
   1. Dow Corning: www.dowcorning.com
   2. Pecora Corporation: www.pecora.com.
   3. Tremco: www.tremcosealants.com

B. Polyurethane Sealants:
   1. Pecora; www.pecora.com
   2. Sonneborn; www.chemrex.com
   3. Tremco; www.tremcosealants.com

C. Acrylic Emulsion Latex Sealants:
   1. Pecora Corporation: www.pecora.com.
   2. Sonneborn; www.chemrex.com
   3. Tremco; www.tremcosealants.com

2.02 SEALANTS

A. Sealants and Primers - General: Provide only products having lower volatile organic compound (VOC) content than required by South Coast Air Quality Management District Rule No.1168.

B. Type I - General Purpose Exterior Sealant: Silicone ; ASTM C 920, Grade NS, Class 25, Uses M ; single component, ultra low-mod.
   1. Color: To be selected by Architect from manufacturer's full range.
   2. Product:
      a. Dow 790
      b. Pecora 890
      c. Tremco Spectrem-1
   3. Applications: Use for:
      a. Vertical and horizontal construction joints between masonry/concrete/stone to masonry/concrete/stone.
   4. Warranties: In addition to manufacturer's standard product warranties, Provide manufacturer's 20 year Non-Staining and 20 year Structural Adhesion limited warranties. Provide manufacturer's compatibility testing as required.

C. Type II - General Purpose Exterior Sealant: Silicone ; ASTM C 920, Grade NS, Class 25, Uses M, G, and A; single component, structural
   1. Color: To be selected by Architect from manufacturer's range.
   2. Product;
      a. Dow 795
      b. Pecora 895
      c. Tremco Spectrum -2
   3. Applications: Use for:
      a. All other vertical and horizontal construction joints not listed in sealant type I & III.
   4. Warranties: In addition to manufacturer's standard product warranties, Provide manufacturer's 20 year Non-Staining and 20 year Structural Adhesion limited warranties. Provide manufacturer's compatibility testing as required.

D. Exterior Expansion Joint Sealer: Precompressed foam sealer; urethane with water-repellent;
   1. Color: Black
   2. Product: Equal to Backerseal by Emseal
   3. Size as required to provide seal when installed.

4. Applications: Use for:
    a. Exterior wall expansion joints used in conjunction with Dow 790

E. Type IV - General Purpose Interior Sealant: Acrylic emulsion latex; ASTM C 834, Type S, single component, paintable.
1. Color: To be selected by Architect from manufacturer's standard range.
2. Product:
    a. Pecora AC-20
    b. Tremco Tremflex 834
    c. Sonneborn Sonolac
3. Applications: Use for:
    a. Interior wall and ceiling control joints.
    b. Other interior joints for which no other type of sealant is indicated.

F. Type V - General Purpose Interior Sealant: Medium Modulas silicone sealant
1. Color: To be selected by Architect from manufacturer's range.
2. Products:
    a. Dow 795
    b. Percora 895
    c. Tremco Spectrem-2
3. Applications: Use for:
    a. Joints between aluminum door and window frames and adjacent wall surfaces.

G. Bathtub/Tile Sealant: White silicone; ASTM C920, Uses M and A; single component, mildew resistant.
1. Product:
    a. Dow 786
    b. Tremco Tremsil 200
    c. Pecora 898
2. Applications: Use for:
    a. Joints between plumbing fixtures and floor and wall surfaces.
    b. Joints between kitchen and bath countertops and wall surfaces.

H. Type VII - Interior Floor Joint Sealant: Polyurethane, self-leveling; ASTM C 920, Grade P, Class 25, Uses T, M and A; multi- component, type M
1. Color: To be selected by Architect from manufacturer's range.
2. Product:
    a. Tremco THC 900/901
    b. Pecora NR-200
    c. Sonneborn- SL-2
3. Applications: Use for:
    a. Expansion joints in floors.
    b. .

I. Type VIII - Concrete Joint Sealant: Polyurethane; ASTM C 920, Class 25, Uses T, and M; multi- component (type M), Grade NS vertical and horizontal
1. Color:
2. Product:
    a. Sonneborn NP-2
    b. Pecora Dynatrol-II
    c. Tremco Dymeric 240 FC
3. Applications: Use for:

a. Joints in sidewalks and curb and gutters
b. Joints in concrete walls

2.03 ACCESSORIES

A. Primer: Non-staining type, recommended by sealant manufacturer to suit application, and compatible with joint substrates.

B. Joint Cleaner: Non-corrosive and non-staining type, recommended by sealant manufacturer; compatible with joint forming materials.

C. Sealant Backer Rod: Bi- Cellular Polyolefin foam rod equal to SOF ROD/ Nomaco and or Open cell Polyurethane foam equal to Foam Pak II/Nomaco. All backer rods shall be as recommended by sealant manufacture for specific use. Provide size and shape of rod to control joint depth, break bond at the bottom of joint, form optimum shape of bead on back side, and minimize the possibility of extrusion when joint is compressed.

D. Joint Backing: Round foam rod compatible with sealant; oversized 25 percent larger than joint width.

E. Tooling Agent: Agent recommended by material manufacturer to ensure contact of material with inner joint faces.

F. Bond Breaker: Pressure sensitive tape recommended by sealant manufacturer to suit application. Provide self adhering tape where applicable.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that are ready to receive work.

B. Verify that joint backing and release tapes are compatible with sealant.

3.02 PREPARATION

A. Remove loose materials and foreign matter that could impair adhesion of sealant.

B. Clean and prime joints in accordance with manufacturer's instructions.

C. Perform preparation in accordance with manufacturer's instructions and ASTM C1193.

D. Protect elements surrounding the work of this section from damage or disfigurement.

3.03 INSTALLATION

A. Perform work in accordance with sealant manufacturer's requirements for preparation of surfaces and material installation instructions.

B. Perform installation in accordance with ASTM C1193.

C. Measure joint dimensions and size joint backers to achieve width-to-depth ratio, neck dimension, and surface bond area as recommended by manufacturer.

D. Install bond breaker where joint backing is not used.

E. Install sealant free of air pockets, foreign embedded matter, ridges, and sags.

F. Apply sealant within recommended application temperature ranges. Consult manufacturer when sealant cannot be applied within these temperature ranges.

G. Tool joints .

H. Precompressed Foam Sealant: Do not stretch; avoid joints except at corners, ends, and intersections; install with face below adjoining surface.

3.04 CLEANING

A. Clean adjacent soiled surfaces.

3.05 PROTECTION

A. Protect sealants until cured.

PROJECT JOINT SEALANT WARRANTY

PROJECT :_____

LOCATION:_____

OWNER :_____

WATERPROOFING CONTRACTOR_____

ADDRESS_____

DATE OF ACCEPTANCE _____ **DATE OF EXPIRATION**_____

The Joint Sealant Contractor and General Contractor do hereby certify that the above and underground work included in this contract was installed in strict accordance with all requirements of the plans and specifications and in accordance with approved joint sealants manufacturers' recommendations.

The Joint Sealant Contractor and General Contractor do hereby guarantee the joint sealants and associated work including but not limited to all above and underground vertical and horizontal joint sealants to be water tight and free from all leaks, due to faulty or defective materials and workmanship for a period of ten (10) years (unless noted 20 years in specification), starting on the date of substantial completion of the project.

Subject to the terms and conditions listed below, the Joint Sealants Contractor and General Contractor also guarantee that during the guarantee period he will, at his own cost and expense, make or cause to be made such repairs to, or replacements of said work, in accordance with the joint sealant manufacturers recommendations as are necessary to correct faulty and defective work and/or materials which may develop in the work including. Anticipated life of the joint sealant systems and the best standards applicable to the particular joint sealant type in value and in accordance with construction documents as are necessary to maintain said work in watertight conditions, and further, to respond on or within seven (7) calendar days upon proper notification of leaks or defects by the Owner.

During the guarantee period, if the Owner allows alteration of the work by anyone other the Joint Sealant Contractor or General Contractor, including cutting, patching and maintenance in connection with penetrations, and positioning of anything affected by, this guarantee shall become null and void upon the date of said alterations.

Future building additions will not void this guarantee, except for that portion of the future addition that might affect the work under this contract at the point of connection of the joint sealant areas, and any damage caused by such addition. If this contract is for joint sealant of an addition to an existing building, then this guarantee covers the work involved at the point of connection with the existing.

The Owner shall promptly notify the Joint Sealant Contractor or General Contractor of observed, known or suspected leaks, defects or deterioration, and shall afford reasonable opportunity for the Joint Sealant Contractor or General Contractor to inspect the work, and to examine the evidence of such leaks, defects or deterioration.

IN WITNESS THEREOF,

THIS INSTRUMENT HAS BEEN DULY EXECUTED THIS _____ DAY OF _____(YEAR).

_____	_____
GENERAL CONTRACTOR'S AUTHORIZED SIGNATURE	**JOINT SEALANT CONTRACTOR'S AUTHORIZED SIGNATURE**
_____	_____
TYPED NAME AND TITLE	**TYPED NAME AND TITLE**

_____

Notary Public

END OF SECTION 07 9005

SECTION 08 1113
HOLLOW METAL DOORS AND FRAMES

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section Includes:
   1. Standard and hollow metal door frames.

B. Related Sections:
   1. Division 08 Section “Flush Wood Doors”.
   2. Division 08 Section "Door Hardware".
   3. Division 09 Section "Interior Painting" for field painting hollow metal door frames.

C. Codes and References: Comply with the version year adopted by the Authority Having Jurisdiction.
   1. ANSI/SDI A250.8 - Recommended Specifications for Standard Steel Doors and Frames.
   2. ANSI/SDI A250.4 - Test Procedure and Acceptance Criteria for Physical Endurance for Steel Doors, Frames, Frames Anchors and Hardware Reinforcing.
   3. ANSI/SDI A250.6 - Recommended Practice for Hardware Reinforcing on Standard Steel Doors and Frames.
   4. ANSI/SDI A250.10 - Test Procedure and Acceptance Criteria for Prime Painted Steel Surfaces for Steel Doors and Frames.
   5. ANSI/SDI A250.11 - Recommended Erection Instructions for Steel Frames.
   6. ANSI/SDI A250.13 - Testing and Rating of Severe Windstorm Resistant Components for Swing Door Assemblies.
   7. ASTM A1008 - Standard Specification for Steel Sheet, Cold-Rolled, Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   8. ASTM A653 - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process.
   9. ASTM A924 - Standard Specification for General Requirements for Steel Sheet, Metallic-Coated by the Hot-Dip Process.
   10. ASTM C 1363 - Standard Test Method for Thermal Performance of Building Assemblies by Means of a Hot Box Apparatus.
   11. ANSI/BHMA A156.115 - Hardware Preparation in Steel Doors and Frames.
   12. ANSI/SDI 122 - Installation and Troubleshooting Guide for Standard Steel Doors and Frames.
   13. ANSI/NFPA 105: Standard for the Installation of Smoke Door Assemblies.
   14. TAS-201-94 - Impact Test Procedures.

1.03 SUBMITTALS

A. Product Data: For each type of product indicated. Include construction details, material descriptions, core descriptions, hardware reinforcements, profiles, anchors, fire-resistance rating, and finishes.

B. Door hardware supplier is to furnish templates, template reference number and/or physical hardware to the steel door and frame supplier in order to prepare the doors and frames to receive the finish hardware items.

C. 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 anchorages, joints, field splices, and connections.
   6. Details of accessories.
   7. Details of moldings, removable stops, and glazing.
   8. Details of conduit and preparations for power, signal, and control systems.

D. Samples for Verification:
   1. Samples are only required by request of the architect and for manufacturers that are not current members of the Steel Door Institute.

1.04 QUALITY ASSURANCE

A. Source Limitations: Obtain hollow metal doors and frames through one source from a single manufacturer wherever possible.

B. Quality Standard: In addition to requirements specified, comply with ANSI/SDI A250.8, latest edition, "Recommended Specifications for Standard Steel Doors and Frames".

1.05 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 non-vented plastic.

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. Door and frames to be stacked in a vertical upright position.

1.06 PROJECT CONDITIONS

A. Field Measurements: Verify actual dimensions of openings and wall thickness by field measurements before fabrication.

1.07 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.

1.08 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.

B. Warranty includes installation and finishing that may be required due to repair or replacement of defective doors.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. CECO Door Products.
2. Curries Company.
3. Steelcraft.
4. Mesker

2.02 MATERIALS

A. Cold-Rolled Steel Sheet: ASTM A 1008/A 1008M, Commercial Steel (CS), Type B; suitable for exposed applications.

B. Metallic-Coated Steel Sheet: ASTM A 653/A 653M, Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

C. Frame Anchors: ASTM A 653/A 653M, Commercial Steel (CS), Commercial Steel (CS), Type B; with minimum G60 (Z180) or A60 (ZF180) metallic coating.

2.03 STANDARD HOLLOW METAL FRAMES

A. General: Comply with ANSI/SDI A250.8 and with details indicated for type and profile.

B. Interior Frames: Fabricated from cold-rolled steel sheet that complies with ASTM A 1008/A 1008M.
   1. Fabricate frames with mitered or coped corners.
   2. Fabricate frames, with the exception of slip-on drywall types, with "closed and tight" miter seams continuously welded on face, finished smooth with no visible seam unless otherwise indicated.
   3. Frames for Steel Doors: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.
   4. Frames for openings up to 48 inches in width: Minimum 16 gauge (0.053-inch -1.3-mm) thick steel sheet.]
   5. Frames for openings 48 inches and wider in width: Minimum 14 gauge (0.067-inch -1.7-mm) thick steel sheet.]
   6. Frames for Wood Doors: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
   7. Frames for Borrowed Lights: Minimum 16 gauge (0.053-inch-1.3-mm-) thick steel sheet.
   8. Manufacturers Basis of Design:
      a. CECO Door Products BU Serries (Drywall Profile).
      b. Curries Company CM Series (Drywall Profile).

C. Hardware Reinforcement: Fabricate according to ANSI/SDI A250.6 Table 4 with reinforcement plates from same material as frames.

2.04 FRAME ANCHORS

A. Jamb Anchors:
   1. Masonry Type: Adjustable strap-and-stirrup or T-shaped anchors to suit frame size, formed from A60 metallic coated material, 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 and not less than 0.042 inch thick.
   3. Compression Type for Drywall Slip-on (Knock-Down) Frames: Adjustable compression anchors.
   4. Windstorm Opening Anchors: Types as tested and required for indicated wall types to meet specified wind load design criteria.

B. Floor Anchors: Floor anchors to be provided at each jamb, formed from A60 metallic coated material, not less than 0.042 inches thick.

C. Mortar Guards: Formed from same material as frames, not less than 0.016 inches thick.

2.05 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. When shipping limitations so dictate, frames for large openings are to be fabricated in sections for splicing or splining in the field by others.

B. Tolerances: Fabricate hollow metal work to tolerances indicated in ANSI/SDI A250.8.

C. Hollow Metal Frames:
   1. Shipping Limitations: 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.
   2. Welded Frames: Weld flush face joints continuously; grind, fill, dress, and make smooth, flush, and invisible.
      a. Welded frames are to be provided with two steel spreaders temporarily attached to the bottom of both jambs to serve as a brace during shipping and handling. Spreader bars are for bracing only and are not to be used to size the frame opening.
   3. Sidelight and Transom Bar Frames: Provide closed tubular members with no visible face seams or joints, fabricated from same material as door frame. Fasten members at crossings and to jambs by butt welding.
   4. High Frequency Hinge Reinforcement: Provide high frequency hinge reinforcements at door openings 48-inches and wider with mortise butt type hinges at top hinge locations.
   5. Continuous Hinge Reinforcement: Provide welded continuous 12 gauge straps for continuous hinges specified in hardware sets in Division 08 Section "Door Hardware".
   6. Provide countersunk, flat- or oval-head exposed screws and bolts for exposed fasteners unless otherwise indicated for removable stops, provide security screws at exterior locations.
   7. Mortar Guards: Provide guard boxes at back of hardware mortises in frames at all hinges and strike preps regardless of grouting requirements.
   8. Floor Anchors: Weld anchors to bottom of jambs and mullions with at least four spot welds per anchor.
   9. Jamb Anchors: Provide number and spacing of anchors as follows:
      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.

c. Severe Storm Shelter Openings: Provide jamb, head, and sill anchors in accordance with manufacturer's tested and approved assemblies.

10. Door Silencers: Except on weatherstripped or gasketed doors, drill stops to receive door silencers. Silencers to be supplied by frame manufacturer regardless if specified in Division 08 Section "Door Hardware".

D. Hardware Preparation: Factory prepare hollow metal work to receive template 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 ANSI/SDI A250.8.
2. Reinforce doors and frames to receive non-template, mortised and surface mounted door hardware.
3. Comply with applicable requirements in ANSI/SDI A250.6 and ANSI/DHI A115 Series specifications for preparation of hollow metal work for hardware.
4. Coordinate locations of conduit and wiring boxes for electrical connections with Division 26 Sections.

2.06 STEEL FINISHES

A. Prime Finishes: frames to be cleaned, and chemically treated to insure maximum finish paint adhesion. Surfaces of the door and frame exposed to view to receive a factory applied coat of rust inhibiting shop primer.
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; and compatible with substrate and field-applied coatings.

PART 3 EXECUTION

3.01 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. General Contractor to verify the accuracy of dimensions given to the steel door and frame manufacturer for existing openings or existing frames (strike height, hinge spacing, hinge back set, etc.).

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.02 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.

C. Tolerances shall comply with SDI-117 "Manufacturing Tolerances Standard Steel Doors and Frames."

D. Drill and tap doors and frames to receive non-template, mortised, and surface-mounted door hardware.

3.03 INSTALLATION

A. General: Install hollow metal work plumb, rigid, properly aligned, and securely fastened in place; comply with Drawings and manufacturer's written instructions.

B. Hollow Metal Frames: Install hollow metal frames of size and profile indicated. Comply with ANSI/SDI A250.11 and NFPA 80 at fire rated openings.
   1. Set frames accurately in position, plumbed, aligned, and braced securely until permanent anchors are set. After wall construction is complete and frames properly set and secured, remove temporary braces, leaving surfaces smooth and undamaged. Shim as necessary to comply with installation tolerances.
   2. Floor Anchors: Provide floor anchors for each jamb and mullion that extends to floor, and secure with post-installed expansion anchors.
   3. Masonry Walls: Coordinate installation of frames to allow for solidly filling space between frames and masonry with mortar.
   4. Grout Requirements: Do not grout head of frames unless reinforcing has been installed in head of frame. Do not grout vertical or horizontal closed mullion members.

C. Hollow Metal Doors: Fit hollow metal doors accurately in frames, within clearances specified below. Shim as necessary.
   1. Non-Fire-Rated Standard Steel Doors:
      a. Jambs and Head: 1/8 inch plus or minus 1/16 inch.
      b. Between Edges of Pairs of Doors: 1/8 inch plus or minus 1/16 inch.
      c. Between Bottom of Door and Top of Threshold: Maximum 3/8 inch.
      d. Between Bottom of Door and Top of Finish Floor (No Threshold): Maximum 3/4 inch.
   2. Fire-Rated Doors: Install doors with clearances according to NFPA 80.

D. Field Glazing: Comply with installation requirements in Division 08 Section "Glazing" and with hollow metal manufacturer's written instructions.

3.04 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 and Painted Finish Touchup: Immediately after erection, sand smooth rusted or damaged areas of prime coat, or painted finishes, and apply touchup of compatible air drying, rust-inhibitive primer, zinc rich primer (exterior and galvanized openings) or finish paint.

END OF SECTION 08 1113

SECTION 08 1416
FLUSH WOOD DOORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Flush wood doors; flush configuration; non-rated and factory finished.

B. Transom panels.

1.02 RELATED REQUIREMENTS

A. Section 08 1113 - Hollow Metal Doors and Frames.

B. Section 08 7100 - Door Hardware

C. Section 09 7000 Architectural Finishes: refinish existing doors to remain. See door schedule and 01 2300 Alternates

1.03 REFERENCE STANDARDS

A. ANSI A135.4 - American National Standard for Basic Hardboard; 2012.

B. AWI (QCP) - Quality Certification Program; current edition at www.awiqcp.org.

C. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

D. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

E. ICC (IBC) - International Building Code 2015.

F. LMA (VPS) - Voluntary Product Standards and Typical Physical Properties of Decorative Overlays; Composite Panel Association; 2004.

G. NEMA LD 3 - High-Pressure Decorative Laminates; 2005.

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

I. UBC Std 7-2, Part II - Test Standard for Smoke- and Draft-control Assemblies; International Conference of Building Officials; 1997.

J. UL (BMD) - Building Materials Directory; Underwriters Laboratories Inc.; current edition.

K. WDMA I.S. 1A - Interior Architectural Wood Flush Doors; 2013.

L. WI (CCP) - Certified Compliance Program (CCP); current edition at www.woodworkinstitute.com/certification.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Indicate door core materials and construction; edge construction, and trim for openings.

C. Shop Drawings: Show doors and frames, elevations, sizes, types, swings, undercuts, beveling, blocking for hardware, factory machining, factory finishing, cutouts for glazing and other details.

D. Specimen warranty.

E. Samples: Submit two samples of door finish, 12 by 12 inch (____ by ____ mm) in size illustrating wood grain, stain color, and sheen.

F. Manufacturer's Installation Instructions: Indicate special installation instructions.

G. Warranty, executed in Owner's name.

1.05 QUALITY ASSURANCE

A. Maintain one copy of the specified door quality standard on site for review during installation and finishing.

B. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section, with not less than three years of documented experience.
   1. Accredited participant in the specified certification program prior to the commencement of fabrication and throughout the duration of the project.

C. Quality Certification: Comply with AWI (QCP) woodwork association quality certification service/program in accordance with requirements for work specified in this section.
   1. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

D. Source Limitations: Obtain flush wood doors from single manufacturer.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package, deliver and store doors in accordance with specified quality standard.

B. Accept doors on site in manufacturer's packaging. Inspect for damage.

C. Protect doors with resilient packaging sealed with heat shrunk plastic. Do not store in damp or wet areas; or in areas where sunlight might bleach veneer. Seal top and bottom edges with tinted sealer if stored more than one week. Break seal on site to permit ventilation.

D. 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.

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Interior Doors: Provide manufacturer's warranty for the life of the installation.

C. Include coverage for delamination of veneer, warping beyond specified installation tolerances, defective materials, and telegraphing core construction.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Graham Wood Doors: www.grahamdoors.com.

B. Eggers Industries; ____: www.eggersindustries.com/#sle.

C. Ampco Products, Inc.

D. Marshfield

E. Algoma

F. VT Industries
   1. DOORS AND PANELS
      a. Doors: Refer to drawings for locations and additional requirements.
         1) Quality Standard: Custom Grade, Heavy Duty performance, in accordance with WDMA I.S. 1A.
         2) Exposed Vertical and Top Edges: Hardwood edges for finishing to match faces.
      b. Interior Doors: 1-3/4 inches (44 mm) thick unless otherwise indicated; flush construction.

1) Provide solid core Medium Density Overlay doors at all locations. Opaque finish noted on Finish Schedule.

2. DOOR AND PANEL CORES
   a. Non-Rated Solid Core: Type particleboard core (PC), plies and faces as indicated.
      1) Particleboard: ANSI A208.1, Grade LD-1.
      2) Blocking: Provide wood blocking in particleboard-core doors as needed to eliminate through-bolting hardware as follows:
         (a) 5-inch (125-mm) top-rail blocking, in doors indicated to have closers.
         (b) 5-inch (125-mm) bottom-rail blocking, in exterior doors and doors indicated to have kick, mop, or armor plates.
         (c) 5-inch (125-mm) midrail blocking, in doors indicated to have exit devices.
      3) Provide doors with either glued-wood-stave or structural-composite-lumber cores instead of particleboard cores for doors indicated to receive exit devices.
   b. Fire Rated Doors: Mineral core, Type FD, plies and faces as indicated above; with core blocking as required to provide adequate anchorage of hardware without through-bolting.
      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. Provide stiles with concealed intumescent seals. Comply with specified requirements for exposed edges.
      3) Pairs: Provide formed-steel edges and astragals with intumescent seals.
         (a) Finish steel edges and astragals with baked enamel same color as doors.
   c. Sound-Rated Doors: Equivalent to type, with particleboard core (PC) construction as required to achieve **STC rating as shown on door schedule**; plies and faces as indicated above.
3. DOOR FACINGS
   a. Veneer Facing for Opaque Finish: Medium density overlay (MDO), in compliance with indicated quality standard.
   b. Facing Adhesive: Type I - waterproof.
4. DOOR CONSTRUCTION
   a. Fabricate doors in accordance with door quality standard specified.
   b. Where supplementary protective edge trim is required, install trim after veneer facing has been applied full-width.
   c. Factory machine doors for hardware other than surface-mounted hardware, in accordance with hardware requirements and dimensions.
   d. Factory fit doors for frame opening dimensions identified on shop drawings, with edge clearances in accordance with specified quality standard.
      1) Exception: Doors to be field finished.
   e. Provide edge clearances in accordance with the quality standard specified.
   f. Openings: Cut and trim openings through doors in factory.
5. FACTORY FINISHING - WOOD DOORS
   a. Finish work in accordance with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS), Section 5 - Finishing for grade specified and as follows:
      1) Opaque:
         (a) System - 1, Lacquer, Nitrocellulose.
         (b) Color: As selected by Architect. Refer to finish schedule.

(c) Sheen: Flat.

b. Finish work in accordance with WDMA I.S. 1A for grade specified and as follows:
c. Factory finish doors in accordance with Refer to Finish Schedule for opaque finish.
d. Seal door top and bedges with color sealer to match door facing.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that opening sizes and tolerances are acceptable.

C. Do not install doors in frame openings that are not plumb or are out-of-tolerance for size or alignment.

3.02 INSTALLATION

A. Install doors in accordance with manufacturer's instructions and specified quality standard.
1. Install fire-rated doors in accordance with NFPA 80 requirements.

B. Factory-Finished Doors: Do not field cut or trim; if fit or clearance is not correct, replace door.

C. Coordinate installation of doors with installation of frames and hardware.

D. Hardware: For installation, see Division 8 Section "Door Hardware", coordinate with all electrical requirements of door hardware and security equipment.

3.03 TOLERANCES

A. Conform to specified quality standard for fit and clearance tolerances.

B. Conform to specified quality standard for telegraphing, warp, and squareness.

3.04 ADJUSTING

A. Adjust doors for smooth and balanced door movement.

B. Adjust closers for full closure.

C. Operation: Rehang or replace doors that do not swing or operate freely.

D. 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.

3.05 SCHEDULE

A. Refer to Door and Frame Schedule appended to this section.

B. Refer to Finish Schedule for color.

END OF SECTION 08 1416

SECTION 08 4113
FIRE-RATED ALUMINUM FRAMED ENTRANCES AND STOREFRONTS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.

D. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

E. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

F. ASTM F588 - Standard Test Methods for Measuring the Forced Entry Resistance of Window Assemblies, Excluding Glazing Impact; 2014.

G. ASTM F2248 - Standard Practice for Specifying an Equivalent 3-Second Duration Design Loading for Blast Resistant Glazing Fabricated with Laminated Glass; 2012.

H. NFPA 80 - Standard for Fire Doors and Other Opening Protectives; 2016.

I. NFPA 252 - Standard Methods of Fire Tests of Door Assemblies; 2012.

J. NFPA 257 - Standard on Fire Test for Window and Glass Block Assemblies; 2012.

K. NFRC 100 - Procedure for Determining Fenestration Product U-factors; 2014.

L. NFRC 200 - Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence; 2014.

M. UFC 4-010-01 - DoD Minimum Antiterrorism Standards for Buildings; 2012.

N. UL 9 - Standard for Fire Tests of Window Assemblies; Current Edition, Including All Revisions.

O. UL 10B - Standard for Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

P. UL 10C - Standard for Positive Pressure Fire Tests of Door Assemblies; Current Edition, Including All Revisions.

Q. UL 263 - Standard for Fire Tests of Building Construction and Materials; Current Edition, Including All Revisions.

R. UL 752 - Standard for Bullet-Resisting Equipment; Current Edition, Including All Revisions.

1.02 SUMMARY

A. Section Includes: Fire resistive framing system.
   1. GPX® Architectural Series Framing fire resistive, temperature rise, framing system with aluminum or decorative cladding for 45-120 minute interior applications.

B. Applications of fire rated framing includes:
   1. Vision lites in fire rated doors, full vision fire rated doors, sidelites, borrowed lites, transoms and transparent walls with fire rating requirement as specified.

1.03 RELATED SECTIONS

A. Section 08 8000: Glazing

B. Section 08 8814: Fire-Rated Glazing
C. Section 08 11 13: Hollow Metal Doors and Frames
D. Section 08 4313: Aluminum Doors and Frames
E. Section 08 12 16.13: Fire-Rated Aluminum Frames
F. Section 08 43 13: Fire-Rated Aluminum Storefronts
G. Section 08 7100: Door Hardware
H. Section 08 8813: Fire Rated Glazing - 60 minute

1.04 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM E119 Methods for Fire Tests of Building Construction and Materials.
   2. ASTM E152 Methods of Fire Tests of Door Assemblies.
   3. ASTM E163 Methods for Fire Tests of Window Assemblies.
   4. ASTM E2074: Standard Test Method for Fire Tests of Door Assemblies, including Positive Pressure Testing of Side-hinged and Pivoted Swinging Door Assemblies.

B. ASTM E2110-1: Standard Test for Positive Pressure of Fire Tests of Window Assemblies.
   1. ASTM E283-04: Test Method for Determining Rate of Air Leakage Through Exterior Windows, Curtain Walls and Doors.
   2. ASTM 547-00: Test Method for Water Penetration of Exterior Windows, Curtain Walls and Doors by Cyclic Static Air Pressure Difference.
   3. ASTM E331-00: Standard Test Method for Metal Curtain Walls and Doors by Uniform Static Air Pressure Difference.
   4. ASTM E330-02: Structural Performance of Exterior Windows, Curtain Walls, and Doors by Uniform Static Air Pressure Difference.

C. ASTM F 588-04: Test Method for Resistance of Window Assemblies to Forced Entry Excluding Glazing.

D. National Fire Protection Association (NFPA):
   1. NFPA 80: Fire Doors and Windows.
   2. NFPA 251: Fire Tests of Building Construction and Materials.
   3. NFPA 252: Fire Tests of Door Assemblies.
   4. NFPA 257: Fire Tests of Window Assemblies.

E. Underwriters Laboratories, Inc. (UL):
   1. UL 9: Standard for Safety of Fire Tests of Window Assemblies.
   2. UL 10B: Standard for Safety of Fire Tests of Door Assemblies.

F. UL 10C: Standard for Safety of Positive Pressure Fire Tests of Door Assemblies.
   1. UL 263: Fire Tests of Building Construction and Materials.
   2. UL 752-2005: Standard for Safety for Bullet-Resisting Equipment.

G. Standard Council of Canada (ULC):
   1. ULC Standard CAN4-S101: Fire Tests of Building Construction and Materials.
   2. ULC Standard CAN4-S104: Fire Tests of Door Assemblies.
   3. ULC Standard CAN4-S106: Fire Tests of Window Assemblies.

H. Consumer Product Safety Commission (CPSC):
   1. CPSC 16 CFR 1201: Safety Standard for Architectural Glazing Materials.

I. American National Standards Institute (ANSI):
   1. ANSI Z97.1: Safety Glazing Materials Used in Buildings - Safety Performance Specifications and Methods of Test.

J. Glass Association of North America (GANA)
   1. GANA – Glazing Manual.
   2. FGMA – Sealant Manual.

K. National Fenestration Rating Council (NFRC)
   1. NFRC 100: Procedure for Determining Fenestration Product U-Factors.
   2. NFRC 200: Procedure for Determining Fenestration Product Solar Heat Gain Coefficient and Visible Transmittance at Normal Incidence.

L. American Recovery and Reinvestment Act
   1. Section 1605, Title XVI Buy American Provision]

M. IBC 2018

1.05 SYSTEM DESCRIPTION

A. Performance Requirements:
   1. Fire Rating: must meet 60, 90 or 120 minutes as specified see door schedule.
   2. Fire Resistive Wall Assembly Certifications: must meet 60-120 minute fire resistive wall assemblies tested in accordance with ASTM E119, NFPA 251, UL 263 and ULC-S101.
   3. Fire Resistive, Temperature Rise Door Assembly Certifications: must meet 60-90 minute fire resistive temperature rise door assemblies tested in accordance with NFPA 252, UL 10B, UL 10C and CAN4 S104. Must meet 250 degrees F/450 degrees F temperature rise door requirements.
   4. Uniform Load Deflection Test Pressure: up to +/- 50.0 psf
   5. Uniform Load Structural Test Pressure: up to +/- 75.0 psf
   6. Forced Entry Resistance: must meet ASTM F588 Type D
   7. FIRST's NFRC CMAST document for examples of simulations based on available glazing materials in the NFRC CMAST database.
   8. Testing Laboratory: Fire test must be conducted by a nationally recognized independent testing laboratory.
   9. Glazing: Fire resistive glazing in 60-90 minute fire resistance doors and openings up to the maximum size tested. Fire resistive glazing that meets ASTM E-119/UL 263/ULC- S101 up to the max. size tested. All glazing used in doors, sidelites or any hazardous location must meet CPSC Cat. I or II impact safety.
   10. Max. Door Opening Sizes: must meet up to 4'0" wide x 9'0" high for single doors and 8'0" wide by 9'0" high in pair doors. No intermediate rails required.

B. Listings and Labels:
   1. Fire resistive, temperature rise framing system shall be under current follow-up service by a nationally recognized independent laboratory approved by OSHA and maintain a current listing or certification. Assemblies shall be labeled in accordance with limits of listings.

C. Appearance:
   1. Fire rated wall/door assembly shall have a neat finished appearance with minimum joints at decorative cover intersections.

1.06 SUBMITTALS

A. Submit listed submittals in accordance with Conditions of the Contract and Division 1 Submittal Procedure Section.

B. Shop Drawings: Submit shop drawings showing layout, profiles and product components.
   1. Samples: Submit samples for finishes, colors and textures.

C. Technical Information: Submit latest edition of manufacturer's product data providing product descriptions, technical data and installation instructions.

1.07 DELIVERY, STORAGE AND HANDLING

A. General: Comply with Division1 Product Requirements Sections.

B. Ordering: Comply with manufacturer's ordering instructions and lead-time requirements to avoid construction delays.

C. Delivery: Deliver materials to specified destinations in manufacturer's or distributor's packaging undamaged, complete with installation instructions.

D. Storage and Protection: Store off ground, under cover, protected from weather and construction activities and at temperature conditions recommended by manufacturer.

1.08 FABRICATION DIMENSIONS

A. Field Measurements: Verify actual measurements for openings by field measurements before fabrication. Show recorded measurements on shop drawings. Coordinate field measurements and fabrication schedule with construction progress to avoid construction delays.

1.09 WARRANTY

A. Project Warranty: Refer to Conditions of the Contract for project warranty provisions.

B. Manufacturer's Warranty: Submit, for Owner's acceptance, manufacturer's standard warranty document. Manufacturer's warranty is not intended to limit other rights that the Owner may have under the Contract Documents.
   1. Warranty Period: 5-year limited warranty from date of substantial completion.

PART 2 PRODUCTS

2.01 MANUFACTURERS – FIRE RATED (DOOR) (OPENING) (WALL ASSEMBLY)

A. Manufacturer of Framing System: GPX Architectural Series Framing as manufactured and distributed by SAFTI FIRST® Fire Rated Glazing Solutions.
   1. Contact: 100 N Hill Drive, Suite 12, Brisbane, CA 94005; Telephone 888.653. 3333; email info@safti.co; Web site www.safti.com - basis of design.

B. Manufacturer of Glazing Material: SuperLite® II-XL as manufactured and distributed by SAFTI FIRST® Fire Rated Glazing Solutions.
   1. Type FRG-1 - 60 Minute Glazing
   2. Contact: 100 N Hill Drive, Suite 12, Brisbane, CA 94005; Telephone 888.653. 3333; Fax 888.653.4444; email info@safti.co; Web site www.safti.com

C. Fire rated glass and framing must be provided by a single-source, US manufacturer. Distributors of fire rated glass and framing are not to be considered as manufacturers. Materials for the project should be shipped together in the same shipment on the same truck.

D. Substitutions: No substitutions allowed.

2.02 MATERIALS – FRAMING

A. Fire resistive, temperature rise framing system rated for 60 to 120 minutes.

Properties:
   1. Window/Wall Frame thickness: 2-1/2" Standard. 3", 4-1/8" and 5" also available. Door profile thickness: 5" Standard.

2. Fire resistive aluminum door capable of accommodating concealed hardware.
3. Internal framing: Internal tube steel framing shall conform to ASTM A501. Formed steel retainers shall be galvanized conforming to ASTM A527.
4. Insulation: The framing system shall insulate against the effects of fire, smoke and heat transfer from either side. The perimeter of the framing system to the rough opening shall be firmly packed with mineral wool fire stop insulation or appropriately rated intumescent sealant.
5. Fasteners: Type recommended by manufacturer. No exposed fasteners allowed.
6. Glazing accessories: The glazing material perimeter shall be separated from the perimeter framing system with approved flame retardant glazing tape. The SuperLite® glazing panel shall be caulked continuously around the edge to the tube steel frame utilizing neutral cure silicone. Silicone setting blocks recommended.
7. SAFTI FIRST listing allows for doors by others.

2.03 MATERIALS – GLASS

A. Assemblies shall be glazed with SuperLite® glazing products. If assembly is required to meet ASTM E 119/UL 263/ULC-S101, SuperLite® II-XL will be used.

B. Properties:
1. Individual Lites shall be permanently identified with a listing mark.
2. Glazing material installed in “Hazardous Locations” (subject to human impact) shall be certified to meet the applicable requirements for fire rated assemblies referenced in ANSI Z97.1 Standard for Safety Glazing Materials Used In Buildings and/or CPSC 16 CFR 1201 Safety Standard for Architectural Glazing Materials.
3. Temperature rise on the unexposed side of glazing material shall be limited to 250 degrees Fahrenheit when required.
4. Visible Transmittance: Varies by glazing type. Must meet:

SuperLite ® II-XL 60 Starphire®	0.877
SuperLite ® II-XL 90 Starphire®	0.875
SuperLite ® II-XL 120 Starphire®	0.878

5. STC/OITC rating: Varies by glazing type. Must meet:

SuperLite® II-XL 60 & SuperLite® II-XL 60 Starphire®	STC 43/OITC 39
SuperLite® II-XL 90 & SuperLite® II-XL 90 Starphire®	STC 44/OITC 40
SuperLite® II-XL 120 & SuperLite® II-XL 120 Starphire®	STC 44/OITC 40

6. Pressure glazing is acceptable.

C. Logo: Each piece of fire rated glazing shall be labeled with a permanent logo.

2.04 FABRICATION

A. Assemblies shall be furnished [knocked down for field assembly and will be glazed in the field] [assembled (should configurations and job site conditions allow)][unitized (should configurations and job site conditions allow)] .

B. Door assemblies shall be factory prepared for field mounting of hardware.

C. Fabrication Dimensions: Fabricate to approved dimensions. The general contractor shall guarantee dimensions within required tolerance. Obtain approved shop drawings prior to fabrication.

2.05 FINISHES

A. Comply with NAAMM's "Metal Finishes Manual for Architectural and Metal Products" for recommendations for applying and designing finishes.

B. Covers shall be chemically cleaned and pretreated; then, finished with:
   1. High Performance Coraflon Fluoropolymer Finish by PPG®. Solid color to be selected from SAFTI's Standard Color Chart. Mica, XL, Gloss & Exotics are available at an additional charge.

C. Protect finishes on exposed surfaces from damage by applying strippable, temporary protective covering before shipping.

D. Variations in appearance of abutting or adjacent pieces are acceptable. Noticeable variations in the same piece are not acceptable.

2.06 DOOR HARDWARE FOR SINGLE AND PAIRED DOORS

A. Hardware shall be supplied with the fire door. Hardware selection shall be from door manufacturer's standard recommended hardware groups as specified below. Please call manufacturer for custom hardware.

B. Standard operating hardware for single and pair doors.

QUANTITY	ITEM	DESCRIPTION	MANUFACTURER	FINISH
1	HINGES	HEAVY-DUTY CONTINUOUS GEARED OKC	PEMKO	ANODIZED
1	PANIC DEVICE	MODERN TOUCHBAR WITH SURFACE VERTICAL RODS	VON DUPRIN 9827F W/ 996 L-TRIM	US26D
1	CLOSING DEVICE	HEAVY-DUTY SURFACE APPLIED CLOSER	LCN 4040XP	ALUMINUM
1	AUTO DOOR BOTTOMS	420APKL	PEMKO	

PART 3 EXECUTION

3.01 MANUFACTURER'S INSTRUCTIONS

A. Compliance: Comply with manufacturer's product data including product technical bulletins and installation instructions.

3.02 EXAMINATION

A. Site Verification of Conditions: Verify substrate conditions, have been previously installed under other sections, and are acceptable for product installation in accordance with manufacturer's instructions. Openings shall be plumb, square and within allowable tolerances. The

Architect/Engineer shall be notified of any conditions that jeopardize the integrity of the proposed fire wall/door framing system. Do not proceed until such conditions are corrected.

3.03 INSTALLATION

A. Fire wall/door installation shall be by a licensed contractor and in strict accordance with the approved shop drawings.

3.04 CLEANING AND PROTECTION

A. Protect glass from contact with contaminating substances resulting from construction operations. Remove such substances by method approved by manufacturer.

B. Wash glass on both faces not more than four days prior to date schedule for inspections intended to establish date of Substantial Completion. Wash glass by method recommended by glass manufacturer.

C. Remove temporary coverings and protection of adjacent work areas.

D. Remove construction debris from project site and legally dispose of debris.

This page intentionally left blank

SECTION 08 4313
ALUMINUM-FRAMED STOREFRONTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Aluminum-framed storefront, with vision glass.

B. Aluminum doors and frames.

C. Weatherstripping.

1.02 RELATED REQUIREMENTS

A. Division 3 - Tilt up Concrete and Concrete

B. Section 05 5000 - Metal Fabrications: Steel attachment devices.

C. Section 07 2726: Fluid applied membrane air barriers.

D. Section 07 6200 - Sheet Metal Flashing and Trim

E. Section 08 7100 - Door Hardware

F. Section 07 9005 - Joint Sealers

G. Section 08 8000 - Glazing: Glass and glazing accessories.

H. Section 08 2953 - 08 2954 - 08 2955 Mullion Mate, see index

I. Section 08 8733 - Decorative Films

1.03 REFERENCE STANDARDS

A. AAMA 501.2 - Quality Assurance and Diagnostic Water Leakage Field Check of Installed Storefronts, Curtain Walls, and Sloped Glazing Systems; 2015.

B. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

C. AAMA 612 - Voluntary Specification, Performance Requirements, and Test Procedures for Combined Coatings of Anodic Oxide and Transparent Organic Coatings on Architectural Aluminum; 2017a.

D. AAMA 1503 - Voluntary Test Method for Thermal Transmittance and Condensation Resistance of Windows, Doors and Glazed Wall Sections; 2009.

E. AAMA 2604 - Voluntary Specification, Performance Requirements and Test Procedures for High Performance Organic Coatings on Aluminum Extrusions and Panels; 2013.

F. AAMA 2605 - Voluntary Specification, Performance Requirements and Test Procedures for Superior Performing Organic Coatings on Aluminum Extrusions and Panels; 2013.

G. AAMA CW-10 - Care and Handling of Architectural Aluminum from Shop to Site; 2015.

H. ASCE 7 - Minimum Design Loads for Buildings and Other Structures; 2010, with 2013 Supplements and Errata.

I. ASTM B209 - Standard Specification for Aluminum and Aluminum-Alloy Sheet and Plate; 2014.

J. ASTM E283 - Standard Test Method for Determining the Rate of Air Leakage Through Exterior Windows, Curtain Walls, and Doors Under Specified Pressure Differences Across the Specimen; 2004 (Reapproved 2012).

K. ASTM E330/E330M - Standard Test Method for Structural Performance of Exterior Windows, Doors, Skylights and Curtain Walls by Uniform Static Air Pressure Difference; 2014.

L. ASTM E331 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Uniform Static Air Pressure Difference; 2000 (Reapproved 2009).

M. ASTM E547 - Standard Test Method for Water Penetration of Exterior Windows, Skylights, Doors, and Curtain Walls by Cyclic Static Air Pressure Difference; 2000 (Reapproved 2016).

N. ASTM E1105 - Standard Test Method for Field Determination of Water Penetration of Installed Exterior Windows, Skylights, Doors, and Curtain Walls, by Uniform or Cyclic Static Air Pressure Difference; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate with installation of other components that comprise the exterior enclosure.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide component dimensions, describe components within assembly, anchorage and fasteners, glass and infill, internal drainage details and _____.

C. Shop Drawings: Indicate system dimensions, framed opening requirements and tolerances, affected related Work, expansion and contraction joint location and details, and field welding required.

D. Samples: Submit two samples 12" x 12" inches (__ mm) in size illustrating finished aluminum surface, glass, infill panels, glazing materials. Provide jamb and head closures and high performance sill and end dams.

E. Manufacturer's Certificate: Certify that the products supplied meet or exceed the specified requirements.

F. Mock Up: Include a portion of the storefront system in the project mock up.

G. Warranty: Submit manufacturer warranty and ensure forms have been completed in Owner's name and registered with manufacturer.

1.06 MOCK UP

A. Construct a portion of the full size storefront assembly as a mock-up panel sized to illustrate assembly construction, flashings, end dams, sills, and sealants; mock up may be used as final product if accepted by architect. Head, Jamb, and Sill sealant joints to be as recomended by manufacturer and approved by architect, and Harun Biswas, owner's representative.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in performing work of type specified and with at least three years of documented experience.

B. Comply with Zone 3, Ashrae Standard 90.7 (2013) Table 5.5.3 U Factor .50 Maximum, SHGC .25 Minimum

C. Rating of Fenestration Products
   1. The U-factor, SHGC, and air leakage rate for all manufactured fenestration products shall be determined by a laboratory accredited by a nationally recognized accreditation organization, such as the National Fenestration Rating Council.

D. Labeling of Fenestration Products
   1. All manufactured fenestration products shall have a permanent nameplate, installed by the manufacturer, listing the U-factor, SHGC, and air leakage rate.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Handle products of this section in accordance with AAMA CW-10.

B. Protect finished aluminum surfaces with wrapping. Do not use adhesive papers or sprayed coatings that bond to aluminum when exposed to sunlight or weather.

1.09 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a 10 year period after Date of Substantial Completion.

C. Provide 10 year manufacturer warranty against excessive degradation of exterior finish. Include provision for replacement of units with excessive fading, chalking, or flaking.

PART 2 PRODUCTS

2.01 BASIS OF DESIGN -- FRAMING FOR INSULATING GLAZING

A. Front-Set Style, Thermally-Broken: Exterior.
   1. Basis of Design: Kawneer Trifab VersaGlaze 601UT Framing System or Approved Equal.
   2. Mullion Dimensions: 2" sightline x 6" depth

B. Center-Set Style, Not Thermally-Broken (Interior):
   1. Basis of Design: Kawneer Trifab VersaGlaze 450 Framing System or Approved Equal.

C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:
   1. YKK AP America Inc; _____: www.ykkap.com/#sle.
   2. Oldcastle Building Envelope.

D. Substitutions: See Section 01 6000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

2.02 BASIS OF DESIGN -- SWINGING DOORS

A. Wide Stile, Non-Insulated Glazing: Non-Thermally-Broken (Interior):
   1. Basis of Design: Kawneer 500 Standard Entrance or Approved Equal.
   2. Thickness: 1-3/4 inches (43 mm)
   3. Bottom Rail: 10 inches.

B. Wide Stile, Insulating Glazing, (Exterior):
   1. Basis of Design: Kawneer 500 Entrance or Approved Equal.
   2. Thickness: 1-3/4 inches (43 mm).
   3. Bottom Rail: 10 inches.

C. Other Manufacturers: Provide either the product identified as "Basis of Design" or an equivalent product of one of the manufacturers listed below:

D. Substitutions: See Section 01 6000 - Product Requirements.
   1. For any product not identified as "Basis of Design", submit information as specified for substitutions.

E. Provide Mullion Mate Series 40 or equal. Profiles at junctions between walls and window mulls. Match storefront finish. Provide Mullion Mate end cap and verify size.

2.03 APPLICATION SCHEDULE

A. Provide thermally broken systems at all exterior applications.

B. Provide non-thermally broken systems at all interior applications.

2.04 STOREFRONT

A. Aluminum-Framed Storefront: Factory fabricated, factory finished aluminum framing members with infill, and related flashings, anchorage and attachment devices.
   1. Finish: AAMA 2605 Fluoropolymer Coating. PVDF
      a. Factory finish all surfaces that will be exposed in completed assemblies.
      b. Touch-up surfaces cut during fabrication so that no natural aluminum is visible in completed assemblies, including joint edges.
   2. Finish Color: As selected by Architect from Manufacturer's full color range.
   3. Fabrication: Joints and corners flush, hairline, and weatherproof, accurately fitted and secured; prepared to receive anchors and hardware; fasteners and attachments concealed from view; reinforced as required for imposed loads.
   4. Construction: Eliminate noises caused by wind and thermal movement, prevent vibration harmonics, and prevent "stack effect" in internal spaces.
   5. System Internal Drainage: Drain to the exterior by means of a weep drainage network any water entering joints, condensation occurring in glazing channel, and migrating moisture occurring within system.
   6. Expansion/Contraction: Provide for expansion and contraction within system components caused by cycling temperature range of 170 degrees F (95 degrees C) over a 12 hour period without causing detrimental effect to system components, anchorages, and other building elements.
   7. Movement: Allow for movement between storefront and adjacent construction, without damage to components or deterioration of seals.
   8. Perimeter Clearance: Minimize space between framing members and adjacent construction while allowing expected movement.

B. Performance Requirements:
   1. Wind Loads: Design and size components to withstand the specified load requirements without damage or permanent set, when tested in accordance with ASTM E330/E330M, using loads 1.5 times the design wind loads and 10 second duration of maximum load.
      a. Design Wind Loads: Comply with requirements of ASCE 7.
      b. Member Deflection: Limit member deflection to flexure limit of glass in any direction, with full recovery of glazing materials.
   2. Water Penetration Resistance: No uncontrolled water on interior face, when tested in accordance with ASTM E331 at pressure differential of 8 psf (390 Pa).
   3. Air Leakage: Maximum of 0.06 cu ft/min sq ft (0.3 L/sec sq m) of wall area, when tested in accordance with ASTM E283 at 6.27 psf (300 Pa) pressure differential across assembly.
   4. Overall U-value Including Glazing for Thermally Broken Application: 0.46 Btu/(hr sq ft deg F) (_____ Btu/(hr sq ft deg F)), maximum.

2.05 COMPONENTS

A. Aluminum Framing Members: Tubular aluminum sectionsthermally broken where indicated, drainage holes and internal weep drainage system.
   1. Glazing Stops: Flush.

B. Glazing: As specified in Section 08 8000.

C. Exterior Sill: Provide high performance flashing sill equal to Kawneer 451T037 with manufacturers recommended weep holes, provide sealed manufacturers end dams. Provide weeps as recommended by the manufacturer.

D. Exterior Jamb and Head back side manufacturer's aluminum closure components.

E. Aluminum Sheet Metal: PVDF finish, .040 inch thick, match color of storefront.

2.06 MATERIALS

A. Extruded Aluminum: ASTM B221 (ASTM B221M).

B. Fasteners: Stainless steel.

C. Sill Flashing Sealant: Elastomeric, silicone compatible with flashing material.

D. Glazing Gaskets: Type to suit application to achieve weather, moisture, and air infiltration requirements.

E. Glazing Accessories: As specified in Section 08 8000.

2.07 ACCESSORIES

A. **Provide . 040 inch thick PVDF finished aluminum Sheet Metal per SMACA to match Storefront, match storefront color as approved by architect. Consult with architect prior to installation.**

2.08 FINISHES

A. Superior Performing Organic Coatings System: 2605 -Polyvinylidene fluoride (PVDF) multi-coat superior performing organic coatings system complying with AAMA 2605, including at least 70 percent PVDF resin, and at least 80 percent of aluminum extrusion and panels surfaces having minimum total dry film thickness (DFT) of 1.2 mils, 0.0012 inch (0.030 mm).
   1. Manufacturers:
      a. PPG Metal Coatings; Duranar: www.ppgmetalcoatings.com/#sle.
      b. Sherwin-Williams Company; SHER-NAR 5000: oem.sherwin-williams.com/#sle.
      c. Valspar; Fluropon: www.valsparcoilextrusion.com/#sle.
      d. _____.

B. Color: As selected by Architect from manufacturer's standard range..

C. Touch-Up Materials: As recommended by coating manufacturer for field application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify dimensions, tolerances, and method of attachment with other work.

B. Verify that wall openings and adjoining air and vapor seal materials are ready to receive work of this section.

3.02 INSTALLATION

A. Install wall system in accordance with manufacturer's instructions.

B. Attach to structure to permit sufficient adjustment to accommodate construction tolerances and other irregularities.

C. Provide alignment attachments and shims to permanently fasten system to building structure.

D. Align assembly plumb and level, free of warp or twist. Maintain assembly dimensional tolerances, aligning with adjacent work.

E. Provide thermal isolation where components penetrate or disrupt building insulation.

F. Install sill flashings. Turn up ends and edges; seal to adjacent work to form water tight dam. Place end dams in full bed of sealant.

G. Where fasteners penetrate sill flashings, make watertight by seating and sealing fastener heads to sill flashing.

H. Pack fibrous insulation in shim spaces at perimeter of assembly to maintain continuity of thermal barrier.

I. Jambs and Head shall be installed with a continuous aluminum filler (vinyl acceptable)

J. Install all vertical mullions per manufacturers' instruction and cap each vertical in full bed of sealant.

K. Install all horizontal to vertical intersections (except sills) with water deflectors per manufacturers' instructions.

L. Touch-up minor damage to factory applied finish; replace components that cannot be satisfactorily repaired.

M. Install Aluminum Break Metal per SMACNA.

3.03 TOLERANCES

A. Maximum Variation from Plumb: 0.06 inches every 3 ft (1.5 mm/m) non-cumulative or 1/16 inches per 10 ft (1.5 mm/3 m), whichever is less.

B. Maximum Misalignment of Two Adjoining Members Abutting in Plane: 1/32 inch (0.8 mm).

3.04 FIELD QUALITY CONTROL

A. See Section 01 4000 - Quality Requirements, for independent testing and inspection requirements. Inspection will monitor quality of installation and glazing.

B. Test installed storefront for water leakage in accordance with AAMA 501.2 hose test.

C. Test installed storefront for water penetration in accordance with ASTM E1105 with a uniform test pressure difference of 2.86 lbf/sq ft (140 Pa).

3.05 CLEANING

A. Remove protective material from pre-finished aluminum surfaces.

B. Wash down surfaces with a solution of mild detergent in warm water, applied with soft, clean wiping cloths. Take care to remove dirt from corners. Wipe surfaces clean.

3.06 PROTECTION

A. Protect installed products from damage until Date of Substantial Completion.

END OF SECTION 08 4313

SECTION 08 7100
DOOR HARDWARE

PART 1 GENERAL

1.01 SUMMARY:

A. Section Includes: Finish Hardware for door openings, except as otherwise specified herein.
   1. Door hardware for aluminum storefront doors.
   2. Door hardware for wood doors.
   3. Door hardware for other doors indicated.
   4. Keyed cylinders as indicated - existing cores to remain unless noted otherwise.

B. Related Sections:
   1. Division 06: Rough Carpentry.
   2. Division 08: Aluminum Doors and Frames
   3. Division 08: Hollow Metal Doors and Frames.
   4. Division 08: Wood Doors.

C. References: Comply with applicable requirements of the following standards. Where these standards conflict with other specific requirements, the most restrictive shall govern.
   1. Builders Hardware Manufacturing Association (BHMA)
   2. NFPA 101 Life Safety Code
   3. NFPA 80 – Standard for Fire Doors and Other Opening Protectives
   4. ANSI-A156.xx- Various Performance Standards for Finish Hardware
   5. UL10C – Positive Pressure Fire Test of Door Assemblies
   6. ANSI-A117.1 – Accessible and Usable Buildings and Facilities
   7. DHI /ANSI A115.IG – Installation Guide for Doors and Hardware
   8. ICC - IBC – International Building Code 2012

D. Intent of Hardware Groups
   1. Should items of hardware not definitely specified be required for completion of the Work, furnish such items of type and quality comparable to adjacent hardware and appropriate for service required.
   2. Where items of hardware are not definitely or correctly specified, but are required for completion of the Work, a written statement of such omission, error, or other discrepancy must be submitted to Architect prior to date specified for receipt of bids for clarification by addendum. Otherwise, furnish such items in the type and quality established by this specification, and appropriate to the service intended.

E. Alternates
   1. Refer to Division 01 for Alternates and procedures.

1.02 SUBSTITUTIONS:

A. Comply with Division 01.

1.03 SUBMITTALS:

A. Comply with Division 01.

B. Special Submittal Requirements: Combine submittals of this Section with Sections listed below to ensure the "design intent" of the system/assembly is understood and can be reviewed together.

C. Product Data: Manufacturer's specifications and technical data including the following:
   1. Detailed specification of construction and fabrication.

2. Manufacturer's installation instructions.
3. Wiring diagrams for each electric product specified. Coordinate voltage with electrical before submitting.
4. Submit 6 copies of catalog cuts with hardware schedule.
5. Provide 9001-Quality Management and 14001-Environmental Management for products listed in Materials Section 2.2

D. Shop Drawings - Hardware Schedule: Submit 6 complete reproducible copy of detailed hardware schedule in a vertical format.
1. List groups and suffixes in proper sequence.
2. Completely describe door and list architectural door number.
3. Manufacturer, product name, and catalog number.
4. Function, type, and style.
5. Size and finish of each item.
6. Mounting heights.
7. Explanation of abbreviations and symbols used within schedule.
8. Detailed wiring diagrams, specially developed for each opening, indicating all electric hardware, security equipment and access control equipment, and door and frame rough-ins required for specific opening.

E. Templates: Submit templates and "reviewed Hardware Schedule" to door and frame supplier and others as applicable to enable proper and accurate sizing and locations of cutouts and reinforcing.
1. Templates, wiring diagrams and "reviewed Hardware Schedule" of electrical terms to electrical for coordination and verification of voltages and locations.

F. Samples: (If requested by the Architect)
1. 1 sample of Lever and Rose/Escutcheon design, (pair).
2. 3 samples of metal finishes

G. Contract Closeout Submittals: Comply with Division 01 including specific requirements indicated.
1. Operating and maintenance manuals: Submit 3 sets containing the following.
a. Complete information in care, maintenance, and adjustment, and data on repair and replacement parts, and information on preservation of finishes.
b. Catalog pages for each product.
c. Name, address, and phone number of local representative for each manufacturer.
d. Parts list for each product.
2. Copy of final hardware schedule, edited to reflect, "As installed".
3. Copy of final keying schedule
4. As installed “Wiring Diagrams” for each piece of hardware connected to power, both low voltage and 110 volts.
5. One set of special tools required for maintenance and adjustment of hardware, including changing of cylinders.

1.04 QUALITY ASSURANCE

A. Comply with Division 01.
1. Statement of qualification for distributor and installers.
2. Statement of compliance with regulatory requirements and single source responsibility.
3. Distributor's Qualifications: Firm with 3 years of experience in the distribution of commercial hardware.

a. Distributor to employ full time Architectural Hardware Consultants (AHC) for the purpose of scheduling and coordinating hardware and establishing keying schedule.
b. Hardware Schedule shall be prepared and signed by an AHC.

4. Installer's Qualifications: Firm with 3 years of experience in the installation of similar hardware to that required for this Project, including specific requirements indicated.
5. Regulatory Label Requirements: Provide testing agency label or stamp on hardware for labeled openings.
   a. Provide UL listed hardware for labeled and 20-minute openings in conformance with requirements for class of opening scheduled.
   b. Underwriters Laboratories requirements have precedence over this specification where conflict exists.
6. Single Source Responsibility: Except where specified in hardware schedule, furnish products of only one manufacturer for each type of hardware.

B. Review Project for extent of finish hardware required to complete the Work. Where there is a conflict between these Specifications and the existing hardware, notify the Architect in writing and furnish hardware in compliance with the Specification unless otherwise directed in writing by the Architect.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Packing and Shipping: Comply with Division 01.
1. Deliver products in original unopened packaging with legible manufacturer's identification.
2. Package hardware to prevent damage during transit and storage.
3. Mark hardware to correspond with "reviewed hardware schedule".
4. Deliver hardware to door and frame manufacturer upon request.

B. Storage and Protection: Comply with manufacturer's recommendations.

1.06 PROJECT CONDITIONS:

A. Coordinate hardware with other work. Furnish hardware items of proper design for use on doors and frames of the thickness, profile, swing, security and similar requirements indicated, as necessary for the proper installation and function, regardless of omissions or conflicts in the information on the Contract Documents.

B. Review Shop Drawings for doors and entrances to confirm that adequate provisions will be made for the proper installation of hardware.

1.07 WARRANTY:

A. Refer to Conditions of the Contract

B. Manufacturer’s Warranty:
1. Closers: Ten years
2. Exit Devices: Five Years
3. Locksets & Cylinders: Three years
4. All other Hardware: Two years.

1.08 OWNER’S INSTRUCTION:

A. Instruct Owner’s personnel in operation and maintenance of hardware units.

1.09 MAINTENANCE:

A. Extra Service Materials: Deliver to Owner extra materials from same production run as products installed. Package products with protective covering and identify with descriptive labels. Comply with Division 01 Closeout Submittals Section.

1. Special Tools: Provide special wrenches and tools applicable to each different or special hardware component.
2. Maintenance Tools: Provide maintenance tools and accessories supplied by hardware component manufacturer.
3. Delivery, Storage and Protection: Comply with Owner's requirements for delivery, storage and protection of extra service materials.

B. Maintenance Service: Submit for Owner's consideration maintenance service agreement for electronic products installed.

PART 2 PRODUCTS

2.01 MANUFACTURERS:

A. The following manufacturers are approved subject to compliance with requirements of the Contract Documents. Approval of manufacturers other than those listed shall be in accordance with Division 01.
1. Manufacturer: Approved:

Hinges	Best	PBB, McKinney
Continuous Hinges	National Guard Products	Best, ABH
Locksets	Best 45H Series	Campus Standard
Cylinders	Best 1E, 12E Series	Campus Standard
Exit Devices	Precision 2000 Series	Von Duprin 98
Closers	Dorma 8900 Series	Best HD8000, Sargent 351
Push/Pull Plates	Trimco	Burns, Rockwood
Push/Pull Bars	Trimco	Burns, Rockwood
Protection Plates	Trimco	Burns, Rockwood
Overhead Stops	Dorma 900 Series	ABH, Rixson
Door Stops	Trimco	Burns, Rockwood
Flush Bolts	Trimco	ABH, Burns
Coordinator & Brackets	Trimco	ABH, Burns
Threshold & Gasketing	National Guard	Reese, K.N. Crowder

2.02 MATERIALS:

A. **EXISTING DOOR HARDWARE TO REMAIN UNLESS NOTED OTHERWISE. SEE DOOR HARDWARE SCHEDULE.**

B. Hinges: Shall be Five Knuckle Ball bearing hinges
1. Template screw hole locations
2. Bearings are to be fully hardened.
3. Bearing shell is to be consistent shape with barrel.
4. Minimum of 2 permanently lubricated non-detachable bearings on standard weight hinge and 4 permanently lubricated bearing on heavy weight hinges.
5. Equip with easily seated, non-rising pins.
6. Non Removable Pin screws shall be slotted stainless steel screws.
7. Hinges shall be full polished, front, back and barrel.
8. Hinge pin is to be fully plated.
9. Bearing assembly is to be installed after plating.
10. Sufficient size to allow 180-degree swing of door

11. Furnish five knuckles with flush ball bearings
12. Provide hinge type as listed in schedule.
13. Furnish 3 hinges per leaf to 7-foot, 6-inch height. Add one for each additional 30 inches in height or fraction thereof.
14. Tested and approved by BHMA for all applicable ANSI Standards for type, size, function and finish
15. UL10C listed for Fire rated doors.

C. Geared Continuous Hinges:
1. Tested and approved by BHMA for ANSI A156.26-1996 Grade 1
2. Anti-spinning through fastener
3. UL10C listed for 3-hour fire rating
4. Non-handed
5. Lifetime warranty
6. Provide Fire Pins for 3-hour fire ratings
7. Sufficient size to permit door to swing 180 degrees

D. Mortise Type Locks and Latches:
1. Tested and approved by BHMA for ANSI A156.13, Series 1000, Operational Grade 1, Extra-Heavy Duty, Security Grade 2 and be UL10C.
2. Furnish UL or recognized independent laboratory certified mechanical operational testing to 4 million cycles minimum.
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Fit ANSI A115.1 door preparation
5. Functions and design as indicated in the hardware groups
6. Solid, one-piece, 3/4-inch (19mm) throw, anti-friction latchbolt made of self-lubricating stainless steel
7. Deadbolt functions shall have 1 inch (25mm) throw bolt made of hardened stainless steel
8. Latchbolt and Deadbolt are to extend into the case a minimum of 3/8 inch (9.5mm) when fully extended
9. Auxiliary deadlatch to be made of one piece stainless steel, permanently lubricated
10. Provide sufficient curved strike lip to protect door trim
11. Lever handles must be of forged or cast brass, bronze or stainless steel construction and conform to ANSI A117.1. Levers that contain a hollow cavity are not acceptable
12. Lock shall have self-aligning, thru-bolted trim
13. Levers to operate a roller bearing spindle hub mechanism
14. Mortise cylinders of lock shall have a concealed internal setscrew for securing the cylinder to the lockset. The internal setscrew will be accessible only by removing the core, with the control key, from the cylinder body.
15. Spindle to be designed to prevent forced entry from attacking of lever
16. Provide locksets with 7-pin removable and interchangeable core cylinders
17. Each lever to have independent spring mechanism controlling it
18. Core face must be the same finish as the lockset.

E. Exit Devices:
1. Exit devices to meet or exceed BHMA for ANSI 156.3, Grade 1.
2. Exit devices to be tested and certified by UL or by a recognized independent laboratory for mechanical operational testing to 10 million cycles minimum with inspection confirming Grade 1 Loaded Forces have been maintained.
3. Exit devices chassis to be investment cast steel, zinc dichromate.
4. Exit devices to have stainless steel deadlocking ¾” through latch bolt.

5. Exit devices to be equipped with sound dampening on touch bar.
6. Non-fire rated exit devices to have cylinder dogging.
7. Non-fire rated exit devices to have ¼" minimum turn hex key dogging.
8. Touchpad to be "T" style constructed of architectural metal with matching metal end caps.
9. Touch bar assembly on wide style exit devices to have a ¼" clearance to allow for vision frames.
10. All exposed exit device components to be of architectural metals and "true" architectural finishes.
11. Provide strikes as required by application.
12. Fire exit hardware to conform to UL10C and UBC 7-2. UL tested for Accident Hazard.
13. The strike is to be black powder coated finish.
14. Exit devices to have field reversible handing.
15. Provide heavy duty vandal resistant lever trim with heavy duty investment cast stainless steel components and extra strength shock absorbing overload springs. Lever shall not require resetting. Lever design to match locksets and latch sets.
16. Provide 9001-Quality Management and 14001-Environmental Management.
17. Vertical Latch Assemblies to have gravity operation, no springs.

F. Door Closers shall:
1. Tested and approved by BHMA for ANSI 156.4, Grade 1
2. UL10C certified
3. Provide 9001-Quality Management and 14001-Environmental Management.
4. Closer shall have extra-duty arms and knuckles
5. Conform to ANSI 117.1
6. Maximum 2-7/16 inch case projection with non-ferrous cover
7. Separate adjusting valves for closing and latching speed, and backcheck
8. Provide adapter plates, shim spacers and blade stop spacers as required by frame and door conditions
9. Full rack and pinion type closer with 1-1/2" minimum bore
10. Mount closers on non-public side of door, unless otherwise noted in specification
11. Closers shall be non-handed, non-sized and multi-sized.

G. Door Stops: Provide a dome floor or wall stop for every opening as listed in the hardware sets.
1. Wall stop and floor stop shall be wrought bronze, brass or stainless steel.
2. Provide fastener suitable for wall construction.
3. Coordinate reinforcement of walls where wall stop is specified.
4. Provide dome stops where wall stops are not practical. Provide spacers or carpet riser for floor conditions encountered

H. Over Head Stops: Provide a Surface mounted or concealed overhead when a floor or wall stop cannot be used or when listed in the hardware set.
1. Concealed overhead stops shall be heavy duty bronze or stainless steel.
2. Surface overhead stops shall be heavy duty bronze or stainless steel.

I. Push Plates: Provide with four beveled edges ANSI J301, 0.050 thickness, size as indicated in hardware set. Furnish oval-head countersunk screws to match finish.

J. Pulls with plates: Provide with four beveled edges ANSI J301, 0.050 thickness Plate s with ANSI J401 Pull as listed in hardware set. Provide proper fasteners for door construction.

K. Push Pull Bars: Provide ANSI J504, 1-1/4" Diameter Pull and Push Bar model and series as listed in hardware set. Provide proper fasteners for door construction.

L. Kickplates: Provide with four beveled edges ANSI J102, 8 inches high by width less 2 inches on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

M. Mop plates: Provide with four beveled edges ANSI J103, 6 inches high by width less 1 inch on single doors and 1 inch on pairs of doors. Furnish oval-head countersunk screws to match finish.

N. Seals: All seals shall be finished to match adjacent frame color. Seals shall be furnished as listed in schedule. Material shall be UL listed for labeled openings.

O. Weatherstripping: Provide at head and jambs only those units where resilient or flexible seal strip is easily replaceable. Where bar-type weatherstrip is used with parallel arm mounted closers install weatherstrip first.
   1. Weatherstrip shall be resilient seal of (Neoprene, Polyurethane, Vinyl, Pile, Nylon Brush, Silicone)
   2. UL10C Positive Pressure rated seal set when required.

P. Door Bottoms/Sweeps: Surface mounted or concealed door bottom where listed in the hardware sets.
   1. Door seal shall be resilient seal of (Neoprene, Polyurethane, Nylon Brush, Silicone)
   2. UL10C Positive Pressure rated seal set when required.

Q. Thresholds: Thresholds shall be aluminum beveled type with maximum height of ½” for conformance with ADA requirements. Furnish as specified and per details. Provide fasteners and screws suitable for floor conditions.

R. Silencers: Furnish silencers on all interior frames, 3 for single doors, 2 for pairs.

2.03 FINISH:

A. Designations used in Schedule of Finish Hardware - 3.05, and elsewhere to indicate hardware finishes are those listed in ANSI/BHMA A156.18 including coordination with traditional U.S. finishes shown by certain manufacturers for their products

B. Powder coat door closers to match other hardware, unless otherwise noted.

C. Aluminum items shall be finished to match predominant adjacent material. Seals to coordinate with frame color.

2.04 KEYS AND KEYING:

A. Provide keyed brass construction cores and keys during the construction period. Construction control and operating keys and core shall not be part of the Owner's permanent keying system or furnished in the same keyway (or key section) as the Owner's permanent keying system. Permanent cores and keys (prepared according to the accepted keying schedule) will be furnished to the Owner.

B. Cylinders, removable and interchangeable core system: Best CORMAX™ Patented 7-pin. Coordinate and provide cores to work with Owner’s existing Master Key System.
   1. **ALL EXISTING CYLINDERS / CORES TO REMAIN UNLESS NOTED OTHERWISE. SEE DOOR SCHEDULE.**

C. Permanent keys and cores: Stamped with the applicable key mark for identification. These visual key control marks or codes will not include the actual key cuts. Permanent keys will also be stamped "Do Not Duplicate."

D. Transmit Grand Master keys, Master keys and other Security keys to Owner by Registered Mail, return receipt requested.

E. Furnish keys in the following quantities:

1. 1 each Grand Master keys - COORDINATE NEW & EXISTING LOCKS WITH OWNER. New locks should match existing master key.
2. 4 each Master keys - COORDINATE NEW & EXISTING LOCKS WITH OWNER. New locks should match existing master key.
3. 2 each Change keys each keyed core
4. 15 each Construction Master keys
5. 1 each Control keys

F. The Owner, or the Owner's agent, will install permanent cores and return the construction cores to the Hardware Supplier. Construction cores and keys remain the property of the Hardware Supplier.

G. **Keying Schedule: Arrange for a keying meeting, and programming meeting with Architect Owner and hardware supplier, and other involved parties to ensure locksets and locking hardware, are functionally correct and keying and programming complies with project requirements. Furnish 3 typed copies of keying and programming schedule to Architect.**

PART 3 EXECUTION

3.01 EXAMINATION

A. Verification of conditions: Examine doors, frames, related items and conditions under which Work is to be performed and identify conditions detrimental to proper and or timely completion.
   1. Do not proceed until unsatisfactory conditions have been corrected.

3.02 HARDWARE LOCATIONS:

A. Mount hardware units at heights indicated in the following publications except as specifically indicated or required to comply with the governing regulations.
   1. Recommended Locations for Builder’s Hardware for Standard Steel Doors and Frames, by the Door and Hardware Institute (DHI).
   2. Recommended locations for Architectural Hardware for flush wood doors (DHI).
   3. WDMA Industry Standard I.S.-1A-04, Industry Standard for Architectural wood flush doors.

3.03 INSTALLATION:

A. Install each hardware item per manufacturer's instructions and recommendations. Do not install surface mounted items until finishes have been completed on the substrate. Set units level, plumb and true to line and location. Adjust and reinforce the attachment substrate as necessary for proper installation and operation.

B. Conform to local governing agency security ordinance.

C. Install Conforming to ICC/ANSI A117.1 Accessible and Usable Building and Facilities.
   1. Adjust door closer sweep periods so that from the open position of 70 degrees, the door will take at least 3 seconds to move to a point 3 inches from the latch, measured to the landing side of the door.

D. Installed hardware using the manufacturers fasteners provided. Drill and tap all screw holes located in metallic materials. Do not use “Riv-Nuts” or similar products.

3.04 FIELD QUALITY CONTROL AND FINAL ADJUSTMENT

A. Contractor/Installers, Field Services: After installation is complete, contractor shall inspect the completed door openings on site to verify installation of hardware is complete and properly adjusted, in accordance with both the Contract Documents and final shop drawings.
   1. Check and adjust closers to ensure proper operation.

2. Check latch set, lockset, and exit devices are properly installed and adjusted to ensure proper operation.
   a. Verify levers are free from binding.
   b. Ensure latch bolts and dead bolts are engaged into strike and hardware is functioning.
3. Report findings, in writing, to architect indicating that all hardware is installed and functioning properly. Include recommendations outlining corrective actions for improperly functioning hardware if required.

3.05 SCHEDULE OF FINISH HARDWARE:

MANUFACTURER LIST

CODE	NAME
AB	ABH MANUFACTURING INC.
AD	ADAMS RITE
BE	BEST ACCESS SYSTEMS
BY	BY RELATED SECTION
DM	DORMA DOOR CONTROLS
NA	NATIONAL GUARD PRODUCTS
PR	BEST PRECISION EXIT DEVICES
SECU	SECURITECH
ST	BEST HINGES AND SLIDING
TR	TRIMCO

HARDWARE SETS

SET #01 - EXTERIOR STOREFRONT

DOORS: 100A, 100B (SEE ALTERNATES)

2	CONTINUOUS HINGE	HD1100A X LAR		NA
1	EXIT DEVICE	2103 X 1700C 36"	630	PR
1	RIM CYLINDER* ACTIVE LEAF	12E-72 PATD	626	BE
2	MORTISE CYLINDER-CYL DIGGING	1E-74 PATD C4	626	BE
2	CLOSER W/ STOP	8916 DS	689	DM
1	PERIMETER GASKETING	BY ALUMINUM DOOR AND FRAME PROVIDER		BY
2	DRIP CAP (AS NEEDED)	16A X LAR		NA
2	DOOR SWEEP	101 VA X LAR		NA
1	THRESHOLD	896 S X LAR	AL	NA

***NEW CYLINDER/CORE TO BE PROVIDED PER SPECS. COORDINATE WITH OWNER TO MATCH EXISTING MASTER KEY.**

SET #02 - INTERIOR STOREFRONT

DOORS: 100C, 106

2	CONTINUOUS HINGE	HD1100A X LAR		NA
2	MANUAL FLUSHBOLT	3917-12	626	TR
1	DUST PROOF STRIKE	3911	630	TR
1	DEADLOCK	MS1850SN	628	AD
1	MORTISE CYLINDER*	1E-76 PATD C181	626	BE
1	MORTISE THUMB TURN	1EA-6A4 C181	626	BE
2	PUSH/PULL BAR SET	1747-1 36"	630	TR
2	CLOSER-SPRING	8916 S-DS BSHD	689	DM
	STOP			
1	PERIMETER GASKETING	BY ALUMINUM DOOR AND FRAME PROVIDER		BY

***NEW CYLINDER/CORE TO BE PROVIDED PER SPECS. COORDINATE WITH OWNER TO MATCH EXISTING MASTER KEY.**

SET #03 - EXISTING DOORS TO REMAIN / EXISTING DOORS RELOCATED

DOORS: 103G, 106A, 112A, 114 (RELOCATED). SEE DEMO PLAN FOR ALL EXISTING DOORS TO RECEIVE NEW ADA HANDLE.

3	BUTT HINGE	EXISTING	EXISTING	EXISTING
1	LOCKSET-OFFICE*	45H-7AT16J PATD	626	BE
1	WALL BUMPER	EXISTING (WHERE OCCURS)	EXISTING (WHERE OCCURS)	EXISTING (WHERE OCCURS)
1	PERIMETER GASKETING	EXISTING (WHERE OCCURS)	EXISTING (WHERE OCCURS)	EXISTING (WHERE OCCURS)

***EXISTING CYLINDER CORE TO REMAIN**

SET #04 - OFFICE

DOORS: 105, 146A, 146B, 146C, 146D, 146F, 146G, 150B

3	BUTT HINGE	FBB179 4.5" X 4.5"	26D	ST
1	LOCKSET-OFFICE*	45H-7AT16J PATD	626	BE
1	WALL BUMPER	1270CV	626	TR
1	PERIMETER GASKETING	5050 C X LAR	GREY	NA

***NEW CYLINDER/CORE TO BE PROVIDED PER SPECS. COORDINATE WITH OWNER TO MATCH EXISTING MASTER KEY.**

SET #05 - CLASSROOM

DOORS: 116, 117, 146

3	BUTT HINGE	FBB168 4.5" X 4.5"	26D	ST
1	LOCKSET-CLASSROOM*	45H-7R16J PATD	626	BE
1	CLOSER W/ STOP	8916 IS	689	DM
1	KICK PLATE	K0050 8" X 2" LDW B4E CSK	630	TR
1	WALL BUMPER	1270CV	626	TR
1	PERIMETER GASKETING	5050 C X LAR	GREY	NA

***NEW CYLINDER/CORE TO BE PROVIDED PER SPECS. COORDINATE WITH OWNER TO MATCH EXISTING MASTER KEY.**

SET #06 - BATHROOMS

DOORS: 171, 172

3	BUTT HINGE	FBB168 4.5" X 4.5"	26D	ST
1	PRIVACY SET W/ INDICATOR	45H-0L15H VIB	626	BE
1	KICK PLATE	K0050 8" X 2" LDW B4E CSK	630	TR
1	MOP PLATE	KM050 6" X 1" LDW B4E CSK	630	TR

1	**WALL BUMPER**	**1270CV**	**626**	**TR**
1	**COAT HOOK**	**3072**	**630**	**TR**
1	**PERIMETER GASKETING**	**5050C X LAR**		**NA**
1	**DOOR SWEEP**	**198 UA X LAR**		**NA**

END OF SECTION 08 7100

SECTION 08 8000
GLAZING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass.

B. Glazing accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 7200 - Stainless Steel and Glass Railing System.

B. Section 06 2000 - Finish Carpentry.

C. Section 07 2726 - Fluid-Applied Membrane Air Barriers.

D. Section 07 9005 - Joint Sealers: Sealant and back-up material.

E. Section 08 1113 - Hollow Metal Doors and Frames: Glazed lites in doors.

F. Section 08 1416 - Flush Wood Doors: Glazed lites in doors.

G. Section 08 4313 - Aluminum-Framed Storefronts: Glazing furnished by storefront manufacturer.

H. Section 08 4413 - Glazed Aluminum Curtain Walls: Glazing furnished by wall manufacturer.

I. Section 10 2800 - Toilet, Bath, and Laundry Accessories: Mirrors.

1.03 REFERENCE STANDARDS

A. 16 CFR 1201 - Safety Standard for Architectural Glazing Materials; current edition.

B. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

C. ASTM C864 - Standard Specification for Dense Elastomeric Compression Seal Gaskets, Setting Blocks, and Spacers; 2005 (Reapproved 2011).

D. ASTM C920 - Standard Specification for Elastomeric Joint Sealants; 2014.

E. ASTM C1036 - Standard Specification for Flat Glass; 2011.

F. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

G. ASTM C1172 - Standard Specification for Laminated Architectural Flat Glass; 2014.

H. ASTM C1193 - Standard Guide for Use of Joint Sealants; 2013.

I. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

J. ASTM E1300 - Standard Practice for Determining Load Resistance of Glass in Buildings; 2016.

K. ASTM E2190 - Standard Specification for Insulating Glass Unit Performance and Evaluation; 2010.

L. GANA (GM) - GANA Glazing Manual; 2009.

M. GANA (LGRM) - Laminated Glazing Reference Manual; 2009.

N. GANA (SM) - GANA Sealant Manual; 2008.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Glass Types: Provide structural, physical and environmental characteristics, size limitations, special handling or installation requirements.

C. Product Data on Glazing Compounds: Provide chemical, functional, and environmental characteristics, limitations, special application requirements. Identify available colors.

D. Samples: Submit two samples by 12 inch (by 12 mm) in size of glass units.

E. Manufacturer's Certificate: Certify that sealed insulated glass meets or exceeds specified requirements.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Insulating Glass Units: One of each glass size and each glass type.

1.05 QUALITY ASSURANCE

A. Perform Work in accordance with GANA Glazing Manual and FGMA Sealant Manual for glazing installation methods.

B. Installer Qualifications: Company specializing in performing the work of this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Do not install glazing when ambient temperature is less than 50 degrees F (10 degrees C).

1.07 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Sealed Insulating Glass Units: Provide a five (5) year warranty to include coverage for seal failure, interpane dusting or misting, including replacement of failed units.

C. Laminated Glass: Provide a five (5) year warranty to include coverage for delamination, including replacement of failed units.

PART 2 PRODUCTS

2.01 INSULATING GLASS UNITS

A. Type IG-1 - Sealed Insulating Glass Units: +/-1" thick Vision glazing.
   1. Application: All exterior glazing unless otherwise indicated.
   2. Outboard Lite: Fully tempered float glass, 1/4 inch (6 mm) thick, minimum.
      a. Tint: Clear.
      b. Coating: Low-E type, on #2 surfac, Optic Gray Tint.
      c. Coating Type: Solarban 70 or Cardinal Glass lo- E meeting below requirements
   3. Inboard Lite: Fully tempered float glass, 1/4 inch (6 mm).
      a. Tint: Clear.
   4. Total Thickness: 1 inch (25 mm).
   5. Total Visible Light Transmittance: 27.5 percent maximum.
   6. Total Solar Heat Gain Coeffficient: .27 nominal; (Glass Alone)
   7. Whole window or door Assembly maximum solar heat gain coefficient: .23
   8. Glazing Method: Gasket glazing.

B. Type IG-3 - ALTERNATE #1 - Sealed Insulating Glass Units: STC rated, Fire rated, Vision glass, triple glazed.
   1. Application: Exterior glazing as indicated on drawings.
   2. Outboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
      a. Tint: Clear.

3. Middle Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
4. Inboard Lite: Annealed float glass, 1/4 inch (6 mm) thick, minimum.
   a. Tint: Clear.
5. Total Thickness: 1 inch (25 mm).

2.02 GLAZING UNITS

A. Type IG-3 - Sealed Insulating Acoustic Door Glass Units: Safety glazing with .030 " PVD Interlayer:
   1. 1/8" glass + PVD + 1/8" glass + 1/2" Air space + 1/8" glass + PVD + 1/8" glass

B. Type S-1 - Single Vision Glazing:
   1. Application: All interior glazing unless otherwise indicated.
   2. Type: Fully tempered float glass.
   3. Tint: Clear.
   4. Thickness: 1/4 inch (6 mm).

2.03 TYPE S-2 - SINGLE GLAZING:

A. Applications: Interior glazing noted to be frosted or translucent

B. Type: Fully Tempered float glass.

C. Opacifier: Ceramic frit, on #4 surface.

D. Opacifier Color: Color to be selected by the architect from manufacturers standard colors.

E. Thickness: 1/4 inch (6 mm).

F. Type S-2 - Fire-Protection-Rated Glazing (Prov:
   1. IBC Fire Protection Rating: D-H-T-90, minimum.
   2. Safety Certification: 16 CFR 1201 Category II.
   3. Manufacturer: FireLite® as manufactured by Nippon Electric Glass Company, Ltd., and distributed by Technical Glass Products, 8107 Bracken Place SE, Snoqualmie, WA 98065, voice 1-800-426-0279, fax 1-800-451-9857, e-mail sales@fireglass.com, web site www.fireglass.com. or approved equal
   4. Thickness: as required by manufacturer for specified rating.
   5. Impact Safety Resistance: Fully-tempered as required by code for glass applications in doors.
   6. Positive Pressure Test: UL 10C, UBC 7-2 and 7-4; passes.
   7. Surface Finish:
      a. Premium Grade-Ground and polished on both sides
   8. Labeling: Permanently label each piece of FireLite® with the FireLite® logo, UL logo and fire rating in sizes up to 3,325 sq. in., and with the FireLite® label only for sizes that exceed the listing (as approved by the local authority having jurisdiction).
   9. Fire Rating: As indicated on the drawings, refer to life safety plan.

2.04 EXTERIOR GLAZING ASSEMBLIES

A. Performance Criteria: Select type and thickness of glass to withstand dead and live loads caused by positive and negative wind pressure acting normal to plane of glass.
   1. Use the procedure specified in ASTM E1300 to determine glass type and thickness.
   2. Limit glass deflection to 1/200 or flexure limit of glass, whichever is less, with full recovery of glazing materials.
   3. Glass thicknesses listed are minimum.

2.05 GLASS MATERIALS

A. Float Glass Manufacturers:
   1. AGC Flat Glass North America, Inc: www.na.agc-flatglass.com.
   2. Guardian Industries Corp: www.sunguardglass.com/#sle.
   3. Pilkington North America Inc: www.pilkington.com/na.
   4. VITRO , Formally PPG
   5. Oldcastle Building Envelope
   6. Cardinal Glass Indusries (www.cardinalcorp.com)
   7. Substitutions: Refer to Section 01 6000 - Product Requirements.

B. Float Glass: Provide float glass based glazing unless noted otherwise.
   1. Annealed Type: ASTM C1036, Type I - Transparent Flat, Class 1 - Clear, Quality-Q3.
   2. Heat-Strengthened and Fully Tempered Types: ASTM C1048, Kind HS and Kind FT.
   3. Tinted Types: ASTM C1036, Class 2 - Tinted, color and performance characteristics as indicated.
   4. Thicknesses: As indicated; for exterior glazing comply with requirements indicated for wind load design regardless of thickness indicated.

C. Fire-Protection-Rated Glazing: Type, thickness, and configuration as required to achieve indicated ratings.
   1. IBC Fire Protection Rating: As indicated on drawings.
   2. Provide products listed by Underwriters Laboratories or Intertek Warnock Hersey.
   3. Labeling: Provide permanent label on each piece giving the IBC rating and other information required by the applicable code.

2.06 SEALED INSULATING GLASS UNITS

A. Sealed Insulating Glass Units: Types as indicated.
   1. Durability: Certified by an independent testing agency to comply with ASTM E2190.
   2. Edge Spacers: Aluminum, bent and soldered corners.
   3. Edge Seal: Glass to elastomer.
   4. Purge interpane space with dry hermetic air.

2.07 GLAZING ACCESSORIES

A. Setting Blocks: Neoprene, 80 to 90 Shore A durometer hardness; ASTM C864 Option I. Length of 0.1 inch for each square foot (25 mm for each square meter) of glazing or minimum 4 inch (100 mm) x width of glazing rabbet space minus 1/16 inch (1.5 mm) x height to suit glazing method and pane weight and area.

B. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness; ASTM C864 Option I. Minimum long x one half the height of the glazing stop x thickness to suit application.

C. Glazing Tape: Preformed butyl compound with integral resilient tube spacing device; 10 to 15 Shore A durometer hardness; coiled on release paper; black color.
   1. Manufacturers:
      a. Pecora Corporation: www.pecora.com.
      b. Tremco Global Sealants: www.tremcosealants.com.
      c. Dow Chemical
      d. Substitutions: Refer to Section 01 6000 - Product Requirements.

D. Glazing Splines: Resilient polyvinyl chloride extruded shape to suit glazing channel retaining slot; ASTM C864 Option I; Black color.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that openings for glazing are correctly sized and within tolerance.

B. Verify that surfaces of glazing channels or recesses are clean, free of obstructions that may impede moisture movement, weeps are clear, and ready to receive glazing.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Seal porous glazing channels or recesses with substrate compatible primer or sealer.

C. Prime surfaces scheduled to receive sealant.

D. Install sealants in accordance with ASTM C1193 and GANA Sealant Manual.

E. Install sealants in accordance with manufacturer's instructions.

3.03 INSTALLATION - EXTERIOR/INTERIOR DRY METHOD (GASKET GLAZING)

A. Place setting blocks at 1/4 points with edge block no more than 6 inch (152 mm) from corners.

B. Rest glazing on setting blocks and push against fixed stop with sufficient pressure on gasket to attain full contact.

C. Install removable stops without displacing glazing gasket; exert pressure for full continuous contact.

3.04 FIELD QUALITY CONTROL

A. Glass product manufacturers to provide field surveillance of the installation of their products.

B. Monitor and report installation procedures and unacceptable conditions.

3.05 CLEANING

A. Remove glazing materials from finish surfaces.

B. Remove labels after Work is complete.

C. Clean glass and adjacent surfaces.

3.06 PROTECTION

A. After installation, mark pane with an 'X' by using removable plastic tape or paste; do not mark heat absorbing or reflective glass units.

END OF SECTION 08 8000

This page intentionally left blank

SECTION 08 8300
MIRRORS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Glass mirrors.
   1. Tempered safety glass.

1.02 REFERENCE STANDARDS

A. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

1.03 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data on Mirror Types: Submit structural, physical and environmental characteristics, size limitations, special handling and installation requirements.

C. Warranty: Submit manufacturer warranty and ensure that forms have been completed in Owner's name and registered with manufacturer.

D. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.04 QUALITY ASSURANCE

A. Fabricate, store, transport, receive, install, and clean mirrors in accordance with manufacturer's recommendations.

1.05 FIELD CONDITIONS

A. Do not install mirrors when ambient temperature is less than 50 degrees F (10 degrees C).

B. Maintain minimum ambient temperature before, during and 24 hours after installation of glazing compounds.

1.06 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Provide five year manufacturer warranty for reflective coating on mirrors and replacement of same.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Mirrors:
   1. Trulite Glass and Aluminum Solutions; _____: www.trulite.com/#sle.
   2. Walker Glass Company Ltd; Walker Glass Mirrors: www.walkerglass.com/#sle.
   3. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Mirror Design Criteria: Select materials and/or provide supports as required to limit mirror material deflection to 1/200, or to the flexure limit of glass, with full recovery of glazing materials, whichever is less.

B. Mirror Glass; Type MR-02: Clear, tempered safety glass; ASTM C1048, with copper and silver coatings, and protective overcoating.
   1. Thickness: 1/4 inch (6.4 mm).

2. Edges: Bevelled. Frameless.
3. Size: As indicated on drawings.

2.03 ACCESSORIES

A. Spacer Shims: Neoprene, 50 to 60 Shore A durometer hardness.

B. Mirror Adhesive: Silicone pre-polymer based, chemically compatible with mirror coating and wall substrate.
1. Application Temperature: Minus 35 to 140 degrees F (Minus 37 to 60 degrees C) at contact surfaces.
2. Volatile Organic Content (VOC): Less than 7 percent by weight.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces of mirror frames or recesses are clean, free of obstructions, and ready for installation of mirrors.

3.02 PREPARATION

A. Clean contact surfaces with solvent and wipe dry.

B. Prepare installation in accordance with ASTM C1193 for solvent release sealants, and install sealant in accordance with manufacturer's instructions.

3.03 INSTALLATION

A. Install mirrors in accordance with manufacturer's recommendations.

B. Set mirrors plumb and level, and free of optical distortion.

C. Set mirrors with edge clearance free of surrounding construction including countertops or backsplashes.

D. Frameless Mirrors: Set mirrors in proper place with adhesive, applied in accordance with adhesive manufacturer's instructions.

3.04 CLEANING

A. Remove wet glazing materials from finish surfaces.

B. Remove labels after work is complete.

C. Clean mirrors and adjacent surfaces.

END OF SECTION 08 8300

SECTION 09 0561
COMMON WORK RESULTS FOR FLOORING PREPARATION

PART 1 GENERAL

1.01 SECTION INCLUDES

A. **All products and procedures must meet the manufacturer's required criteria for installation. Existing flooring will be encapsulated - coordinate with EMC Hazardous Materials Report and flooring manufacturer's preparation requirements.**

B. This section applies to floors identified in contract documents that are receiving the following types of floor coverings:
   1. Resilient tile
   2. Carpet tile
   3. Tiling

C. Preparation of existing concrete floor slabs for installation of floor coverings.

D. Testing of concrete floor slabs for moisture and alkalinity (pH).

E. Remediation of concrete floor slabs due to unsatisfactory moisture or alkalinity (pH) conditions.

F. Contractor shall perform all specified remediation of concrete floor slabs. If such remediation is indicated by testing agency's report and is due to a condition not under Contractor's control or could not have been predicted by examination prior to entering into the contract, a contract modification will be issued.

1.02 RELATED REQUIREMENTS

A. Section 01 4000 - Quality Requirements: Additional requirements relating to testing agencies and testing.

B. Section 03 3000 - Cast-in-Place Concrete: Concrete admixture for slabs to receive adhered flooring, to prevent moisture content-related flooring failures.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

B. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate scheduling of cleaning and testing, so that preliminary cleaning has been completed for at least 24 hours prior to testing.

1.05 SUBMITTALS

A. Floor Covering and Adhesive Manufacturers' Product Literature: For each specific combination of substrate, floor covering, and adhesive to be used; showing:
   1. Moisture and alkalinity (pH) limits and test methods.
   2. Manufacturer's required bond/compatibility test procedure.

B. Testing Agency's Report:
   1. Description of areas tested; include floor plans and photographs if helpful.

2. Summary of conditions encountered.
3. Copies of specified test methods.
4. Recommendations for remediation of unsatisfactory surfaces.
5. Submit report to Architect, owner, owner's representative
6. Submit report not more than two business days after conclusion of testing.

C. Adhesive Bond and Compatibility Test Report.

1.06 QUALITY ASSURANCE

A. Moisture and alkalinity (pH) testing shall be performed by an independent testing agency employed and paid by Contractor.

B. Testing Agency Qualifications: Independent testing agency experienced in the types of testing specified.
1. Submit evidence of experience consisting of at least 3 test reports of the type required, with project Owner's project contact information.

C. Contractor's Responsibility Relating to Independent Agency Testing:
1. Provide access for and cooperate with testing agency.
2. Confirm date of start of testing at least 10 days prior to actual start.
3. Allow at least 4 business days on site for testing agency activities.
4. Achieve and maintain specified ambient conditions.
5. Notify Owner when specified ambient conditions have been achieved and when testing will start.
6. Notify Architect when specified ambient conditions have been achieved and when testing will start.

1.07 FIELD CONDITIONS

A. Maintain ambient temperature in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 65 degrees F (18 degrees C) or more than 85 degrees F (30 degrees C).

B. Maintain relative humidity in spaces where concrete testing is being performed, and for at least 48 hours prior to testing, at not less than 40 percent and not more than 60 percent.

PART 2 EXECUTION

2.01 CONCRETE SLAB PREPARATION

A. PROPER SURFACE PREPARATION INCLUDES THE FOLLOWING:
1. Inspection of the existing concrete substrate
2. Removal of existing floor coatings
3. Decontamination of the concrete surface
4. Creation of surface profile
5. Repair of surface irregularities

B. INSPECTION OF THE EXISTING CONCRETE SUBSTRATE
1. Inspect the existing concrete substrate to determine its general condition, soundness, presence of contaminants, existing floor coating, presence of moisture vapor emissions and the best methods to use in preparation of the surface to meet the requirements of the project.

C. DECONTAMINATION OF THE CONCRETE SURFACE
1. Decontamination of the concrete surface requires the removal of oils, grease, wax, fatty acids and other contaminants, and may be accomplished by the use of detergent

scrubbing with a heavy duty cleaner/degreaser, low pressure water cleaning (less than 5,000 psi), steam cleaning, or chemical cleaning. The success of these methods is dependent upon the depth of penetration of the contaminant; which is completely dependent upon the contaminant's viscosity, the concrete's permeability and the duration of exposure. Special care should be taken when preparing concrete at an "in use" facility for repair, replacement or an initial floor topping.

2. Test concrete substrate for moisture vapor emission using test methods recommended by manufacturer of flooring system being installed.

D. CREATION OF SURFACE PROFILE

1. A creation of surface profile can be accomplished by a number of methods each utilizing a selection of tools, equipment and materials to accomplish the intended purpose, (See METHODS OF SURFACE PREPARATION below). Selection is dependent upon the type of surface to be prepared and the type of system to be installed. In addition, floors, trenches each have their own particular requirements. The type and thickness of the selected flooring system also plays an important role in the selection process. Regardless of the method selected or tools employed, the contractor must provide a surface that will accept the application of flooring products and allow the mechanical bond of the flooring system securely to the concrete. The type of service the structure will be subjected to, will also help to define the degree of profile required. The surface profile is the measure of the average distance from the peaks of the surface to the valleys as seen through a cross sectional view of the surface of the concrete.
2. This dimension is defined pictorially and through physical samples in the ICRI Technical Guideline No 03732, and is expressed as a Concrete Surface Profile number (CSP 1-9).
3. Methods of Surface Preparation
   a. Depending upon conditions of the concrete one or more methods of surface preparation may be required. It is common for decontamination to precede mechanical preparation, and if necessary a second decontamination to follow.
   b. The preferred methods for creation of a surface profile, including the removal of dirt, dust, laitance and curing compounds, is steel shotblasting, abrasive (sand) blasting or scarifying. The steel shotblasting or vacuum blasting process is commonly referenced by equipment brand names, such as, Blastrac, Vacu-Blast, Shot-Blast, etc. Vertical and overhead surfaces, such as cove base, wall, and ceiling surfaces shall be prepared utilizing methods of grinding, scarifying, abrasive (sand) blasting, needle scaling, or vertical steel shotblasting. The following table provides a guide for the degree of surface profile required for the coating or overlay to be applied and the preparation methods used to generate each profile. Provide written instruction from manufacturer to architect regarding profile requirements and recommended method for achieving profile.

Application	Profile	Preparation
Sealers	0-3 mils	Detergent scrub Low-pressure Water Acid Etching (not recommended) Grinding
Thin Film	4-10 mils	Grinding Abrasive Blast Steel Shot Blast
High Build	10-40 mils	Abrasive Blast Steel Shot Blast Scarifying

Self-Leveling	50 mils-1/8 inch	Abrasive Blast Steel Shot Blast Scarifying Needle Scaling
Polymer Overlay	1/8-1/4 inch	Abrasive Blast Steel Shot Blast Scarifying Needle Scaling Scabbling Flame Blasting Milling/rotomilling

4. Other surface preparation methods are mentioned in ADDITONAL SURFACE PREPARATION REFERENCES.

E. REPAIR OF SURFACE IRREGULARITIES
1. Repair of surface irregularities including bugholes, spalls, cracks, deteriorated joints, slopes, areas near transition zones, such as around drains, floor boxes, doorways, etc. must be repaired prior to the placement of the flooring system and/or the system must be designed to off-set the thickness of the irregularities. For bugholes and other minor surface irregularities, fill using materials recommended by manufacturer of flooring system. For treatment of cracks and joints refer to the section below entitled “Crack Isolation”.

F. CRACK ISOLATION
1. The performance of elastomeric products, requires a relatively uniform dry film thickness to resist drying shrinkage and thermal movement of the concrete, while maintaining a seamless bridge or seal over the concrete. Therefore it is critical that all mortar splatter, protrusions, ridges, penetrations, or sharp projections in the surface of the concrete, be ground smooth or otherwise made smooth, in addition to the normal surface preparation outlined above.
2. Prior to application of an elastomeric system, control/contraction joints, construction joints, and cracks should be sealed with the selected system flexible sealant as recommended by manufacturer of flooring system. This coating should extend a minimum of 6” on either side of the joint or crack. The entire surface area should then receive the specified crack isolation system. Isolation and/or expansion joints should be detailed in accordance with the floor system manufacturer’s recommendations.
3. General Polymer systems can be applied to a variety of substrates if the substrate is properly prepared. Preparation of surfaces other than concrete or steel, such as wood, concrete block, brick, quarry tile, glazed tile, cement terrazzo, vinyl composition tile, plastics and existing polymer systems, can be accomplished to receive bonded polymer sealers, coatings, or toppings. For questions regarding a substrate other than concrete or steel, or a condition not mentioned in this guideline, contact the product Technical Service Department prior to starting the project. For steel surfaces, refer to Guideline Instructions for Surface Preparation of Structural Steel, Form G-2.Repair of surface irregularities including bugholes, spalls, cracks, deteriorated joints, slopes, areas near transition zones, such as around drains, floor boxes, doorways, etc. must be repaired prior to the placement of the flooring system and/or the system must be designed to off-set the thickness of the irregularities.

G. ADDITIONAL SURFACE PREPARATION REFERENCES
1. Important and relevant information on surface preparation of concrete is available by referencing the following codes, standards, and guidelines.
a. SSPC The Society for Protective Coatings, 40 24th Street, 6th Floor, Pittsburgh, Pa. 15222-4643, (412) 281-2331.

1) SSPC-SP 13 Surface Preparation of Concrete
2) SSPC-TU 2/NACE 6G197 Design, Installation, and Maintenance of Coating Systems for Concrete Used in Secondary Containment

b. ICRI International Concrete Repair Institute, 38800 Country Club Drive Farmington Hills, MI 48331, (248) 848-3809
c. Technical Guideline No.03732, “Selecting and Specifying Concrete Surface
   1) Preparation for Sealers, Coatings, and Polymer Overlays”. Includes visual standards to act as a guide in defining acceptable surface profiles for the application of industrial coatings and polymer floor toppings.
   2) Technical Guideline No.03730, “Guide for Surface Preparation for the Repair of Deteriorated Concrete Resulting from Reinforcing Steel Corrosion”.
d. ASTM American Society for Testing and Materials, 100 Barr Harbor Drive, West Conshohocken, PA 19428-2959, (610) 832-9585
   1) ASTM D 4258 “Practice for Surface Cleaning Concrete for Coating”
   2) ASTM D 4260 “Standard Practice for Acid Etching Concrete”
   3) ASTM D 4261 “Practice for Surface Cleaning Unit Masonry for Coating”
   4) ASTM D 4262 “Test Method for pH of Chemically Cleaned or Etched Concrete Surfaces”The performance of elastomeric products, requires a relatively uniform dry film thickness to resist drying shrinkage and thermal movement of the concrete, while maintaining a seamless bridge or seal over the concrete. Therefore it is critical that all mortar splatter, protrusions, ridges, penetrations, or sharp projections in the surface of the concrete, be ground smooth or otherwise made smooth, in addition to the normal surface preparation outlined above.

2.02 CONCRETE SLAB PREPARATION

A. Perform following operations in the order indicated:
   1. Preliminary cleaning.
   2. Internal relative humidity tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   3. Alkalinity (pH) tests; in same locations as moisture vapor emission tests, unless otherwise indicated.
   4. Specified remediation, if required.
   5. Patching, smoothing, and leveling, as required.
   6. Other preparation specified.
   7. Adhesive bond and compatibility test.
   8. Protection.

2.03 MOISTURE VAPOR EMISSION TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Test in accordance with ASTM F1869 and as follows.

C. Plastic sheet test and mat bond test may not be substituted for the specified ASTM test method, as those methods do not quantify the moisture content sufficiently.

D. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if test values exceed 3 pounds per 1000 square feet (1.4 kg per 93 square meters) per 24 hours.

E. Report: Report the information required by the test method.

2.04 INTERNAL RELATIVE HUMIDITY TESTING

A. Where the floor covering manufacturer's requirements conflict with either the referenced test method or this specification, comply with the manufacturer's requirements.

B. Test in accordance with ASTM F2170 Procedure A and as follows.

C. Testing with electrical impedance or resistance apparatus may not be substituted for the specified ASTM test method, as the values determined are not comparable to the ASTM test values and do not quantify the moisture content sufficiently.

D. In the event that test values exceed floor covering manufacturer's limits, perform remediation as indicated. In the absence of manufacturer limits, perform remediation if any test value exceeds 75 percent relative humidity.

E. Report: Report the information required by the test method.

2.05 ALKALINITY TESTING

A. The following procedure is the equivalent of that described in ASTM F710, repeated here for the Contractor's convenience.

B. Use a wide range alkalinity (pH) test paper, its associated chart, and distilled or deionized water.

C. Place several drops of water on a clean surface of concrete, forming a puddle approximately 1 inch (25 mm) in diameter. Allow the puddle to set for approximately 60 seconds, then dip the alkalinity (pH) test paper into the water, remove it, and compare immediately to chart to determine alkalinity (pH) reading.

2.06 ADHESIVE BOND AND COMPATIBILITY TESTING

A. Comply with requirements and recommendations of floor covering manufacturer.

END OF SECTION 09 0561

SECTION 09 2116
GYPSUM BOARD ASSEMBLIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Performance criteria for gypsum board assemblies.

B. Metal furring materials.

C. Metal ceiling framing.

D. Cementitious backing board.

E. Gypsum wallboard.

F. Joint treatment and accessories.

1.02 RELATED REQUIREMENTS

A. Section 05 4000 - Cold-Formed Metal Framing: Exterior wind-load-bearing metal stud framing.

B. Section 06 1000 - Rough Carpentry: Wood blocking product and execution requirements.

C. 06 2000 - Finish Carpentry

D. Section 07 2100 - Thermal Insulation:

E. Section 07 8400 - Firestopping

F. Section 07 9200 - Joint Sealants: Sealing acoustical gaps in construction other than gypsum board or plaster work.

G. Section 09 3000 - Tiling:

1.03 REFERENCE STANDARDS

A. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).; 2013.1.

B. ANSI A118.9 - American National Standard Specifications for Test Methods and Specifications for Cementitious Backer Units; 1999 (Reaffirmed 2016).

C. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

D. ASTM C475/C475M - Standard Specification for Joint Compound and Joint Tape for Finishing Gypsum Board; 2015.

E. ASTM C557 - Standard Specification for Adhesives for Fastening Gypsum Wallboard to Wood Framing; 2003 (Reapproved 2009).

F. ASTM C645 - Standard Specification for Nonstructural Steel Framing Members; 2014.

G. ASTM C754 - Standard Specification for Installation of Steel Framing Members to Receive Screw-Attached Gypsum Panel Products; 2015.

H. ASTM C840 - Standard Specification for Application and Finishing of Gypsum Board; 2013.

I. ASTM C954 - Standard Specification for Steel Drill Screws for the Application of Gypsum Panel Products or Metal Plaster Bases to Steel Studs From 0.033 in. (0.84 mm) to 0.112 in. (2.84 mm) in Thickness; 2015.

J. ASTM C1002 - Standard Specification for Steel Self-Piercing Tapping Screws for Application of Gypsum Panel Products or Metal Plaster Bases to Wood Studs or Steel Studs; 2014.

K. ASTM C1047 - Standard Specification for Accessories For Gypsum Wallboard and Gypsum Veneer Base; 2014a.

L. ASTM C1178/C1178M - Standard Specification for Coated Glass Mat Water-Resistant Gypsum Backing Panel; 2013.

M. ASTM C1288 - Standard Specification for Discrete Non-Asbestos Fiber-Cement Interior Substrate Sheets; 2014.

N. ASTM C1325 - Specification for Non-Asbestos Fiber-Mat Reinforced Cementitious Backer Units; 2014.

O. ASTM C1396/C1396M - Standard Specification for Gypsum Board; 2014.

P. ASTM D3273 - Standard Test Method for Resistance to Growth of Mold on the Surface of Interior Coatings in an Environmental Chamber; 2012.

Q. ASTM E119 - Standard Test Methods for Fire Tests of Building Construction and Materials; 2015.

R. GA-216 - Application and Finishing of Gypsum Board; 2013.

S. GA-600 - Fire Resistance Design Manual; 2015.

T. ICC (IBC) - International Building Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

U. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on gypsum board, accessories, and joint finishing system.

C. Product Data: Provide manufacturer's data on partition head to structure connectors, showing compliance with requirements.

D. Test Reports: For stud framing products that do not comply with ASTM C645 or ASTM C754, provide independent laboratory reports showing maximum stud heights at required spacings and deflections.

E. Samples: Submit two samples of predecorated gypsum board, 12 by 12 inches (300 by 300 mm) in size, illustrating finish color and texture.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing gypsum board installation and finishing, with minimum 3 years of experience.

PART 2 PRODUCTS

2.01 GYPSUM BOARD ASSEMBLIES

A. Provide completed assemblies complying with ASTM C840 and GA-216.
   1. See PART 3 for finishing requirements.

B. Refer to wall type plans for wall types.

C. Fire Rated Assemblies: Provide completed assemblies with the following characteristics: Refer to Life Safety Plans
   1. ICC IBC Item Numbers: Comply with applicable requirements of ICC IBC for the particular assembly.
   2. Gypsum Association File Numbers: Comply with requirements of GA-600 for the particular assembly.

3. UL Assembly Numbers: Provide construction equivalent to that listed for the particular assembly in the current UL (FRD).

2.02 METAL FRAMING MATERIALS

A. Manufacturers - Metal Framing, Connectors, and Accessories:
   1. Clarkwestern Dietrich Building Systems LLC; ____: www.clarkdietrich.com/#sle.
   2. Jaimes Industries; ____: www.jaimesind.com/#sle.
   3. Marino; ____: www.marinoware.com/#sle.
   4. Phillips Manufacturing Company; ____: www.phillipsmfg.com.
   5. Substitutions: See Section 01 6000 - Product Requirements.

B. Non-Loadbearing Framing System Components: ASTM C645; galvanized sheet steel, of size and properties necessary to comply with ASTM C754 for the spacing indicated, with maximum deflection of wall framing of L/120 at 5 psf (L/120 at 240 Pa).
   1. Studs: "C" shaped with flat or formed webs with knurled faces.
   2. Runners: U shaped, sized to match studs.
   3. Ceiling Channels: C-shaped.
   4. Ceiling Joist:
   5. Furring: Hat-shaped sections, minimum depth as required for UL Listing and Authority having Jurisdiction.
   6. Resilient Furring Channels: 1/2 inch (12 mm) depth, for attachment to substrate through both legs; both legs expanded metal mesh.

C. Ceiling Hangers: Type and size as specified in ASTM C754 for spacing required.

D. Partition Head To Structure Connections: Provide track fastened to structure with legs of sufficient length to accommodate deflection, for friction fit of studs cut short and fastened as indicated on drawings.

E. Gypsum Board Ceiling Suspension System: Steel grid system of main tees and support bars connected to structure using hanging wire.
   1. Products:
      a. Equal to USG Corporation; Drywall Suspension System: www.usg.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 BOARD MATERIALS

A. Manufacturers - Gypsum-Based Board:
   1. American Gypsum Company; ____: www.americangypsum.com/#sle.
   2. CertainTeed Corporation; ____: www.certainteed.com/#sle.
   3. Continental Building Products; ____: www.continental-bp.com/#sle.
   4. Georgia-Pacific Gypsum; ____: www.gpgypsum.com/#sle.
   5. National Gypsum Company; ____: www.nationalgypsum.com/#sle.
   6. USG Corporation; ____: www.usg.com/#sle.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Gypsum Wallboard: Paper-faced gypsum panels as defined in ASTM C1396/C1396M; sizes to minimize joints in place; ends square cut. Type X - 5/8 inch thick
   1. Application: Use for vertical surfaces and ceilings, unless otherwise indicated.
   2. Thickness:
      a. Vertical Surfaces: 5/8 inch (16 mm).
      b. Ceilings: 5/8 inch (16 mm).
      c. Multi-Layer Assemblies: Thicknesses as indicated on drawings.
   3. Paper-Faced Products:

a. American Gypsum Company; FireBloc Type X Gypsum Wallboard.
b. CertainTeed Corporation; Type X Drywall.
c. Continental Building Products; Firecheck Type X.
d. Georgia-Pacific Gypsum; ToughRock Fireguard X.
e. Substitutions: See Section 01 6000 - Product Requirements.

C. Backing Board For Tiled Areas:
1. Application: Surfaces behind areas where hard tile is specified on metal stud framing. Refer to finish schedule..
2. Mold Resistance: Score of 10, when tested in accordance with ASTM D3273.
3. ANSI Cement-Based Board: Non-gypsum-based; aggregated Portland cement panels with glass fiber mesh embedded in front and back surfaces complying with ANSI A118.9 or ASTM C1325.
a. Thickness: 5/8 inch inch (___ mm).

2.04 ACCESSORIES

A. Acoustic Insulation: Preformed glass fiber, friction fit type, unfaced. Provide at all interior gypsum board/metal stud partitions to the full width of the partition and to the full height of the partition. Refer to section 07 2100 Thermal Insulation.

B. Acoustic Sealant: Acrylic emulsion latex or water-based elastomeric sealant; do not use solvent-based non-curing butyl sealant.

C. Beads, Joint Accessories, and Other Trim: ASTM C1047, rigid plastic, galvanized steel, or rolled zinc, unless noted otherwise.
1. Rigid Corner Beads: Low profile, for 90 degree outside corners.
2. Architectural Reveal Beads:
a. Shapes: As indicated on drawings.
3. Expansion Joints: V-shaped PVC with tear away fins

D. Joint Materials: ASTM C475/C475M and as recommended by gypsum board manufacturer for project conditions.
1. Tape: 2 inch (50 mm) wide, coated glass fiber tape for joints and corners, except as otherwise indicated.
2. Tape: 2 inch (50 mm) wide, creased paper tape for joints and corners, except as otherwise indicated.
3. Ready-mixed vinyl-based joint compound.
4. Powder-type vinyl-based joint compound.
5. Chemical hardening type compound.

E. Screws for Fastening of Gypsum Panel Products to Cold-Formed Steel Studs Less than 0.033 inch (0.84 mm) in Thickness and Wood Members: ASTM C1002; self-piercing tapping screws, corrosion resistant.

F. Screws for Fastening of Gypsum Panel Products to Steel Members from 0.033 to 0.112 inch (0.84 to 2.84 mm) in Thickness: ASTM C954; steel drill screws, corrosion resistant.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that project conditions are appropriate for work of this section to commence.

3.02 FRAMING INSTALLATION

A. Metal Framing: Install in accordance with ASTM C754 and manufacturer's instructions.

B. Suspended Ceilings and Soffits: Space framing and furring members at __ inches on center (at __ mm on center).
   1. Level ceiling system to a tolerance of 1/600.
   2. Laterally brace entire suspension system.

C. Studs: Space studs at 16 inches on center (at 406 mm on center).
   1. Extend partition framing as indicated and as reqiured to accomadate metal joist above finished ceiling. .
   2. Partitions Terminating at Structure: Attach extended leg top runner to structure, maintain clearance between top of studs and structure, and brace both flanges of studs with continuous bridging.
   3. Partitions Terminating at Structure: Attach top runner to structure, maintain clearance between top of studs and structure, and connect studs to track using specified mechanical devices in accordance with manufacturer's instructions; verify free movement of top of stud connections; do not leave studs unattached to track.
   4. Joist: Size and space as required to accomodate hanging of acoustical tile, lighting and other electrical elements, and mechanical registers and elements. Bear and fasten on metal stud partitions.

D. Openings: Reinforce openings as required for weight of doors or operable panels, using not less than double studs at jambs.

E. Standard Wall Furring: Install at concrete walls scheduled to receive gypsum board, not more than 4 inches (100 mm) from floor and ceiling lines and abutting walls. Secure in place on alternate channel flanges at maximum 24 inches (600 mm) on center.
   1. Orientation: Horizontal.
   2. Spacing: As indicated.

F. Acoustic Furring: Install resilient channels at maximum 24 inches (600 mm) on center. Locate joints over framing members.

G. Furring for Fire Ratings: Install as required for fire resistance ratings indicatedand to GA-600 requirements.

H. Blocking: Install wood blocking for support of:
   1. Framed openings.
   2. Wall mounted cabinets.
   3. Plumbing fixtures.
   4. Toilet partitions.
   5. Toilet accessories.
   6. Wall mounted door hardware.
   7. Refer to Section 06 1000 - Rough Carpentry for additional requirements.

3.03 ACOUSTIC ACCESSORIES INSTALLATION

A. Acoustic Insulation: Place tightly within spaces, around cut openings, behind and around electrical and mechanical items within partitions, and tight to items passing through partitions.

B. Acoustic Sealant: Install in accordance with manufacturer's instructions.
   1. Place one bead continuously on substrate before installation of perimeter framing members.
   2. Place continuous bead at perimeter of each layer of gypsum board.
   3. Seal around all penetrations by conduit, pipe, ducts, and rough-in boxes, except where firestopping is provided.

3.04 BOARD INSTALLATION

A. Comply with ASTM C840, GA-216, and manufacturer's instructions. Install to minimize butt end joints, especially in highly visible locations.

B. Single-Layer Non-Rated: Install gypsum board in most economical direction, with ends and edges occurring over firm bearing.
   1. Exception: Tapered edges to receive joint treatment at right angles to framing.

C. Fire-Rated Construction: Install gypsum board in strict compliance with requirements of assembly listing.

D. Exposed Gypsum Board in Interior Wet Areas: Seal joints, cut edges, and holes with water-resistant sealant.

E. Cementitious Backing Board: Install over steel framing members where indicated and at all locations of wall tile at metal stud framing, in accordance with ANSI A108/A118/A136.1 and manufacturer's instructions.

F. Installation on Metal Framing: Use screws for attachment of gypsum board except face layer of non-rated double-layer assemblies, which may be installed by means of adhesive lamination.

G. Gypsum board shall not touch the floor, provide 1/2" clearance.

3.05 INSTALLATION OF TRIM AND ACCESSORIES

A. Control Joints: Place control joints consistent with lines of building spaces and as indicated.
   1. Not more than 30 feet (10 meters) apart on walls and ceilings over 50 feet (16 meters) long.

B. Corner Beads: Install at external corners, using longest practical lengths.

C. Edge Trim: Install at locations where gypsum board abuts dissimilar materials.

3.06 JOINT TREATMENT

A. Finish gypsum board in accordance with levels defined in ASTM C840, as follows:
   1. Level 5: Areas where smooth wall designs include non-flat paints or glossy finishes
   2. Level 4: Walls and ceilings to receive paint finish.
   3. Level 3: Surfaces intended to receive heavy or medium texture finishes before final painting or in areas where heavy-duty commercial wallcoverings will be applied as the final decoration
   4. Level 2: In utility areas, behind cabinetry, and on backing board to receive tile finish.
   5. Level 1: Fire rated wall areas above finished ceilings, whether or not accessible in the completed construction.

B. Tape, fill, and sand exposed joints, edges, and corners to produce smooth surface ready to receive finishes.
   1. Feather coats of joint compound so that camber is maximum 1/32 inch (0.8 mm).
   2. Taping, filling, and sanding is not required at surfaces behind adhesive applied ceramic tile and fixed cabinetry.

C. Fill and finish joints and corners of cementitious backing board as recommended by manufacturer.

3.07 TOLERANCES

A. Maximum Variation of Finished Gypsum Board Surface from True Flatness: 1/8 inch in 10 feet (3 mm in 3 m) in any direction.

END OF SECTION 09 2116

SECTION 09 3000
TILING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Tile for walls and floor applications

B. Backer Boards as tile substrate, refer to Section 09 2116 Gypsum Board Assemblies.

1.02 RELATED REQUIREMENTS

A. Section 09 0561 Common Work Results from Flooring Prep

B. Section 07 9200 - Joint Sealants: Sealing joints between tile work and adjacent construction and fixtures.

C. Section 09 2116 - Gypsum Board Assemblies: Tile backer board.

D. Section 22 4000 - Plumbing Fixtures

1.03 REFERENCE STANDARDS

A. ANSI A108.1a - American National Standard Specifications for Installation of Ceramic Tile in the Wet-Set Method, with Portland Cement Mortar; 2014.

B. ANSI A108.1b - American National Standard Specifications for Installation of Ceramic Tile on a Cured Portland Cement Mortar Setting Bed with Dry-Set or Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

C. ANSI A108.4 - American National Standard Specifications for Installation of Ceramic Tile with Organic Adhesive or Water Cleanable Tile-Setting Epoxy Adhesive; 2023.

D. ANSI A108.6 - American National Standard Specifications for Installation of Ceramic Tile with Chemical Resistant, Water Cleanable Tile-Setting and -Grouting Epoxy; 1999 (Reaffirmed 2010).

E. ANSI A108.9 - American National Standard Specifications for Installation of Ceramic Tile with Modified Epoxy Emulsion Mortar/Grout; 1999 (Reaffirmed 2010).

F. ANSI A108.10 - American National Standard Specifications for Installation of Grout in Tilework; 1999 (Reaffirmed 2010).

G. ANSI A108.12 - American National Standard for Installation of Ceramic Tile with EGP (Exterior Glue Plywood) Latex-Portland Cement Mortar; 1999 (Reaffirmed 2010).

H. ANSI A108.13 - American National Standard for Installation of Load Bearing, Bonded, Waterproof Membranes for Thin-Set Ceramic Tile and Dimension Stone; 2005 (Reaffirmed 2010).

I. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).; 2013.1.

J. ANSI A108/A118/A136.1 - American National Standard Specifications for the Installation of Ceramic Tile (Compendium).; 2013.1.

K. ANSI A118.1 - American National Standard Specifications for Dry-Set Cement Mortar; 2012 (Revised).

L. ANSI A118.12 - American National Standard Specifications for Crack Isolation Membranes for Thin-set Ceramic Tile and Dimension Stone Installation; 2014.

M. ASTM C1027-99 Abrasion Resistance Data to equal Class Four or Class Five

N. ASTM C1028-06 Static Coefficient of Friction (COF) Slip Resistance of tile

O. ASTM C373 - Standard Test Method for Water Absorption, Bulk Density, Apparent Porosity, and Apparent Specific Gravity of Fired Whiteware Products, Ceramic Tiles, and Glass Tiles; 2014a.

P. ASTM C648-04 Breaking strength

Q. ASTM C650-04 Chemical Resistance

R. TCNA (HB) - Handbook for Ceramic, Glass, and Stone Tile Installation; 2015.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Preinstallation Meeting: Convene a preinstallation meeting one week before starting work of this section; require attendance by all affected installers. The Tiling contractor shall present for approval of architect all approved submittals of materials and demonstrate all installation methods specified.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide manufacturers' data sheets on tile, mortar, grout, and accessories. Include instructions for using grouts and adhesives.

C. Shop Drawings: Indicate tile layout, patterns, and color arrangement.

D. Samples: Mount tile and apply grout on two plywood panels, minimum 18 by 18 inches (457 by 457 mm) in size illustrating pattern, color variations, and grout joint size variations.

E. Maintenance Data: Include recommended cleaning methods, cleaning materials, and stain removal methods.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
1. See Section 01 6000 - Product Requirements, for additional provisions.
2. Extra Tile: 10 square feet (1 square meters) of each size, color, and surface finish combination.

1.06 QUALITY ASSURANCE

A. Maintain one copy of and ANSI A108/A118/A136.1 and TCNA (HB) on site.

B. Manufacturer Qualifications: Company specializing in manufacturing the types of products specified in this section, with minimum five years of documented experience.

C. Installer Qualifications: Company specializing in performing tile installation, with minimum of five years of documented experience.

1.07 MOCK-UP

A. See Section 01 4000 - Quality Requirements, for general requirements for mock-up.

B. Construct tile mock-up of each tile type where indicated on drawings, incorporating all components specified for the location; and all installation methods.
1. Approved mock-up may remain as part of the Work.

1.08 DELIVERY, STORAGE, AND HANDLING

A. Protect adhesives from freezing or overheating in accordance with manufacturer's instructions.

1.09 FIELD CONDITIONS

A. Do not install solvent-based products in an unventilated environment.

B. Maintain ambient and substrate temperature of 50 degrees F (10 degrees C) during installation of mortar materials.

PART 2 PRODUCTS

2.01 TILE

A. Refer to finish schedule for tile types, colors, basis of design manufacturers, and products. Prior to beginning work provide the architect a written statement that are equal, by the same manufacturer and are all compatible for a durable and long-lasting tile installation.
   1. Substitutions: See Section 01 6000 - Product Requirements.

2.02 TRIM AND ACCESSORIES

A. Ceramic Accessories: Glazed finish, same color and finish as adjacent field tile; same manufacturer as tile.

B. Non-Ceramic Trim: Satin natural anodized extruded aluminum, style and dimensions to suit application, for setting using tile mortar or adhesive.
   1. Applications: Edge Strips and Thresholds: [Extruded Aluminum], color as selected by Architect. Equal to Schluter, straight and radiused as required. Conform to ADAAG Requirements. Verify all tile and stone thickness in selection of trim.
      a. Refer to drawings.
   2. Manufacturers:
      a. Schluter-Systems: www.schluter.com/#sle.
      b. Substitutions: See Section 01 6000 - Product Requirements.

2.03 SETTING MATERIALS

A. Manufacturers:
   1. ARDEX Engineered Cements; _____: www.ardexamericas.com.
   2. Bostik Inc; _____: www.bostik-us.com/#sle.
   3. Custom Building Products; _____: www.custombuildingproducts.com.
   4. LATICRETE International, Inc; 4-XLT polymer fortified thin set mortar, ANSI A118.4, A118.15, A118.11, ISO 13007-1 C2T: www.laticrete.com/sle. **(Basis of Design)**
   5. Merkrete, by Parex USA, Inc; _____: www.merkrete.com/#sle.
   6. ProSpec, an Oldcastle brand; _____: www.prospec.com.
   7. Substitutions: See Section 01 6000 - Product Requirements.

B. Dry-Set Portland Cement Mortar Bond Coat: ANSI A118.1.
   1. **Provide thick set mortar bed as shown on drawings equal to Laticrete 226 with 3701 admixture.**

2.04 GROUTS

A. Manufacturers:
   1. LATICRETE International, Inc; LATICRETE SPECTRALOCK PRO Premium Grout - Premium Epoxy Grout: ANSI A118.3, **Basis of Design (or approved equal),** www.laticrete.com/#sle. specs
   2. Substitutions: See Section 01 6000 - Product Requirements.

2.05 ACCESSORY MATERIALS

A. Concrete Floor Slab Crack Isolation Membrane: Material complying with ANSI A118.12 and TCNA F125.
   1. Thickness: ____ mils (____ mm), maximum.
   2. Crack Resistance: No failure at 1/16 inch (1.6 mm) gap, minimum.
   3. Products:
      a. LATICRETE International, Inc: www.laticrete.com/#sle. Liquid crack suppression with reinforcing fabric.

b. Provide crack suppression membrane on concrete floor substrates to receive tile per manufacturer's recommendations prior to tile installation.

B. Waterproofing Membrane: equal to **Laticrete 9275** -. Other products must be approved in writing by Architect per Substitution Proceedures Section 01 2500.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within the tolerances specified for that type of work and are ready to receive tile.

B. Verify that wall surfaces are smooth and flat within the tolerances specified for that type of work, are dust-free, and are ready to receive tile.

C. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of setting materials to sub-floor surfaces.

D. Verify that concrete sub-floor surfaces are ready for tile installation by testing for moisture emission rate and alkalinity; obtain instructions if test results are not within limits recommended by tile manufacturer and setting materials manufacturer.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Protect surrounding work from damage.

B. Vacuum clean surfaces and damp clean.

C. Seal substrate surface cracks with filler. Level existing substrate surfaces to acceptable flatness tolerances.

3.03 INSTALLATION - GENERAL

A. Install tile and thresholds and grout in accordance with applicable requirements of ANSI A108.1a through ANSI A108.13, manufacturer's instructions, and TCNA (HB) recommendations.

B. Lay tile to pattern indicated. Do not interrupt tile pattern through openings.

C. Cut and fit tile to penetrations through tile, leaving sealant joint space. Form corners and bases neatly. Align floor joints.

D. Place tile joints uniform in width, subject to variance in tolerance allowed in tile size. Make grout joints without voids, cracks, excess mortar or excess grout, or too little grout.

E. Form internal angles square and external angles bullnosed.

F. Install ceramic accessories rigidly in prepared openings.

G. Install non-ceramic trim in accordance with manufacturer's instructions.

H. Sound tile after setting. Replace hollow sounding units.

I. Keep control and expansion joints free of mortar, grout, and adhesive.

J. Prior to grouting, allow installation to completely cure; minimum of 48 hours.

K. Grout tile joints unless otherwise indicated. Use standard grout unless otherwise indicated.

L. At changes in plane and tile-to-tile control joints, use tile sealant instead of grout, with either bond breaker tape or backer rod as appropriate to prevent three-sided bonding.

3.04 INSTALLATION - FLOORS - THIN-SET METHODS

A. Over interior concrete substrates, install in accordance with polymer fortified adhesive mortar manufacturer's requirements, with epoxy grout, unless otherwise indicated. Provide waterproofing /crack suppression membrane at all tiled floor locations and up all adjacent tiled walls 6" high. **Provide waterproof membrane up walls 6 inches vertically.**

3.05 INSTALLATION - WALL TILE - THIN SET METHODS

A. Over cementitious backer units on metal studs, install in accordance per TCNA (HB) Method. Provide polymer fortified adhesive thin set mortar and epoxy grout on cementitious board over metal studs. **Provide waterproof membrane at all tiled floors.**

3.06 CLEANING

A. Clean tile and grout surfaces.

3.07 PROTECTION

A. Do not permit traffic over finished floor surface for 4 days after installation.

END OF SECTION 09 3000

This page intentionally left blank

SECTION 09 5100
ACOUSTICAL CEILINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Acoustical units.

1.02 RELATED REQUIREMENTS

A. Section 05 3100 - Steel Decking: Placement of special anchors or inserts for suspension system.

B. Section 07 2100 - Thermal Insulation: Acoustical insulation.

C. Section 21 1300 - Fire-Suppression Sprinkler Systems: **Sprinkler heads in ceiling system.**

D. Section 26 5100 - Interior Lighting: Light fixtures in ceiling system.

E. Section 28 4600 - Fire Detection and Alarm: Fire alarm components in ceiling system.

F. Applicable sections from Divisions 21, 23, & 26.

1.03 REFERENCE STANDARDS

A. ASTM C635/C635M - Standard Specification for the Manufacture, Performance, and Testing of Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings; 2013a.

B. ASTM C636/C636M - Standard Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels; 2013.

C. ASTM E580/E580M - Standard Practice for Installation of Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels in Areas Subject to Earthquake Ground Motions; 2014.

D. ASTM E1264 - Standard Classification for Acoustical Ceiling Products; 2019.

E. NFPA 286 - Standard Methods of Fire Tests for Evaluating Contribution of Wall and Ceiling Interior Finish to Room Fire Growth; 2024.

F. UL (FRD) - Fire Resistance Directory; current edition.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate grid layout and related dimensioning, junctions with other ceiling finishes, and mechanical and electrical items installed in the ceiling.

C. Product Data: Provide data on suspension system components and acoustical units.

D. Samples: Submit two full size samples illustrating material and finish of acoustical units.

E. Manufacturer's Installation Instructions: Indicate special procedures and perimeter conditions requiring special attention.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. Extra Acoustical Units: Quantity equal to 5 percent of total installed.

1.05 QUALITY ASSURANCE

A. Suspension System Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

B. Acoustical Unit Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years documented experience.

1.06 FIELD CONDITIONS

A. Maintain uniform temperature of minimum 60 degrees F (16 degrees C), and maximum humidity of 40 percent prior to, during, and after acoustical unit installation.

PART 2 PRODUCTS

2.01 ACOUSTICAL UNITS - SEE FINISH SCHEDULE

A. Acoustical Panel Ceilings **(ACT-1)**
   1. Surface Texture: Medium Texture
   2. Composition: Mineral fiber
   3. Color: See finish schedule.
   4. Size: 24 in x 24 in
   5. Edge Profile: Square Lay-In
   6. Noise Reduction Coefficient (NRC) ASTM C 423 Classified w/ UL label on product carton: 0.55
   7. Ceiling Attenuation Class (CAC): ASTM C 1414; Classified with UL label on product carton: 33, 35, 40
   8. Flame Spread: ASTM E 1264; Class A
   9. Light Reflectance (LR) White Panel: ASTM E 1477; 0.80
   10. Dimensional Stability: Standard
   11. Recycle Content: Up to 43% total recycled content. (Total recycled content: pre-consumer, post-consumer and post-industrial)
   12. Material Ingredient Transparency: Health Product Declaration (HPD); Declare Label
   13. Life Cycle Assessment: Third Party Certified Environment Product Declaration (EPD)
   14. Indoor Air Quality Certified to SCS-105 v.4.2-2023
   15. Basis of Design: **CORTEGA 770**, as manufactured by Armstrong World Industries, Inc.

B. Acoustical Panel Ceilings **(ACT-2)**
   1. Surface Texture: Smooth Texture
   2. Composition: Mineral Fiber
   3. Perforation: Unperforated
   4. Color: See finish schedule.
   5. Size: 24 in x 24 in
   6. Edge Profile: Square Lay-In
   7. Ceiling Attenuation Class (CAC) : ASTM E1414/E1414M; Classified with UL label on product carton: 40
   8. Flame Spread: ASTM E1264; Class A
   9. Light Reflectance (LR) White Panel: ASTM E 1477; 0.80
   10. Dimensional Stability: Standard
   11. Recycle Content: Up to 41% total recycled content. (Total recycled content: pre-consumer, post-consumer and post-industrial)
   12. Indoor Air Quality Certified to SCS-105 v4.2-2023
   13. Basis of Design: **Clean Room VL 868**, as manufactured by Armstrong World Industries, Inc.

2.02 SUSPENSION SYSTEM(S)

A. Suspension Systems - Main beams and cross tees, base metal and end detail, fabricated from commercial quality hot dipped galvanized steel complying with ASTM A 653. Main beams and cross tees are double-web steel construction exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.

1. Exposed Steel Suspension System Type 1: Formed steel, commercial quality cold rolled; heavy-duty.
   a. Profile: Tee; 15/16 inch (24 mm) wide face.
   b. Finish: White painted.
   c. Product: Equal to Armstong Prelude XL 15/16" or Donn DXL 15/16"
   d. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

2.03 ACCESSORIES

A. Perimeter Moldings: Same material and finish as grid.
   1. At Exposed Grid Type I: Provide L-shaped molding for mounting at same elevation as face of grid.

B. Touch-up Paint: Type and color to match acoustical and grid units.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify that layout of hangers will not interfere with other work.

3.02 INSTALLATION - SUSPENSION SYSTEM

A. Install suspension system in accordance with ASTM C 636/C 636M, ASTM E 580/E 580M, ASTM C 636/C 636M, ASTM E 580/E 580M, ASTM C 636/C 636M, and ASTM E 580/E 580M and as supplemented in this section.

B. Rigidly secure system, including integral mechanical and electrical components, for maximum deflection of 1:360.

C. Lay out system to a balanced grid design with edge units no less than 50 percent of acoustical unit size.

D. Install after major above-ceiling work is complete. Coordinate the location of hangers with other work.

E. Hang suspension system independent of walls, columns, ducts, pipes and conduit. Where carrying members are spliced, avoid visible displacement of face plane of adjacent members.

F. Where ducts or other equipment prevent the regular spacing of hangers, reinforce the nearest affected hangers and related carrying channels to span the extra distance.

G. Do not support components on main runners or cross runners if weight causes total dead load to exceed deflection capability.

H. Support fixture loads using supplementary hangers located within 6 inches (150 mm) of each corner, or support components independently.

I. Do not eccentrically load system or induce rotation of runners.

J. Perimeter Molding: Install at intersection of ceiling and vertical surfaces and at junctions with other interruptions.
   1. Use longest practical lengths.
   2. Miter corners.

K. Coordinate with mechanical, plumbing and electrical.

3.03 INSTALLATION - ACOUSTICAL UNITS

A. Install acoustical units in accordance with manufacturer's instructions.

B. Fit acoustical units in place, free from damaged edges or other defects detrimental to appearance and function.

C. Fit border trim neatly against abutting surfaces.

D. Install units after above-ceiling work is complete.

E. Install acoustical units level, in uniform plane, and free from twist, warp, and dents.

F. Cutting Acoustical Units:
   1. Cut to fit irregular grid and perimeter edge trim.
   2. Make field cut edges of same profile as factory edges.

G. Where round obstructions occur, provide preformed closures to match perimeter molding.

H. Install hold-down clips on panels within 20 ft (6 m) of an exterior door.

3.04 TOLERANCES

A. Maximum Variation from Flat and Level Surface: 1/8 inch in 10 feet (3 mm in 3 m).

B. Maximum Variation from Plumb of Grid Members Caused by Eccentric Loads: 2 degrees.

END OF SECTION 09 5100

SECTION 09 5126
09 51 26 WOODWORKS LINEAR SOLID WOOD PANELS FOR CEILING

PART 1 - GENERAL

1.01 RELATED DOCUMENTS

A. Drawings and general conditions of Contract, including General and Supplementary Conditions and Divisions-1 Specification sections apply to work of this section.

1.02 SUMMARY

A. Section Includes:
   1. WoodWorks Linear Solid Wood Panels
   2. Exposed grid suspension system.
   3. Wire hangers, fasteners, main runners, cross tees, wall angle moldings and accessories.

B. Related Sections:
   1. Section 09 53 00 - Acoustical Ceiling Suspension Assembly
   2. Section 09 20 00 - Plaster and Gypsum Board
   3. Section 09 22 16 - Non-Structural Metal Framing
   4. Divisions 23 (15) - HVAC
   5. Division 26 (16) Sections - Electrical Work

C. Alternates
   1. Prior Approval: Unless otherwise provided for in the Contract documents, submit proposed product substitutions no later than TEN (10) working days prior to the date established for receipt of bids. Acceptability of a proposed substitution is contingent upon the Architect's review and acceptance. Approved products will be set forth by the Addenda. If a substitution is included in a Bid and is not approved by an Addendum, the specified products shall be provided as in place of the substitute without additional compensation.
   2. Submittals, which do not provide adequate data for the product evaluation, will not be considered. The proposed substitution must meet all requirements of this section, including but not necessarily limited to, the following: Single source materials suppliers (if specified in Section 1.5); panel design, size, composition, color, and finish; suspension system component profiles and sizes; compliance with the referenced standards.

1.03 REFERENCES

A. American Society for Testing and Materials (ASTM):
   1. ASTM A 641 Standard Specification for Zinc-Coated (Galvanized) Carbon Steel Wire.
   2. ASTM A 653 Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) by the Hot-Dip Process.
   3. ASTM A 1008 Standard Specification for Steel, Sheet, and Cold Rolled Carbon, Structural, High-Strength Low-Alloy and High-Strength Low-Alloy with Improved Formability.
   4. ASTM C 635 Standard Specification for Metal Suspension Systems for Acoustical Tile and Lay-in Panel Ceilings.
   5. ASTM C 636 Recommended Practice for Installation of Metal Ceiling Suspension Systems for Acoustical Tile and Lay-in Panels.
   6. ASTM E 84 Standard Test Method for Surface Burning Characteristics of Building Materials.
   7. ASTM E 580 Application of Ceiling Suspension Systems for Acoustical Tile and Lay-In Panels in Areas Requiring Seismic Restraint.

8. ASTM C 423 Sound Absorption and Sound Absorption Coefficients by the Reverberation Room Method.
9. ASTM E 1264 Classification for Acoustical Ceiling Products.
10. Hardwood Plywood & Veneer Association (HPVA)
11. International Building Code
12. ASHRAE Standard 62 1 2004 Ventilation for Acceptable Indoor Air Quality
13. NFPA 70 National Electrical Code
14. ASCE 7 American Society of Civil Engineers, Minimum Design Loads for Buildings and Other Structures
15. International Code Council-Evaluation Services - AC 156 Acceptance Criteria for Seismic Qualification Testing of Non-structural Components
16. International Code Council-Evaluation Services Report - Seismic Engineer Report
    a. ESR 1308 - Armstrong T-Bar or Dimensional Suspension
17. California Air Resources Board (CARB) compliant
18. LEED - Leadership in Energy and Environmental Design is a set of rating systems for the design, construction, operation, and maintenance of green buildings.

1.04 SUBMITTALS

A. Shop Drawings: Layout and details of ceilings. Show locations of items that are to be coordinated with or supported by the ceilings.

B. Installation Instructions: Submit manufacturer’s installation instructions as referenced in Part three, Installation.

C. Product Data: Submit manufacturer’s technical data for each type of ceiling unit and suspension system required.

D. Samples: Solid Wood (Poplar) Finishes - Semi-gloss tinted topcoat – Clear Finish

E. Certifications: Manufacturer’s certifications that products comply with specified requirements, including laboratory reports showing compliance with specified tests and standards.

F. Non-Conformance: All products not conforming to the requirements of this specification and or the manufacturer’s published values are to be disposed. The Contractor performing the work will replace with approved product at their expense.

1.05 QUALITY ASSURANCE

A. Single-Source Responsibility: Provide ceiling panel units and grid components by a single manufacturer.

B. Fire Performance Characteristics: Identify ceiling components with appropriate markings of applicable testing and inspecting organization.
   1. Surface Burning Characteristics: As follows, tested per ASTM E 84 and complying with ASTM E 1264 for Class C products.
   2. HPVA (Hardwood Plywood and Veneer Association) certification and audit program per ASTM E-84 tunnel test.

C. Woodworking Standards: Manufacturer must comply with specified provisions of Architectural Woodworking Institute quality standards.

D. Coordination of Work: Coordinate ceiling work with installers of related work including, but not limited to building insulation, gypsum board, light fixtures, mechanical systems, electrical systems, and sprinklers.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store ceiling components in a dry interior location in their cartons prior to installation to avoid damage. Store cartons in a flat, horizontal position. The protectors between the panels should not be removed until installation.

B. Do not store in unconditioned spaces with humidity greater than 55 percent or lower than 25 percent relative humidity and temperatures lower than 50 degrees Fahrenheit (10 degrees Celsius) or greater than 86 degrees Fahrenheit (30 degrees Celsius). Panels must not be exposed to extreme temperatures, for example, close to a heating source or near a window with direct sunlight.

C. Handle ceiling units carefully to avoid chipped edges or damage to units in any way.

1.07 PROJECT CONDITIONS

A. Wood ceiling materials should be permitted to reach room temperature and have a stabilized moisture content for a minimum of 72 hours before installation. (Remove plastic wrap to allow panels to climatize).

B. The wood panels should not be installed in spaces where the temperature or humidity conditions vary from the temperatures and conditions that will be normal in the occupied space.

C. As interior finish products, the solid wood panels are designed for installation in temperature conditions between 50 degrees Fahrenheit (10 degrees Celsius) and 86 degrees Fahrenheit (30 degrees Celsius), in spaces where the building is enclosed, and HVAC systems are functioning and will be in continuous operation. Relative humidity should not fall below 25 percent or exceed 55 percent.

1.08 WARRANTY

A. WoodWorks Linear Solid Wood Panels: Submit a written warranty executed by the manufacturer, agreeing to repair or replace panels that fail within the warranty period. Failures include, but are not limited to:
   1. WoodWorks Linear Solid Wood Panels: Defects in materials or factory workmanship.
   2. Grid System: Rusting and manufacturing defects.

B. Warranty Period:
   1. WoodWorks Linear Solid Wood Panels: One (1) year from date of installation.
   2. Grid: Ten years from date of installation.

C. The Warranty shall not deprive the Owner of other rights the Owner may have under other provisions of the Contract Documents and will be in addition to and run concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

1.09 MAINTENANCE

A. Extra Materials: Deliver extra materials to Owner. Furnish extra materials described below that match products installed. Packaged with protective covering for storage and identified with appropriate labels.
   1. Ceiling Units: Furnish quality of full-size units equal to 2.0 percent of amount installed.
   2. Exposed Suspension System Components: Furnish quantity of each exposed suspension component equal to 1.0 percent of amount installed.

PART 2 - PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design WoodWorks Linear Solid Wood Panels: **Basis of Design**

1. Armstrong World Industries, Inc.

B. Suspension Systems:
   1. Armstrong World Industries, Inc.

C. Substitutions - See Spec Section 01 6000

2.02 WOOD CEILING UNITS

A. Ceiling & Wall Panels: See **"CP-1"** and **"WP-1"**
   1. Surface Texture: Smooth
   2. Composition: Solid Wood (Poplar)
   3. Finish(s): Tinted, UV Cured Topcoat Finishes on Solid Wood (Poplar)
      a. Color: See finish schedule.
   4. Material IDs & Dimensions:
      a. Dimensions:
         1) Panel Width: 12-inch (Nominal)
         2) Panel Length Size(s): With 1” reveal panel to panel @ lengths
            (a) 96-inch (Nominal): 95-inch (Actual)
         3) Plank Height: 3/4 inch (19.05 mm)
         4) Panel Height: 1-1/4 inch (32 mm)
         5) Design Options & Material IDs:
            (a) 5-1/4” (Actual Plank Width) x 3/4” (Actual Plank Height) – 2 Planks at 12”x96”x1-1/4”
   5. Acoustical Performance Infill Options:
            (a) Calla Square Lay-in panel - Item 2820BK:
   6. Flame Spread: Class C ASTM E84

ACCESSORIES:
   1. 8ft Ledger item 6571_ _ _
   2. Heavy Duty Wall Anchor – item 7100
   3. Backer Clip – item 5687
   4. Flat Backet Kit – item 7290GBL
   5. WoodWorks Solid End-Stain (Gallon Size) - item 5457GAL1 _ _ _ (Finish Suffix)
   6. WoodWorks Solid End-Stain (Quart Size) - item 5457QT1_ _ _ (Finish Suffix)

3.02 SUSPENSION SYSTEMS

A. Components: All main beams and cross tees shall be commercial quality hot dipped galvanized steel as per ASTM A653. Main beams and cross tees are double-web steel construction with 15/16-inch type exposed flange design. Exposed surfaces chemically cleansed, capping prefinished galvanized steel in baked polyester paint. Main beams and cross tees shall have rotary stitching.
   1. Structural Classification: ASTM C635 (Heavy Duty).
   2. Color: Tech Black.
   3. Acceptable Product: Prelude XL 15/16" Exposed Tee Main beam item 7301BL, Prelude XL Exposed Tee item XL7341BL, Prelude XL Exposed Tee 2’ item XL7328BL, and Prelude XL Exposed Tee 2’ item XL8320BL as manufactured by Armstrong World Industries, Inc.

B. Attachment Devices: Size for five times design load indicated in ASTM C 635, Table 1, Direct Hung unless otherwise indicated.

C. Wire for Hangers and Ties: ASTM A641, Class 1 zinc coating, soft temper, pre-stretched, with a yield stress load of at least times-three design load, but not less than 12 gauge.

D. Accessories/Edge Moldings and Perimeter Trim:
   1. 4” Solid Wood Trim with 4 Clips – item7146H4L96_ _ _ (Finish Suffix)
   2. 6” Solid Wood Trim with 4 Clips – item7146H6L96_ _ _ (Finish Suffix)
   3. Replacement Trim Clip – item 5925
   4. Adjustable Trim Clip – item 7239
   5. Axiom Straight Trim - Recommend in Black 6” and up – AX_VESTR_ _ _ (Finish Suffix)
   6. Axiom Curved Trim - Recommend in Black 6” and up – AX_VECUR_ _ _ (Finish Suffix)

PART 3 - EXECUTION

4.01 EXAMINATION

A. Do not proceed with installation until all wet work such as concrete, terrazzo, plastering and painting has been completed and thoroughly dried out.

B. Proper designs for both supply air and return air, maintenance of the HVAC filters and building interior space are essential to minimize soiling. Before starting the HVAC system, make sure supply air is properly filtered and the building interior is free of construction dust.

4.02 PREPARATION

A. Measure each ceiling area and establish layout of acoustical units to balance border widths at opposite edges of each ceiling. Avoid use of less than half width units at borders and comply with reflected ceiling plans. Coordinate panel layout with mechanical and electrical fixtures.

B. WoodWorks ceiling materials should be permitted to reach room temperature and have a stabilized moisture content for a minimum of 72 hours before installation. (Remove plastic wrap to allow panels to climatize).

4.03 INSTALLATION

A. Interior WoodWorks products, the solid wood panels are designed for installation in temperature conditions between 50 degrees Fahrenheit (10 degrees Celsius) and 86 degrees Fahrenheit (30 degrees Celsius), in spaces where the building is enclosed, and HVAC systems are functioning and will be in continuous operation. Relative humidity should not fall below 25 percent or exceed 55 percent.

B. Install suspension system and panels in compliance with ASTM C636, ASTM E580, with the approval of the authorities having jurisdiction, and in accordance with the manufacturer’s WoodWorks Linear Solid Wood Panels Installation Instructions.

4.04 ADJUSTING AND CLEANING

A. Replace damaged and broken panels.

B. Clean exposed surfaces of ceilings panels, including trim, edge moldings, and suspension members. Comply with manufacturer’s instructions for cleaning and touch up of minor finish damage.

END OF SECTION 09 5126

This page intentionally left blank

SECTION 09 6513
RESILIENT FLOORING ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient base.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors to receive adhesive-applied resilient flooring.

C. Section 09 0561 - Common Work Results for Flooring Preparation: Removal of existing floor coverings, cleaning, and preparation.

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

B. ASTM F1913 - Standard Specification for Vinyl Sheet Floor Covering Without Backing; 2019 (Reapproved 2025).

C. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.

D. ASTM E662 - Standard Test Method for Specific Optical Density of Smoke Generated by Solid Materials; 2013b.

E. ASTM F137 - Standard Test Method for Flexibility of Resilient Flooring; 2011

F. ASTM F1514 - Standard Test Method for Measuring Heat Stability for Color Change; 2003 (Reapproved 2008)

G. ASTM F1515 - Standard Test Method for Measuring Light Stability of Resieleint Flooring by Color Change; 2003 (Reapproved 2008)

H. ASTM F1914 - Standard Test Method for Short-Term Indention and Residual Indention of Resileint FLoor Covering; 2007 (Reapproved 2011)

I. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anydrous Calcium Chloride; 2011

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate seaming plans and floor patterns.

C. Verification Samples: Submit two samples, 12 by 12 inch (___ by ___ mm) in size illustrating color and pattern for each resilient flooring product specified.

D. Concrete Subfloor Test Report: Submit a copy of the moisture and alkalinity (pH) test reports. See Specification 09 0561.

E. Maintenance Data: Include maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning, stripping, and re-waxing.

F. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.
   2. Extra Materials/ Attic Stock: Quantity equivalent to 3 percent of each type and color.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in installing specified flooring with minimum three years documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and the correct style, color, quantity and run numbers.

B. Store all materials off of the floor in an acclimatized, weather-tight space.

C. Maintain temperature in storage area between 55 degrees F (13 degrees C) and 90 degrees F (72 degrees C).

D. Protect roll materials from damage by storing on end.

E. Do not double stack pallets.

1.07 FIELD CONDITIONS

A. Maintain ambient temperatures as recommeded by the manufacturer but not less than 65 degrees or more than 85 degrees.

B. Maintain the ambient relative humidity between 40-60% during installation.

PART 2 PRODUCTS

2.01 RESILIENT BASE - SEE FINISH SCHEDULE

A. Traditional Rubber Resilient Base, see **RB-1** on Finish Schedule: ASTM F1861, Type TV, vinyl, thermoplastic; top set Style B, Cove.
   1. Manufacturers:
      a. Burke Flooring; Commercial Wall Base - TS: www.burkeflooring.com/#sle.
      b. Johnsonite, a Tarkett Company: www.johnsonite.com/#sle. **Basis of Design**
      c. Roppe Corp: www.roppe.com/#sle.
   2. Length: Roll.
   3. Color: See finish schedule.
   4. Accessories: Premolded external corners.
   5. Style: Cove (with top-set toe).
   6. Height: See finish schedule.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that surfaces are flat to tolerances acceptable to flooring manufacturer, free of cracks that might telegraph through flooring, clean, dry, and free of curing compounds, surface hardeners, and other chemicals that might interfere with bonding of flooring to substrate.

B. Cementitious Subfloor Surfaces: Verify that substrates are ready for resilient flooring installation by testing for moisture and alkalinity (pH).
   1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive manufacturer.

C. **Flooring manufacturers to give architect written approval that substrate is acceptable prior to commencing with any floor installation. This shall not add any cost to the owner or time to the contract schedule.**

D. Refer to paragraph 1.03 References for floor substrate testing.

E. Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities shall be filled or smoothed with patching or underlayment compound

recommended by the resilient flooring manufacturer and for job conditions for filling or smoothing, or both. The flooring contractor shall include these cost in their bid.

1. Obtain instructions if test results are not within limits recommended by resilient flooring manufacturer and adhesive materials manufacturer.

3.02 INSTALLATION - GENERAL

A. Starting installation constitutes acceptance of subfloor conditions.

B. Install in accordance with manufacturer's written instructions.

3.03 INSTALLATION - RESILIENT BASE

A. Fit joints tightly and make vertical. Maintain minimum dimension of 18 inches (45 mm) between joints.

B. Install base on solid backing. Bond tightly to wall and floor surfaces.

3.04 CLEANING

A. Remove excess adhesive from floor, base, and wall surfaces without damage.

B. Clean in accordance with manufacturer's written instructions.

3.05 PROTECTION

A. Prohibit traffic on resilient flooring for 48 hours after installation.

B. No heavy traffic, rolling loads or furniture for 72 hours after installation.

END OF SECTION 09 6513

This page intentionally left blank

SECTION 09 6519
RESILIENT TILE FLOORING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Resilient tile flooring.

B. Installation accessories:
   1. Adhesives.
   2. Finishes and cleaners.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions: SCS FloorScore certification documentation.

B. Section 01 7419 - Construction Waste Management and Disposal.

C. Section 03 3000 Cast in Place Concrete

D. Section 07 9200 - Joint Sealants.

E. Section 09 0561 Common Work Results from Flooring Prep

1.03 REFERENCE STANDARDS

A. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

B. ASTM F1700 - Standard Specification for Solid Vinyl Floor in Modular Format such as Tile(s) or Plank(s); 2025.

C. ASTM F1869 - Standard Test Method for Measuring Moisture Vapor Emission Rate of Concrete Subfloor Using Anhydrous Calcium Chloride; 2011.

D. ASTM F2170 - Standard Test Method for Determining Relative Humidity in Concrete Floor Slabs Using in situ Probes; 2011.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Manufacturer's documentation for flooring and accessories:
   1. Technical Data.
   2. Installation and Maintenance.
   3. Warranty.

C. Verification Samples: Submit two samples, 6 by 30 inch (____ by ____ mm) in size illustrating color and pattern for each resilient flooring product specified.

D. Verification Samples: Submit two samples, full size, illustrating color and pattern for each resilient flooring product specified.

1.05 DELIVERY, STORAGE, AND HANDLING

A. Upon receipt, immediately remove any shrink-wrap and check materials for damage and that the material is of the correct style, color, quantity and run number(s).

B. Store all materials flat and off of the floor in an acclimatized, weather-tight space between 65 to 85 degrees F (18 to 29 degrees C).

C. Do not double stack pallets.

1.06 FIELD CONDITIONS

A. Acclimate material at jobsite between 65 to 85 degrees F (18 to 29 degrees C) and 35 percent to 85 percent relative humidity for 48 hours prior to installation. Temperature and relative humidity should also be maintained at the same levels during installation, and after installation.

B. Spread unopened cartons no more than 6 cartons high and at least 4 inches (101 mm) apart.

C. Keep away from heating and cooling ducts and direct sunlight.

D. If permanent HVAC is not operational, temporary means should be used to maintain the recommended temperature and relative humidity levels.

E. Close areas to traffic during installation of flooring and accessories.

1.07 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with not less than three years of documented experience.

B. Installer Qualifications: Should only be installed by professional flooring mechanics that have demonstrated successful installations of jobs in similar size and scope.

1.08 WARRANTY

A. Manufacturer's Limited 20-Year and Limited 25-Year Commercial Warranty for Luxury Vinyl Flooring

PART 2 PRODUCTS

2.01 RESILIENT TILE FLOORING

A. Luxury Vinyl Flooring: Refer to finish schedule for **LVT-1.**
   1. Equal to Tarkett, Event + Wood, **Basis of Design**
   2. Color: See finish schedule.
   3. Size: See finish schedule.
   4. Physical Properties:
      a. Finish: Techtonic
      b. Wear Layer Thickness: 30 mil
      c. Edge Treatment: Square Edge
      d. Overall Thickness: 0.120" (3.0 mm)
   5. Manufacturing, Performance, and Safety Standards:
      a. Meets ASTM F1700, Class III, Type B performance
      b. Static Load Limit (ASTM F970): 250 psi, ≤ 0.005”
         1) *Modified 2000 psi: ≤ 0.005”
      c. Residual Indentation (ASTM F1914): Passes
      d. Static Coefficient of Friction (ASTM D2047): SCOF ≥ 0.5
      e. Dimensional Stability (ASTM F2199): Passes
      f. Resistance to Heat (ASTM F1514): ΔΣ ≤ 8.0
      g. Resistance to Light (ASTM F1515): ΔΣ ≤ 8.0
      h. Chemical Resistance (ASTM F925): Passes
      i. Fire Resistance (ASTM E648): CRF ≥ 0.45 watts/cm2 NFPA, Class I

B. Luxury Vinyl Flooring: Refer to finsh schedule for **LVT-2 and LVT-3.**
   1. Equal to Tarkett, Color + Light & Tarkett, Castlerock Sandstone, **Basis of Design**
   2. Color: See finish schedule.
   3. Size: See finish schedule.
   4. Physical Properties

a. Finish: Techtonic
b. Wear Layer Thickness: 32 mil
c. Edge Treatment: Square Edge
d. Overall Thickness: .120" (3.00 mm)

5. Manufacturing, Performance, and Safety Standards:
   a. Meets ASTM F1700, Class III, Type B performance
   b. Flexibility (ASTM F137): Passes
   c. Static Load Limit (ASTM F970): 250 psi, ≤ 0.005”
      1) *Modified 2000 psi: ≤ 0.005”
   d. Residual Indentation (ASTM F1914): Passes
   e. Static Coefficient of Friction (ASTM D2047): SCOF ≥ 0.5
   f. Dimensional Stability (ASTM F2199): Passes
   g. Resistance to Heat (ASTM F1514): ΔΣ ≤ 8.0
   h. Resistance to Light (ASTM F1515): ΔΣ ≤ 8.0
   i. Chemical Resistance (ASTM F925): Passes
   j. Fire Resistance (ASTM E648): CRF ≥ 0.45 watts/cm2 NFPA, Class I

C. Luxury Vinyl Flooring: Refer to finish schedule for **LVT-4, LVT-5, LVT-6, and LVT-7**
   1. Equal to Tarkett, Victory Hues & Tones, **Basis of Design**
   2. Color: See finish schedule.
   3. Size: See finish schedule.
   4. Physical Properties
      a. Wear Layer Thickness: N/A (Homogenous product)
      b. Edge Treatment: Square Edge or Slight Bevel
      c. Overall Thickness: 0.120" (3.0 mm)
      d. Standard Emboss: Slate
   5. Manufacturing, Performance, and Safety Standards:
      a. Meets ASTM F1700, Class III, Type B performance
      b. Static Load Limit (ASTM F970): 250 psi, ≤ 0.005”
         1) *Modified 1500 psi: ≤ 0.005”
      c. Residual Indentation (ASTM F1914): Passes
      d. Static Coefficient of Friction (ASTM D2047): SCOF ≥ 0.5
      e. Dimensional Stability (ASTM F2199): Passes
      f. Resistance to Heat (ASTM F1514): ΔΣ ≤ 8.0
      g. Resistance to Light (ASTM F1515): ΔΣ ≤ 8.0
      h. Chemical Resistance (ASTM F925): Passes
      i. Fire Resistance (ASTM E648): CRF ≥ 0.45 watts/cm2 NFPA, Class I

D. Moldings, Transition and Edge Strips: See dwgs for transtion details.

E. Adhesive and Adhesive Encapsulators: As recommended by flooring manufacturer.

F. Finishes and Cleaners: As recommended by flooring manufacturer.

PART 3 EXECUTION

3.01 EXAMINATION _____

A. Install flooring and accessories after other operations (including painting) have been completed.

B. Acceptance of Conditions: Carefully examine all installation areas with installer/applicator present, for compliance with requirements affecting work performance.
   1. Verify that field measurements, product, adhesives, substrates, surfaces, structural support, tolerances, levelness, temperature, humidity, moisture content level, pH,

cleanliness and other conditions are as required by the manufacturer, and ready to receive work.

C. Verify that substrate is contaminant-free, including old adhesives and any chemicals.

D. Test substrates as required by manufacturer to verify proper conditions exist.
   1. Concrete:
      a. Check for concrete additives such as fly ash, curing compounds, hardeners, or other surface treatments that may prevent proper bonding of floor coverings.
      b. Moisture testing: Perform either the In-Situ Relative Humidity (RH) test (ASTM F2170) or Moisture Vapor Emission Rate (MVER) test (ASTM F1869). Refer to the Manufacturer's Installation Guide/Manual for the maximum allowable substrate moisture content. Substrates above the maximum allowable moisture content will require a moisture mitigation system.
      c. Perform alkalinity testing to verify pH level is between 5 to 9 per ASTM F710.

E. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prior to installation, the flooring installer should plan and attend an on-site construction meeting with the General Contractor, Architect and Property Owner to review all requirements and inspect site conditions as outlined in the manufacturer's installation document, as well as to review the requirements of ASTM F710 and any relevant building codes, or local, state, or national regulations.

B. Flooring installation should not begin until all site conditions have been assessed, testing has been completed and subfloor conditions have been approved.

C. Prepare per manufacturer's written instructions, Section 01 7000, and as follows:
   1. Prepare substrates to ensure proper adhesion of Luxury Vinyl Plank and Tile Flooring.
   2. Concrete Substrates: Prepare substrate per ASTM F710.
      a. Verify that subfloor is clean, flat, smooth, free of dirt, rust, paint, oil, wax or any contaminant that will interfere with adhesive bonding.
      b. Mechanically remove substrate coatings that are not compatible with adhesives, such as sealers, curing, hardening or parting compounds, soap, wax, oil, etc.
         1) Do not use solvents or adhesive removers.
      c. Expansion joints, isolation joints, or other moving joints must be honored and must not be filled with underlayment products or other materials, and floor coverings must not be laid over them. Expansion joint covering systems should be detailed by the architect or engineer, and based upon intended usage and aesthetic considerations.
      d. Surface cracks, grooves, depressions, control joints or other non-moving joints, and other irregularities shall be filled or smoothed with high-quality Portland cement or calcium aluminate based patching or underlayment compound for filling or smoothing, or both.
         1) Do not skim-coat large areas with patching compound, especially slick power-troweled surfaces.
         2) Sand smooth per manufacturer's instructions.
      e. Slick surfaces such as power-troweled concrete shall be profiled as needed to allow for a mechanical bond between the adhesive and subfloor.
      f. Do not use gypsum-based underlayment products and do not skim coat concrete subfloors.
      g. Self-Leveling Underlayments: Provide a dry and smoothly-sanded underlayment substrate ready for installation of Luxury Vinyl Plank Underlayment compound shall

be moisture-resistant, mildew-resistant, and alkali-resistant and must have a minimum of 3,000 psi compressive strength per ASTM C109/C109M prior to installation of underlayment provide architect with written approval by flooring manufacturer citing all specified warranties will be in affect.

h. Lightweight concrete shall have a compressive strength greater than 90 pounds per cubic foot with minimum compression strength of 2,500 psi or greater.

3. Existing and Other Substrates:
   a. Refer to manufacturer's professional installation guide and/or contact manufacturer, as special conditions may exist.

3.03 INSTALLATION

A. Installation per manufacturer's written instructions, Section 01 7000, and as follows:
   1. Layout shall be specified by Architect, Designer or End User.
   2. Follow layout and ensure installation reference lines are square.
   3. Field tiles shall be installed with directional arrows on back aligned in the same direction, or may be installed in quarter-turned fashion.
   4. Check cartons for and do not mix dye lots.
   5. Expansion Joints: Locate expansion, isolation, and other moving joints prior to installation.
      a. Do not fill expansion, isolation, and other moving joints with patching compound nor cover with resilient flooring.
      b. Install movement joint systems per manufacturer's instructions.
   6. Adhesives: Adhere flooring to substrate using the full spread method resulting in a completed installation without gaps, voids, raised edges, bubbles or any other surface imperfections.
      a. Select appropriate adhesive, trowel and follow manufacturer's instructions.
      b. Periodically spot-check transfer of adhesive to back of tile during installation.
      c. Roll floor with a 100 pound roller to ensure proper transfer of adhesive and bonding.
      d. Protect floor from traffic per manufacturer's instructions.
      e. Do not wet mop floor until the adhesive has properly set per written instructions.

3.04 FIELD QUALTITY CONTROL

A. Site tests and inspections per Section 01 4000 and as follows:
   1. Inspect flooring installation for non-conforming work including (but not limited to) the following:
      a. Lack of adhesion.
      b. Bubbles, loose tiles or raised edges.
      c. Dirt and debris underneath flooring.
      d. Excessive gaps.
      e. Improper substrate preparation (as indicated by telegraphing).
      f. Damage to tiles, including: dents/indentations, cuts, cracks, burns or punctures.

B. Non-conforming work per General Conditions and as follows:
   1. Repair or replace damaged material if not acceptable to the Architect.

3.05 CLEANING

A. Waste Management per Section 01 7000 and as follows:
   1. Coordinate material reclamation program with manufacturer, if applicable.
      a. Store and return cartons and pallets to manufacturer or recycler for reuse or recycling.

B. Provide progress cleaning per manufacturer's written instructions, Section 01 7000, and as follows:
   1. Work Areas: Clean areas where work is in progress to the level of cleanliness necessary for proper execution of the work.
      a. Clean and protect completed construction until Date of Substantial Completion.
      b. During installation, remove wet adhesive from surface of flooring per manufacturer's instructions.
   2. Site: Maintain project site free of waste materials and debris.

C. Provide final cleaning immediately prior to Date of Substantial Completion inspection per manufacturer's written instructions and Section 01 7000 and 01 7800
   1. Protection: Remove manufacturer's and other installed protection immediately prior to Date of Substantial Completion inspection, unless required otherwise.
   2. Clean floor with a neutral 6-8 pH cleaner or as recommended by manufacturer.

3.06 MAINTENANCE

A. Initial maintenance per flooring manufacturer’s written instructions.

3.07 PROTECTION

A. Protect materials from construction operations until Date of Substantial Completion or Owner occupancy, whichever occurs first.
   1. Protect finished floor from abuse and damage by using heavy non-staining kraft paper, drop cloths or equivalent. Use additional, non-damaging protective materials as needed.
   2. Light foot traffic on a newly installed floor can be permitted after 24 hours.
   3. Keep heavy traffic and rolling loads off the newly installed LVT flooring for 48 hours.
   4. Protect the floor from rolling loads by covering with protective boards.

END OF SECTION 09 6519

SECTION 09 6813
TILE CARPETING

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Carpet tile

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

B. Section 01 60 00 Product Requirements

C. Section 03 3000 - Cast-in-Place Concrete: Restrictions on curing compounds for concrete slabs and floors.

D. Division 26: Electrical floor boxes with carpet inserts.

E. Section 09 0561 Common Work Results from Flooring Prep

1.03 REFERENCE STANDARDS

A. ASTM D2859 - Standard Test Method for Ignition Characteristics of Finished Textile Floor Covering Materials; 2016 (Reapproved 2021).

B. ASTM E648 - Standard Test Method for Critical Radiant Flux of Floor-Covering Systems Using a Radiant Heat Energy Source; 2014c.

C. ASTM F710 - Standard Practice for Preparing Concrete Floors to Receive Resilient Flooring; 2011.

D. CRI 104 - Standard for Installation of Commercial Carpet; 2015.

E. CRI (CIS) - Carpet Installation Standard; Carpet and Rug Institute; 2011.

F. CRI (GLP) - Green Label Plus Testing Program - Certified Products; Current Edition.

G. NFPA 253 - Standard Method of Test for Critical Radiant Flux of Floor Covering Systems Using a Radiant Heat Energy Source; 2023.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on specified products, describing physical and performance characteristics; sizes, patterns, colors available, and method of installation.

C. Shop Drawings: Indicate layout of joints.

D. Samples: Submit two carpet tiles illustrating color and pattern design for each carpet color selected.

E. Manufacturer's written Installation Instructions: Indicate special procedures, perimeter conditions requiring special attention, and ____.

F. Maintenance Data: Include written maunufactueres maintenance procedures, recommended maintenance materials, and suggested schedule for cleaning.

G. Maintenance Materials: Furnish the following for Owner's use in maintenance of project.
   1. See Section 01 6000 - Product Requirements, for additional provisions.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing specified carpet tile with minimum three years documented experience.

B. Installer Qualifications: Company specializing in installing carpet tile with minimum 3 years documented experience and approved by carpet tile manufacturer.

1.06 FIELD CONDITIONS

A. Store materials in area of installation for minimum period of 24 hours prior to installation.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Tile Carpeting: Refer to finish schedule.
   1. Substitutions: See Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Tile Carpeting, Type Basis of Design:

B. Product Type: See finish schedule for **"CPT-1", Basis of Design**
   1. Manufacturer: Tarkett
   2. Collection: Offset
   3. Color: See finish schedule.
   4. Size: See finish schedule.
   5. Product Construction: Stratatec Patterned Loop
   6. Fiber System: Dynex SD Nylon (Permanent Stain Resistance)
   7. Gauge: 5/64
   8. Pile Thickness: 0.055 in
   9. Pile Density: 9,164 oz/ cu yd
   10. Flooring Radiant Panel (ASTM E-648) Class 1
   11. Smoke Generation (ASTM E-662) Less than 450
   12. Surface Flammability (ASTM D-2859) Passes CPSC FF 1-70

C. Product Type: See finish schedule for **"CPT-2", Basis of Design**
   1. Manufacturer: Interface
   2. Collection: Rising Signs
   3. Product: Spandrel
   4. Product Number: 139340AK00
   5. Color: See finish schedule.
   6. Size: See finish schedule.
   7. Backing: GlasBac
   8. Product Construction: Engaged Tufted Sheared
   9. Yarn System: 100% Recycled Content Nylon
   10. Machine Gauge: 1/10 in
   11. Pile Thickness: 0.142 in
   12. Pile Density: 7,099 oz/yd^3
   13. Flooring Radiant Panel (ASTM E-648) Passes
   14. Smoke Density (ASTM E662) ≤ 450
   15. Flammability: Passes Methenamine Pill Test

D. Product Type: See finish schedule for **"WM", Basis of Design**
   1. Manufacturer: Interface
   2. Collection: Step Repeat
   3. Product: SR899
   4. Product Number: 1388602500
   5. Color: See finish schedule.

6. Size: See finish schedule.
7. Backing: GlasBac
8. Product Construction: Tufted Textured Loop
9. Yarn System: 100% Recycled Content Nylon
10. Machine Gauge: 1/12 in
11. Pile Thickness: 0.143 in
12. Pile Density: 6,545 oz/yd^3
13. Flooring Radiant Panel (ASTM E-648) Passes
14. Smoke Density (ASTM E662) ≤ 450
15. Flammability: Passes Methenamine Pill Test

2.03 ACCESSORIES

A. Sub-Floor Filler: ____; per written recommendations of flooring materials manufacturer.

B. Edge Strips and Thresholds: Extruded Aluminum, color as selected by Architect. Refer to drawings for details. Equal to Schluter, straight and radiused as required. Conform to ADAAG Requirements.

C. Adhesives:
1. Compatible with materials being adhered; maximum VOC content as specified in Section 01 6116.
2. Carpet Tile Adhesive: Per written recommendations of carpet tile manufacturer; releasable type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that sub-floor surfaces are smooth and flat within tolerances specified for that type of work and are ready to receive carpet tile.

B. Verify that sub-floor surfaces are dust-free and free of substances that could impair bonding of adhesive materials to sub-floor surfaces.

C. Cementitious Sub-floor Surfaces: Verify that substrates and concrete sub-floor are dry enough and ready for flooring installation by testing for moisture emission rate and pH in accordance to ASTM F 170.
1. Obtain manufacturer's written instructions if test results are not within limits recommended by flooring manufacturer and adhesive manufactuer.

D. Verify that required floor-mounted utilities are in correct location.

3.02 PREPARATION

A. Prepare floor substrates as recommended by flooring and adhesive manufacturers written instructions.

B. Remove sub-floor ridges and bumps. Fill minor or local low spots, cracks, joints, holes, and other defects with sub-floor filler per written instructions of flooring manufacturer.

C. Vacuum clean substrate per manufacturers written instructions.

3.03 INSTALLATION

A. Starting installation constitutes acceptance of sub-floor conditions. Provide maunfacturers written approval of substrate prior to installation of carpet.

B. Install carpet tile in accordance with manufacturer's instructions.
1. Install using a 'releasble' glue system, 'peel and sitck', or tackable dots, in accordance with manufacturer's written instructions. Direct-glue method is unacceptable.

C. Blend carpet from different cartons to ensure minimal variation in color match.
D. Cut carpet tile clean. Fit carpet tight to intersection with vertical surfaces without gaps.
E. Lay carpet tile in accordance with manufacturer's installation methods. Architect to select.
F. Trim carpet tile neatly at walls and around interruptions.
G. Complete installation of edge strips, concealing exposed edges.

3.04 ATTIC STOCK

A. 5% of installed amount

3.05 CLEANING

A. Remove excess adhesive without damage, from floor, base, and wall surfaces.
B. Clean and vacuum carpet surfaces.

END OF SECTION 09 6813

SECTION 09 7000
ARCHITECTURAL FINISHES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Architectural finish films for the following interior applications: (3M DI-NOC Architectural)
   1. Resurfacing existing doors to remain. See floor plans and 01 2300 Alternates.

1.02 RELATED SECTIONS

A. 08 1416 Flush Wood Doors

B. 08 1113 Hollow Metal Doors and Frames

1.03 REFERENCES

A. ASTM International (ASTM): ASTM E 84 - Standard Test Method for Surface Burning Characteristics of Building Materials.

B. ASTM International (ASTM): ASTM E 308 - Standard Recommended Practice for Spectophotometry and Description of Color in CIE 1931 System.

C. ASTM International (ASTM): ASTM E 903 - Standard Methods of Test for Solar Absorbance, Reflectance and Transmittance of Materials Using Integrating Spheres.

D. Underwriters Laboratories, Inc. (UL): UL 723 - Test for Surface Burning Characteristics of Building Materials.

1.04 SUBMITTALS

A. Submit under provisions of Section 01 30 00 - Administrative Requirements.

B. Product Data: Manufacturer's data sheets for products specified, including but not limited to:
   1. Performance characteristics.
   2. Preparation instructions and recommendations.
   3. Storage and handling requirements and recommendations.
   4. Maintenance data for installed products, including precautions against harmful cleaning materials and methods.
   5. Installation Instructions.

C. Shop Drawings: Submit shop drawings showing layout, profiles, and product components, including dimensions, anchorage, and accessories.

D. Verification Samples: For each film specified, two samples, 4 inches x 4 inches (100 mm x 100 mm), representing actual architectural film colors and patterns.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Regularly engaged in the manufacture of architectural finish films.

B. Installer Qualifications: Installation shall be performed by a trained and qualified installer, specialized and experienced in work required for this project. A list of 3M Endorsed installers is available at 3M.com/AMD or 3M Commercial Solutions, 1-888-650-3497.

C. Mock-Up: Provide a mock-up for evaluation of surface preparation techniques and application workmanship.
   1. Finish areas designated by Architect.
   2. Do not proceed with remaining work until workmanship is approved by Architect.
   3. Refinish mock-up area as required to produce acceptable work.
   4. Mock-up area may become part of finished work.

D. Performance:
   1. Description: Faux design appearance and texture graphic film with pressure-sensitive adhesive and air release channels. Field applied application.
   2. Film for 3M DI-NOC Architectural: Vinyl 8 mil (0.2032 mm) thickness (thickness includes film and adhesive, excludes liner).
   3. Liner: Silicone-coated poly paper, 6.2 mils (0.15748 mm).
   4. Adhesive: Pressure sensitive with air release channels, as recommended by manufacturer.
   5. Surface-Burning Characteristics for 3M DI-NOC: Per ASTM E84/UL-723:
      a. Flame-Spread Index: 25 or less, or 26-75 depending on pattern.
      b. Smoke-Developed Index: 450 or less.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver, store and handle materials and products in strict compliance with manufacturer's instructions and recommendations and industry standards.

B. Deliver products in manufacturer's original, unopened, undamaged containers with identification labels intact.

C. Store products protected from weather, temperature, and other harmful conditions as recommended by supplier. Conditions including but not limited to:
   1. 40 degrees Fahrenheit (4.44 degrees Celsius) to 90 degrees Fahrenheit (32.22 degrees Celsius) maximum temperature.
   2. Out of sunlight.
   3. Clean dry area.
   4. Original container.
   5. Do not stack boxes over six (6) units high. Excessive weight can damage the film
   6. Relative humidity below 80 percent.
   7. Handle products in accordance with manufacturer's instructions.

1.07 PROJECT CONDITIONS

A. Maintain environmental conditions (temperature, humidity and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.
   1. Acceptable Temperature Range: 54 degrees Fahrenheit (12.22 degrees Celsius) to 100 degrees Fahrenheit (37.78 degrees Celsius).

B. Environmental Limitations: Do not install until spaces are enclosed and weatherproof, wet work in spaces is complete and dry, work above ceilings is complete, and ambient temperature and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use

1.08 WARRANTY

A. Manufacturer's Standard Limited Warranty: For materials and workmanship.

1.09 EXTRA MATERIALS

A. Extra Materials: Furnish 2 percent extra materials in accordance with procedures established in pre-installation conference. Deliver in protective packaging for storage and label contents appropriately.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: 3M Commercial Solutions, which is located at: 3M Center Bldg. 223; St. Paul, MN 55144-1000; Toll Free Tel: 888-650-3497; Tel: 651-737-1081; Fax: 651-737-8241; Email:request info (apeters2@mmm.com); Web:http://www.3m.com/3M/en_US/architectural-design-us/?utm_medium=redirect&utm_source=vanity-url&utm_campaign=www.3M.com/AMD|http://www.3m.com/3M/en_US/building-window-solutions-us

B. Requests for substitutions will be considered in accordance with provisions of Section 01 60 00 - Product Requirements.

2.02 ARCHITECTURAL FINISH FILMS

A. Architectural Finish Films: 3M DI-NOC Architectural Finishes as manufactured by 3M Company - Commercial Solutions.

B. Style: Wood.
   1. Color/Pattern: _____.
   2. Color/Pattern: As selected by Architect from manufacturer's full range.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrate(s) for compliance with requirements for non-porous, smooth surface and other conditions affecting the performance of work in this section. Do not proceed with installation until unsatisfactory conditions have been corrected.

B. Do not proceed with installation until unsatisfactory conditions have been corrected.

C. Responsibility for state of surfaces prior to installation to be pre-determined by installation specialist.

D. Scheduling of installation by Owner or its representative implies that substrate and conditions are prepared and ready for product installation per the recommendations of the installation specialist.

E. Proceeding with installation implies installer's acceptance of substrate and conditions.

3.02 SURFACE PREPARATION

A. Comply with manufacturers' instructions for surface preparation. Consider these factors in determining the suitability of the Product:
   1. Substrate texture affects Product adhesion and application ease.
      a. Unless the substrate is very smooth, its texture may be visible through product.
      b. Compounds used to smooth a textured substrate permanently change that substrate.
      c. Product removal may damage the substrate or its finish.
   2. Application surface conditions affect product adhesion.
      a. Ensure that the existing paint, surface finish, or wall covering has excellent bond to the substrate area where product will be applied.
      b. Repair, prime and paint the substrate, as needed.
      c. An adhesion promoter may be required to increase product adhesion.
   3. Human and environmental conditions affect product.
      a. Temperature and humidity in recommended range.
      b. Direct UV light (sunlight).
      c. Heating or cooling ducts in close proximity.

d. Unsealed substrates in front of water sources.
e. People or equipment that will be in contact with the product.

4. The product may contain a splice. The location of the splices is marked with a tab along the edge of the product. The installer will need to determine the impact of the splice and work around it to make the best use of the material layout.

B. Test and prepare application surfaces per instructions in the 3M DI-NOC Installation Guide.
1. Use the 3M Wall Adhesion Test to determine the compatibility of the application surface with the Product.
2. Use the 3M Enhanced Cleaning Method to ensure that the application surface is ready to receive and hold the product.

C. Repair damaged application surfaces per instructions in the 3M DI-NOC Installation Guide

D. Re-clean application surfaces with a lint-free cloth and 70/30 IPA cleaning solution, or use the 3M Enhanced Cleaning Method in the 3M DI-NOC Installation Guide.

3.03 APPLICATION

A. Refer to the 3M DI-NOC Installation Guide for specific application instructions.

B. Application must be performed by a qualified installer. Refer to 3M.com/AMD for a list of 3M-endorsed installers.

C. Do not proceed with installation until all finishing work has been completed in and around the work area.

D. Measure the application surface and cut film to size with a minimum 1/2 inch (12.7 mm). extra on all sides for trimming.

E. Install on application surfaces with no gaps, wire seams, or overlaps. Form smooth, wrinkle-free, bubble-free surface for finished installation.

F. No exposed joints on corners or other "open" type joints permitted.

G. Verify pattern prior to material acquisition as some part numbers do not allow three-dimensional forming.

H. Comply with manufacturer's installation instructions applicable to products and applications indicated, except where more stringent requirements apply.

I. Apply 3M DI-NOC over properly prepared substrates.

J. Remove air bubbles, wrinkles, and blisters. Use approved procedures to prevent the formation of air bubbles, wrinkles, blisters and other defects.

3.04 CLEANING AND PROTECTION

A. Use cleaning methods recommended by architectural surfacing manufacturer for applicable environment.

B. Protect completed graphic film during remainder of construction period.

C. Consult with authorized installation specialist for project specifics.

END OF SECTION 09 7000

SECTION 09 7200
WALL COVERINGS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface preparation and prime painting.

B. Wallcovering and borders.

1.02 RELATED REQUIREMENTS

A. Section 01 6116 - Volatile Organic Compound (VOC) Content Restrictions.

1.03 REFERENCE STANDARDS

A. ASTM D1308 - Standard Test Method for Effect of Household Chemicals on Clear and Pigmented Organic Finishes; 2002 (Reapproved 2013).

B. ASTM F793/F793M - Standard Classification of Wall Coverings by Use Characteristics; 2015.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Provide data on wallcovering and adhesive.

C. Samples: Submit two samples of wallcovering, 8 x 11 inch (____by____ mm) in size illustrating color, finish, and texture.

D. Maintenance Data: Submit data on cleaning, touch-up, and repair of covered surfaces.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section with minimum three years of documented experience.

B. Installer Qualifications: Company specializing in performing work of the type specified and with at least three years of documented experience.

C. Warranty: Wallcovering materials, when adhered to a sound surface using manufacturer’s recommended procedures and adhesive, shall be guaranteed for a period of five (5) years.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Inspect roll materials at arrival on site, to verify acceptability.

B. Protect packaged adhesive from temperature cycling and cold temperatures.

C. Do not store roll goods on end.

1.07 FIELD CONDITIONS

A. Do not apply materials when surface and ambient temperatures are outside the temperature ranges required by the adhesive or wall covering product manufacturer.

B. Maintain these conditions 24 hours before, during, and after installation of adhesive and wall covering.

C. Provide lighting level of 80 ft candles (860 lx) measured mid-height at substrate surfaces.

PART 2 PRODUCTS

2.01 MANUFACTURERS

2.02 WALLCOVERINGS- SEE FINISH SCHEDULE

A. General Requirements:

1. Surface Burning Characteristics: Flame spread/Smoke developed index of 25/50, maximum, when tested in accordance with ASTM E84.
2. Chemical and Stain Resistance: No visible staining or discoloration and no damage to surface texture when tested in accordance with ASTM D1308.

B. Wall Covering (**VWC-1**) - Type[II]: **Equal to Momentum, Woods**
1. Color: See finish schedule.
2. Repeat: Non-reverse hang, random match
3. Conform to ASTM F793/F793M, Category V, Type II.
4. Weight: 0.30 oz
5. Width: 36 in
6. Backing: Paper, 79% post-consumer recycled content
7. Finish: Water-repellent
8. Flame Resistance: ASTM E84 Class A

C. Wall Covering (**VWC-2**) - Type[II]: **Equal to Momentum, Midtown**
1. Color: See finish schedule.
2. Repeat: Reverse hang / Half drop alignment
3. Conform to ASTM F793/F793M, Category V, Type II.
4. Weight: 20 oz/ly (452 gr/m^2)
5. Width: 52/54" (132/137cm)
6. Backing: Osnaburg
7. Construction: 20% recycled content by weight, minimum 10% post-consumer
8. Flame Resistance: ASTM E84 Class A

D. Adhesive: Type recommended by wall covering manufacturer to suit application to substrate

E. Substrate Filler: As recommended by adhesive and wall covering manufacturers; compatible with substrate.

F. Substrate Primer and Sealer: Alkyd enamel type.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are prime painted and ready to receive work, and conform to requirements of the wallcovering manufacturer.

B. Measure moisture content of surfaces using an electronic moisture meter. Do not apply wallcoverings if moisture content of substrate exceeds level recommended by wallcovering manufacturer.

C. Verify flatness tolerance of surfaces does not vary more than 1/8 inch in 10 feet (3 mm in 3 m) nor vary at a rate greater than 1/16 inch/ft (1.5 mm/300 mm).

3.02 PREPARATION

A. Fill cracks in substrate and smooth irregularities with filler; sand smooth.

B. Wash impervious surfaces with tetra-sodium phosphate, rinse and neutralize; wipe dry.

C. Surface Appurtenances: Remove or mask electrical plates, hardware, light fixture trim, escutcheons, and fittings prior to preparing surfaces or finishing.

D. Surfaces: Correct defects and clean surfaces that affect work of this section. Remove existing coatings that exhibit loose surface defects.

E. Marks: Seal with shellac those that may bleed through surface finishes.

F. Apply one coat of primer sealer to substrate surfaces. Allow to dry. Lightly sand smooth.

G. Vacuum clean surfaces free of loose particles.

3.03 INSTALLATION

A. Apply adhesive and wallcovering in accordance with manufacturer's instructions.

B. Apply adhesive to wall surface immediately prior to application of wall covering.

C. Razor trim edges on flat work table. Do not razor cut on gypsum board surfaces.

D. Horizontal seams are not acceptable.

E. Install wallcovering before installation of bases and items attached to or spaced slightly from wall surface.

F. Cover spaces above and below windows, above doors, in pattern sequence from roll.

G. Remove excess adhesive while wet from seam before proceeding to next wallcovering sheet. Wipe clean with dry cloth.

3.04 PROTECTION

A. Do not permit construction activities at or near finished wallcovering areas.

END OF SECTION 09 7200

This page intentionally left blank

SECTION 09 9123
INTERIOR PAINTING

PART 1 GENERAL

1.01 RELATED DOCUMENTS

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

1.02 SUMMARY

A. Section includes surface preparation and the application of paint systems on the following interior substrates:
   1. Concrete.
   2. Concrete masonry units (CMU).
   3. Steel.
   4. Cast iron.
   5. Galvanized metal.
   6. Wood (Opaque and Transparent Finish).
   7. Gypsum board.

B. Related Requirements:
   1. Section 051200 "Structural Steel Framing" for shop priming of metal substrates with primers specified in this section.
   2. Section 099113 "Exterior Painting" for surface preparation and the application of paint systems on exterior substrates.
   3. Section 099313 "Exterior Stains and Transparent FInishes"
   4. Section 099323 "Staining and Transparent Finishing" for surface preparation and the application of wood stains and transparent finishes on interior wood substrates.
   5. Section 099600 "High-Performance Coatings".

1.03 ACTION SUBMITTALS

A. Product Data: For each type of product. Include preparation requirements and application instructions.
   1. Indicate VOC content.

B. Samples for Initial Selection: For each type of topcoat product.

C. Samples for Verification: For each type of paint system and in each color and gloss of topcoat.
   1. Submit Samples on rigid backing, 8 inches (200 mm) square.
   2. Label each coat of each Sample.
   3. Label each Sample for location and application area.

D. 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. Indicate VOC content.

1.04 CLOSEOUT SUBMITTALS

A. Coating Maintenance Manual: Provide coating maintenance manual including area summary with finish schedule, area detail designating location where each product/color/finish was used, product data pages, material safety data sheets, care and cleaning instructions, touch-up procedures, and color samples of each color and finish used.

1.05 MAINTENANCE MATERIAL SUBMITTALS

A. Furnish extra materials, from the same product run, that match products installed and that are packaged with protective covering for storage and identified with labels describing contents.
   1. Paint: 1 gal. (3.8 L) of each material and color applied.

1.06 QUALITY ASSURANCE

A. Mockups: Apply mockups 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. (9 sq. m).
      b. Other Items: Architect will designate items or areas required.
   2. Final approval of color selections will be based on mockups.
      a. If preliminary color selections are not approved, apply additional mockups of additional colors selected by Architect at no added cost to Owner.
   3. Approval of mockups does not constitute approval of deviations from the Contract Documents contained in mockups unless Architect specifically approves such deviations in writing.
   4. Subject to compliance with requirements, approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

1.07 DELIVERY, STORAGE, AND HANDLING

A. Delivery and Handling: Deliver products to Project site in an undamaged condition in manufacturer's original sealed containers, complete with labels and instructions for handling, storing, unpacking, protecting, and installing. Packaging shall bear the manufacturer’s label with the following information:
   1. Product name and type (description).
   2. Batch date.
   3. Color number.
   4. VOC content.
   5. Environmental handling requirements.
   6. Surface preparation requirements.
   7. Application instructions.

B. 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 (7 deg C).
   1. Maintain containers in clean condition, free of foreign materials and residue.
   2. Remove rags and waste from storage areas daily.

1.08 FIELD CONDITIONS

A. Apply paints only when temperature of surfaces to be painted and ambient air temperatures are between 50 and 95 deg F (10 and 35 deg C).

B. Do not apply paints when relative humidity exceeds 85 percent; at temperatures less than 5 deg F (3 deg C) above the dew point; or to damp or wet surfaces.

PART 1 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Product: Subject to compliance with requirements, provide Sherwin-Williams Company (The); products indicated or comparable product from one of the following:

1. Tnemec: www.tnemec.com
2. Behr Process Corporation: www.behr.com
3. PPG Architectural Finishes, Inc: www.ppgaf.com
4. Benjamin Moore & Co: www.benjaminmoore.com

B. Comparable Products: Comparable products of approved manufacturers will be considered in accordance with Section 016000 "Product Requirements," and the following:
1. Products are approved by manufacturer in writing for application specified.
2. Products meet performance and physical characteristics of basis of design product including published ratio of solids by volume, plus or minus two percent.

C. Source Limitations: Obtain paint materials from single source from single listed manufacturer.
1. Manufacturer's designations listed on a separate color schedule are for color reference only and do not indicate prior approval.

2.02 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: For field applications that are inside the weatherproofing system, paints and coatings shall provide materials that comply with VOC limits of authorities having jurisdiction and for interior paints and coatings applied at Project site, the following VOC limits exclusive of colorants added to a tint base, when calculated according to 40 CFR 59, Subpart D (EPA Method 24):
1. Flat Paints and Coatings: 50 g/L.
2. Nonflat Paints and Coatings: 150 g/L.
3. Primers, Sealers, and Undercoaters: 200 g/L.
4. Anticorrosive and Antirust Paints Applied to Ferrous Metals: 250 g/L.
5. Floor Coatings: 100 g/L.
6. Shellacs, Clear: 730 g/L.
7. Shellacs, Pigmented: 550 g/L.

C. Low-Emitting Materials: Interior paints and coatings shall comply with the testing and product requirements of the California Department of Health Services' "Standard Practice for the Testing of Volatile Organic Emissions from Various Sources Using Small Scale Environmental Chambers."

D. Colors: As selected by Architect from manufacturer's full range

PART 1 EXECUTION

3.01 EXAMINATION

A. Examine substrates and conditions, with Applicator present, for compliance with requirements for maximum moisture content and other conditions affecting performance of the Work. Verify suitability of substrates, including surface conditions and compatibility with existing finishes and primers. Where acceptability of substrate conditions is in question, apply samples and perform in-situ testing to verify compatibility, adhesion, and film integrity of new paint application.
1. Report, in writing, conditions that may affect application, appearance, or performance of paint.

B. Substrate Conditions:

1. Maximum Moisture Content of Substrates: When measured with an electronic moisture meter as follows:
   a. Concrete: 12 percent.
   b. Masonry (Clay and CMU): 12 percent.
   c. Wood: 15 percent.
   d. Gypsum Board: 12 percent.
   e. Plaster: 12 percent.

C. Proceed with coating application only after unsatisfactory conditions have been corrected; application of coating indicates acceptance of surfaces and conditions.

3.02 PREPARATION

A. Comply with manufacturer's written instructions and recommendations in "MPI Manual" applicable to substrates indicated.

B. Remove hardware, covers, plates, and similar items already in place that are removable and 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.

C. Clean substrates of substances that could impair bond of paints, including dust, dirt, oil, grease, and incompatible paints and encapsulants.
   1. Remove incompatible primers and reprime substrate with compatible primers or apply tie coat as required to produce paint systems indicated.

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.
   1. Concrete Floors: Remove oil, dust, grease, dirt, and other foreign materials. Comply with SSPC-SP-13/NACE 6 or ICRI 03732.

E. Masonry Substrates: Remove efflorescence and chalk. Do not paint surfaces if moisture content or alkalinity of surfaces or mortar joints exceed that permitted in manufacturer's written instructions.

F. Steel Substrates: Remove rust, loose mill scale, and shop primer, if any. Clean using methods recommended in writing by paint manufacturer, but not less than the following:
   1. SSPC-SP 2, "Hand Tool Cleaning.”
   2. SSPC-SP 3, "Power Tool Cleaning.”

G. Shop-Primed Steel Substrates: Clean field welds, bolted connections, and abraded areas of shop paint, and paint exposed areas with the same material as used for shop priming to comply with SSPC-PA 1 for touching up shop-primed surfaces.

H. Galvanized-Metal Substrates: Remove grease and oil residue from galvanized sheet metal fabricated from coil stock by mechanical methods to produce clean, lightly etched surfaces that promote adhesion of subsequently applied paints.

I. 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.

3.03 APPLICATION

A. Apply paints according to manufacturer's written instructions and to recommendations in "MPI Manual."
   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.
   4. Do not paint over labels of independent testing agencies or equipment name, identification, performance rating, or nomenclature plates.
   5. Primers specified in painting schedules may be omitted on items that are factory primed or factory finished if acceptable to topcoat manufacturers.

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.

3.04 FIELD QUALITY CONTROL

A. Dry Film Thickness Testing: Owner may engage the services of a qualified testing and inspecting agency to inspect and test paint for dry film thickness.
   1. Contractor shall touch up and restore painted surfaces damaged by testing.
   2. If test results show that dry film thickness of applied paint does not comply with paint manufacturer's written recommendations, Contractor shall pay for testing and apply additional coats as needed to provide dry film thickness that complies with paint manufacturer's written recommendations.

3.05 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.

3.06 INTERIOR PAINTING SCHEDULE

A. Concrete Substrates, Pedestrian Traffic Surfaces:
   1. Urethane Coating:
      a. First Coat:
         1) SW Armorseal, Rexthane I B65C60: Smooth; Color: Clear.
      b. Second Coat:

1) SW Armorseal, Rexthane I B65C60: Smooth; Color: Clear.

c. If necessary, provide additional coats in accordance with Manufacturer's requirements for five (5) year warranty.

B. Metal Substrates (Aluminum, Steel, Galvanized Steel):
1. Latex System (Steel Columns, Metal Fabrications, Metal Doors and Frames):
a. Prime Coat: Primer, rust-inhibitive, water based:
1) S-W Pro Industrial Pro-Cryl Universal Primer, B66-310 Series, at 5.0 to 10 mils (0.127 to 0.254 mm) wet, 2.0 to 4.0 mils (0.051 to 0.102 mm) dry.
b. Intermediate Coat: Water-based acrylic, interior, matching topcoat.
c. Topcoat: Water-based acrylic, semi-gloss:
1) S-W Pro Industrial Acrylic Semi-Gloss Coating, B66-650 Series, at 2.5 to 4.0 mils (0.064 to 0.102 mm) dry, per coat.
2. Water-Based Dry-Fall System (Overhead Steel Structure, Metal Deck, Exposed Fire Protection, Plumbing, Mechanical and Electrical Components):
a. Top Coat: Dry-fall latex, flat:
1) S-W Pro Industrial Waterborne Acrylic Dryfall Flat, B42-W2181 Series, at 6.0 mils (0.152 mm) wet, 1.5 mils (0.038 mm) dry.

C. Wood opaque finished substrates: Including exposed wood items not indicated to receive shop-applied finish.
1. Wood Substrates, Transparent Finish: Stained, polyurethane coating: two (2) finish coats over stain coat and sanding sealer.
a. Stain Coat:
1) Sherwin-Williams; Minwax Performance Series Stain, tintable stain.
b. Intermediate Coat:
1) Sherwin-Williams; Same as finish coat.
c. Finish Coat:
1) Sherwin-Williams; Minwax Performance Series Polyurethane Varnish Satin

D. Gypsum Board Substrates:
1. Walls - Latex System:
a. Prime Coat: Primer, latex, interior:
1) S-W ProMar 200 Zero VOC Latex Primer, B28W12600, at 4.0 mils (0.102 mm) wet, 1.0 mils (0.025 mm) dry.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, eggshell:
1) S-W ProMar 200 Zero VOC Latex Eg-Shel, B20-12600 Series, at 4.0 mils (0.102 mm) wet, 1.7 mils (0.043 mm) dry, per coat.
2. Ceilings - Latex System:
a. Prime Coat: Primer, latex, interior:
1) S-W ProMar 200 Zero VOC Latex Primer, B28W12600, at 4.0 mils (0.102 mm) wet, 1.0 mils (0.025 mm) dry.
b. Intermediate Coat: Latex, interior, matching topcoat.
c. Topcoat: Latex, interior, flat:
1) S-W ProMar 200 Zero VOC Latex Flat, B30-12600 Series, at 4.0 mils (0.102 mm) wet, 1.7 mils (0.043 mm) dry, per coat.

END OF SECTION 09 9123

SECTION 10 0660
PLASTIC FABRICATIONS & TRANSLUCENT PANEL SYSTEMS

PART 1 GENERAL

1.01 REFERENCE STANDARDS

A. ANSI Z97.1 - American National Standard for Safety Glazing Materials Used in Buildings, Safety Performance Specifications and Methods of Test; 2010.

1.02 RELATED DOCUMENTS

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

1.03 SUMMARY

A. This Section includes the Plastic Fabrication as shown and specified in the described system(s):
   1. Feature Wall Treatment
   2. Related Sections include the following:
      a. 06 1000 - Rough Carpentry
      b. 09 2116 - Gypsum Board Assemblies

1.04 SUBMITTALS

A. General: Submit the following in accordance with conditions of contact and Division 1 specification section 01 33 00 “Submittal Procedures”.

B. Product Data: Submit manufacturer’s product data; include product description, fabrication information, and compliance with specified performance requirements.

C. Submit product test reports from a qualified independent 3rd party testing agency indicating each type and class of panel system complies with the project performance requirements, based on comprehensive testing of current products. Previously completed test reports will be acceptable if for current manufacturer and indicative of products used on this project.
   1. Test reports required are:
      a. Rate of Burning (ASTM D 635)
      b. Self-Ignition Temperature (ASTM D 1929)
      c. Density of Smoke (ASTM D 2843)
      d. Flame Spread and Smoke Developed testing (ASTM E 84)
      e. Room Corner Burn Test (((NFPA 286)))
      f. Extent of Burning (((UL 94)))
      g. Impact strength (ASTM D 3763)
      h. Safety glazing impact resistance (((ANSI Z97.1))-2004)
      i. UPITT Test for Combustion Product Toxicity
      j. Passes NFPA 269/ASTM1678 for Combustion Product Toxicity
      k. Dynamic environmental testing (ASTM standards D 5116 or D 6670)
      l. UL Yellowcard

D. Building Approvals: Plastic Fabrications are to have been evaluated and must be registered with and comply to requirements of the following jurisdictions:
   1. Los Angeles Department of Building and Safety (Product must have a LARR {CH#10014091} number) for use as Light-transmitting Panels
   2. ICC-ES Report for Light Transmitting Plastics and Interior Finishes

E. Shop Drawings: Include plans, elevations, sections, panel dimensions, details, and attachments to other work.

F. Samples for Initial Selection:
   1. Submit minimum 2-inch by 2-inch samples. Indicate full color, texture and pattern variation.

G. Samples for Verification:
   1. Submit minimum 4-inch by 4-inch sample for each type, texture, pattern and color of solid plastic fabrication.

H. Mockups:
   1. Build mockups to verify selections made under sample Submittals and to demonstrate aesthetic effects.
   2. Build mockup of Plastic Fabrication. **To include 3FM-1 with components of panel system.**
   3. Approved mockups may become part of the completed Work if undisturbed at time of Substantial Completion.

I. Maintenance Data: Submit manufacturer's care and maintenance data, including care, repair and cleaning instructions. Include in Project closeout documents.

1.05 QUALITY ASSURANCE

A. Manufacturers Qualifications
   1. Materials and systems shall be manufactured by a company continuously and regularly employed in the manufacture of specified materials for a period of at least five (5) consecutive years and which can show evidence of those materials being satisfactorily used on at least six (6) projects of similar size, scope and location. At least three (3) of the projects shall have been successful for use five (5) years or longer.
   2. Manufactured panels must be produced from a minimum of 40% pre-consumer recycle content. This recycle content must be certified by a recognized 3rd party certification group, such as Scientific Certification Systems (SCS).
   3. Completely PVC – Free product
   4. Manufacturer must offer a documented reclaim process that will take back, at the manufacturers cost, panels that are at their end-of life cycle. Return process is preceded by following requirements highlighted in Section 02 42 00 Removal and Salvage of Construction Materials.
   5. Manufacturer must have a 3rd party completed Life Cycle Analysis
   6. Manufacturer must have an Environmental Product Declaration (EPD).

1.06 DELIVERY, STORAGE, AND HANDLING

A. Deliver Plastic Fabrications, systems and specified items in manufacturer's standard protective packaging.

B. Do not deliver Plastic Fabrications, system, components and accessories to Project site until areas are ready for installation.

C. Store materials in a flat orientation in a dry place that is not exposed to exterior elements.

D. Handle materials to prevent damage to finished surfaces. Provide protective coverings to prevent damage or staining following installation for duration of project.

E. Before installing Plastic Fabrications, permit them to reach room temperature.

1.07 PROJECT CONDITIONS

A. Environmental Limitations: Do not install Solid Polymer Fabrications until spaces are enclosed and weatherproof, and ambient temperatures and humidity conditions are maintained at the levels indicated for Project when occupied for its intended use.

1.08 WARRANTY

A. Manufacturer's Special Warranty on Plastic Fabrications: Manufacturer's standard form agreeing to repair or replace units that fail in material or workmanship within the specified warranty period.

B. Warranty Period: 1 year after the date of substantial completion.

C. The warranty shall not deprive the owner of other rights or remedies the Owner may have under other provisions of the Contract Documents, and is in addition to and runs concurrent with other warranties made by the Contractor under the requirements of the Contract Documents.

PART 2 PRODUCTS

2.01 MANUFACTURER

A. Manufacturer: 3form, LLC., Salt Lake City, Utah, USA / telephone 801-649-2500

2.02 MATERIALS - VARIA ECORESIN SHEET - SEE "3FM-1" ON FINISH SCHEDULE

A. Solution: Iltuo Cantilevered I 200.57

B. Varia Ecoresin™ Sheet
   1. Engineered co-polyester resin produced in the USA
   2. Sheet Size: Maximum 4' x 10'
   3. Thickness: 1/2". Polish all exposed edges of resin panels. Provide all extruded aluminum mounting hardware and components.
   4. **Refer to drawings for Varia 3Form panels.**
   5. Basis of Design Product: The design of Plastic Fabrications is based on Varia Ecoresin™ as provided by 3form, LLC. Products from other manufacturers must be approved by the Architect or Designer prior to bidding in accordance with the Instructions to Bidders and Section 10 60 00 "Product Requirements".
   6. Provide all extruded aluminum mounting hardware to include but not limited to fasteners, covers, and clips as required for complete system installation. Comply with manufacturer's installation instructions.

C. Interlayer Materials: Compatible with polyesters and bonding process to create a monolithic sheet of material when complete.

D. Sheet minimum performance attributes:
   1. Rate of Burning (ASTM D 635). Material must attain CC1 Rating for a nominal thickness of 1.5 mm ({CH#10014093}.) and greater.
   2. Self-Ignition Temperature (ASTM D 1929). Material must have a Self-ignition temperature greater than 650°F.
   3. Density of Smoke (ASTM D 2843). Material must have a smoke density less than 75%.
   4. Flame spread and Smoke developed testing (ASTM E 84). Material must be able to meet a level of Class A (Flame spread less than 25 and smoke less than 450) at thickness of 1/8",3/16" and 1".

5. Room Corner Burn Test (((NFPA 286))). Material must meet Class A criteria at ¼" (walls only) and 3/8" (walls only/standoffs only) thickness as described by the 2012 International Building Code.
6. Extent of Burning (((UL 94))). Must submit UL card.
7. Impact strength. Minimum impact strength test as measured by ASTM D 3763 of {CH#10014095} lbs. (for durability, shipping, installation, and use).
8. Safety Glazing. Material must attain a Class A impact rating in accordance with ANSI Z97.1-2004 at 1/8" thickness.
9. UPITT Test for Combustion Product Toxicity: Product must be recorded as "not more toxic than wood".
10. NFPA 269/ASTM 1678 test for toxicity: Product must have a best predicted LC50 value ≤ 80.8 g/m3 Product must have a best predicted corrected for post-flashover conditions LC50 value ≤ 19.0 g/m3
11. Dynamic environmental testing (ASTM standards D 5116 or D 6670). Panels must not have detectable VOC off-gassing agents and must be have Greenguard™ Indoor Air Quality Children and Schools certified.
12. Panels must be produced from a minimum of 40% pre-consumer recycle content. This recycle content must be certified by a recognized 3rd party certification group, such as Scientific Certification Systems (SCS).
13. Building Approvals: Plastic Fabrications are to have been evaluated and must be registered with and comply to requirements of the following jurisdictions:
    a. New York Department of Buildings (Product must have an MEA {CH#10014096} number) for use as Interior Finishes
    b. Los Angeles Department of Building and Safety (Product must have a LARR {CH#10014097} number) for use as Light-transmitting Panels
    c. ICC-ES Report for Interior Finishes and Light Transmitting plastics

2.03 FABRICATION

A. General: Fabricate Plastic Fabrications to designs, sizes and thicknesses indicated and to comply with indicated standards.

B. Comply with manufacturer's written recommendations for fabrication.

C. Machining: Acceptable means of machining are listed below. Ensure that material is not chipped or warped by machining operations.
   1. Sawing: Select equipment and blades suitable for type of cut required.
   2. Drilling: Drills specifically designed for use with plastic products.
   3. Milling: Climb cut where possible.
   4. Routing
   5. Tapping

D. Forming: Form products to shapes indicated using the appropriate method listed below. Comply with manufacturer's written instructions.
   1. Cold Bending
   2. Hot Bending
   3. Thermoforming: Acceptable only on uncoated material.
   4. Drape Forming
   5. Matched Mold Forming
   6. Mechanical Forming

E. Laminating: Laminate to substrates indicated using adhesives and techniques recommended by manufacturer.

2.04 MISCELLANEOUS MATERIALS

A. General: Provide products of material, size, and shape required for application indicated, and with a proven record of compatibility with surfaces contacted in installation.

B. Cleaner: Type recommended by manufacturer.

C. Fasteners: Use screws designed specifically for plastics. Self-threading screws are acceptable for permanent installations. Provide threaded metal inserts for applications requiring frequent disassembly such as light fixtures.

D. Bonding Cements: May be achieved with solvents or adhesives, suitable for use with product and application.

PART 3 EXECUTION

3.01 EXAMINATION

A. Examine substrates, areas, and conditions where installation of Plastic Fabrications will occur, with Installer present, for compliance with manufacturer's requirements. Verify that substrates and conditions are satisfactory for installation and comply with requirements specified.

3.02 INSTALLATION

A. General: Comply with manufacturer's written instructions for the installation of Plastic Fabrications.

B. Manufacturer's shop to fabricate items to the greatest degree possible.

C. Utilize fasteners, adhesives and bonding agents recommended by manufacturer for type of installation indicated. Material that is chipped, warped, hazed or discolored as a result of installation or fabrication methods will be rejected.

D. Install components plumb, level and rigid, scribed to adjacent finishes, in accordance with approved shop drawings and product data.

E. Form field joints using manufacturer's recommended procedures. Locate seams in panels so that they are not directly in line with seams in substrates.

3.03 CLEANING AND PROTECTION

A. Protect surfaces from damage until date of substantial completion. Repair work or replace damaged work, which cannot be repaired to Architect's satisfaction.

B. End of Section 10 0660

END OF SECTION 10 0660

This page intentionally left blank

SECTION 10 1200
DISPLAY BOARDS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Surface-mounted magnetic glass boards.

1.02 RELATED REQUIREMENTS

A. Section 06 1000 - Rough Carpentry: Blocking and supports.

B. Section 09 2116 - Gypsum Board Assemblies: Concealed supports in metal stud walls.

C. Section 09 2216 - Non-Structural Metal Framing: Concealed supports in metal stud walls.

1.03 REFERENCE STANDARDS

A. AAMA 611 - Voluntary Specification for Anodized Architectural Aluminum; 2012.

B. AAMA 2603 - Voluntary Specification, Performance Requirements and Test Procedures for Pigmented Organic Coatings on Aluminum Extrusions and Panels (with Coil Coating Appendix); 2015.

C. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

D. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

E. ASTM C1048 - Standard Specification for Heat-Strengthened and Fully Tempered Flat Glass; 2012.

F. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit complete printed data and installation details indicating products to be provided as specified.
   1. Submit color charts for selection by the Architect.

C. Shop Drawings: Submit complete installation details. Include dimensioned elevations.

D. Samples: Submit samples of material and trim to illustrate finish, color, and texture.

E. Manufacturer's Qualification Statement.

F. Specimen Warranty.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing products specified in this section, with at least three years of documented experience.

1.06 DELIVERY, STORAGE AND HANDLING

A. Deliver materials to the project site with manufacturer’s protective covering and do not open until ready for use.

B. Protect materials before, during, and after installation. In case of damage, immediately provide necessary repairs and replacements.

1.07 FIELD CONDITIONS

A. Field Measurements: Verify field measurements for markerboards before preparation of shop drawings and before fabrication to ensure proper installation.

1.08 WARRANTY

A. See Section 01 7800 - Closeout Submittals, for additional warranty requirements.

B. Correct defective Work within a five year period after Date of Substantial Completion.

C. Provide five year manufacturer warranty against defects and in materials, finish product and workmanship.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Fullbright Glass Boards **(Basis of Design)**; www.fullbrightglassboards.com ; or equal
   1. Representative Andy Anderson - 205-447-0881

B. Clarus; www.clarus.com

C. Egan; www.egan.com

2.02 SURFACE-MOUNTED MAGNETIC GLASS BOARD: FACTORY-FABRICATED TEMPERED SAFTEY GLASS.

A. See drawings for quantity and locations.

B. Mounting: Concealed Z Clip.

C. Color: to be determined by architect from manufacturer's full color range

D. Height: 4 feet (1219 mm).

E. Width: 6 feet.

2.03 COMPONENTS

A. Magnetic Marker Board Rail 12-inch long - Anodized Aluminum Finish, provide 2 per marker board

B. Magnetic Erasers - Provide 3 per markerboard.

C. Plastic Coated Cylinder Magnets - Provide 12.

2.04 MATERIALS

A. Tempered Saftey Glass; 1/4" thickness

B. All accessory materials required for a complete installation.

C. Fasteners per manufacturers recomendations.

PART 3 EXECUTION

3.01 PREPARATION

A. Rough openings, electrical pre-wiring, and final finishing are by other trades.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Provide factory trained installers.

C. Clean glass using manufacturers recommended procedures.

D. Provide concealed wood blocking in wall cavity as required for secure mounting.

3.03 ADJUSTING AND CLEANING

A. Verify that all accessories are installed as detailed for each unit.

B. At completion of work, clean glass surfaces, back panels and trim in accordance with manufacturer's recommendations leaving units ready for use.

END OF SECTION 10 1200

This page intentionally left blank

SECTION 10 1423
SIGNAGE

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Panel Signage

1.02 SUMMARY

A. Furnish room signs at all locations required by code. These include, but may not be limited to:
   1. Occupancy Loads
   2. Restrooms
   3. Exits

1.03 REFERENCE STANDARDS

A. ADA Standards - Americans with Disabilities Act (ADA) Standards for Accessible Design; 2010.

B. ASTM A475 - Standard Specification for Metallic-Coated Steel Wire Strand; 2022.

C. ASTM A555/A555M - Standard Specification for General Requirements for Stainless Steel Wire and Wire Rods; 2023.

D. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

E. ASTM B221 - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes; 2014.

F. ASTM B221M - Standard Specification for Aluminum and Aluminum-Alloy Extruded Bars, Rods, Wire, Profiles, and Tubes [Metric]; 2013.

G. ICC A117.1 - Accessible and Usable Buildings and Facilities; 2009.

H. NFPA 70 - National Electrical Code; Most Recent Edition Adopted by Authority Having Jurisdiction, Including All Applicable Amendments and Supplements.

I. UL 879 - Electric Sign Components; Current Edition, Including All Revisions.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements for submittal procedures.

B. Product Data: Manufacturer's product literature for each type of panel sign, indicating styles, font, foreground and background colors, locations, and overall dimensions of each sign.

C. Shop Drawings:
   1. Include dimensions, locations, elevations, materials, text and graphic layout, attachment details, and schedules.
   2. Show locations of electrical service connections.
   3. Include diagrams for power, signal, and control wiring.
   4. Schedule: Provide information sufficient to completely define each panel sign for fabrication, including room number, room name, other text to be applied, sign and letter sizes, fonts, and colors.
      a. When room numbers to appear on signs differ from those on drawings, include the drawing room number on schedule.
      b. When content of signs is indicated to be determined later, request such information from Owner through Architect at least 2 months prior to start of fabrication; upon request, submit preliminary schedule.
      c. Submit for approval by Owner through Architect prior to fabrication.

D. Samples: Submit two samples of each type of sign, of size similar to that required for project, indicating sign style, font, and method of attachment.

E. Selection Samples: Where colors, materials, and finishes are not specified, submit two sets of color selection charts or chips.

F. Verification Samples: Submit samples showing colors, materials, and finishes specified.

G. Manufacturer's Installation Instructions: Include installation templates and attachment devices.

H. Manufacturer's qualification statement.

1.05 QUALITY ASSURANCE

A. Manufacturer Qualifications: Company specializing in manufacturing the products specified in this section with minimum three years of documented experience.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Package signs as required to prevent damage before installation.

B. Package room and door signs in sequential order of installation, labeled by floor or building.

C. Store under cover and elevated above grade.

D. Store tape adhesive at normal room temperature.

1.07 FIELD CONDITIONS

A. Do not install tape adhesive when ambient temperature is lower than recommended by manufacturer.

B. Maintain minimum ambient temperature during and after installation.

1.08 WARRANTY

A. Manufacturer's Warranty: Provide manufacturer's 5 year warranty against fading, defects in materials, and workmanship. Letters shall be guaranteed for the life of the business against defects.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Panel Signage:
   1. Best Sign Systems, Inc: www.bestsigns.com
   2. Knight Sign Industries, Inc.: www.knightsign.com
   3. LEEDS Architectural Letters of Alabama, Inc.: www.leedssign.com
   4. A.R.K. Ramos Architectural Signage: www.arkramos.com
   5. FASTSIGNS International, Inc: www.fastsigns.com
   6. Takeform: www.takeform.net
   7. Inpro Corporation: www.inprocorp.com
   8. Clarke Systems, Inc: www.clarkesystems.com
   9. APCO Signs: www.apcosigns.com
   10. Substitutions: See Section 016000 - Product Requirements.

B. Signage Vendors:
   1. Design Display, Inc. or approved equal

2.02 REGULATORY REQUIREMENTS

A. Accessibility Requirements: Comply with ADA Standards and ICC A117.1 and applicable building codes, unless otherwise indicated; in the event of conflicting requirements, comply with the most restrictive requirements.

2.03 PANEL SIGNAGE

A. Panel Signage – ID-RR, LS-EX:
   1. Application: Room and door, interior directional and information signs. Refer to Architect's sheet A10.00 for additional information and requirements.
   2. Description: Flat signs with applied character panel media, tactile characters.
   3. Sign Size: As indicated on drawings.
   4. Total Thickness: 1/8 inch (3.18 mm).
   5. Sign Edges: Squared.
   6. Letter Edges: Squared.
   7. Corners: Squared.
   8. Color and Font, unless otherwise indicated:
      a. Character Font: Proxima Nova Medium.
      b. Character Case: Upper case only.
      c. Background Color: 20% Black (Or equivalent, to be coordinated with Architect and Manufacturer).
      d. Character Color: Black.
   9. Material: Painted acrylic plastic base with applied plastic letters and braille.
   10. Profile: Flat panel without frame.
   11. Tactile Letters: Raised 1/32 inch (0.79 mm) minimum.
   12. Braille: Grade II, ADA-compliant.
   13. One-Sided Wall Mounting: Double-side tape adhesive, unless otherwise indicated.
   14. Sign Height: Varies, for multiline text or signage with pictograms. ADA-compliant.

2.04 SIGNAGE APPLICATIONS

A. Room and Door Signs:
   1. Service Rooms (Including Catering, Equipment, Electrical, Storage, Janitors, etc.): Identify with room names and numbers to be determined later, not those indicated on drawings.
   2. Rest Rooms: Identify with pictograms, Identify with room names to be determined later, not those indicated on drawings, and braille.

2.05 ACCESSORIES

A. Concealed Screws: Noncorroding metal; stainless steel, galvanized steel, chrome plated, or other.

B. Exposed Screws: Chrome plated.

C. Tape Adhesive: Double-sided tape, permanent adhesive.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that substrate surfaces are ready to receive work.

B. Verify that power and data service is correctly sized and located to accommodate panel signs.

C. Notify Architect if conditions are not suitable for installation of signs; do not proceed until conditions are satisfactory.

3.02 INSTALLATION

A. Install in accordance with manufacturer's instructions.

B. Install with horizontal edges level.

C. Locate panel signs and mount at heights indicated on drawings and in accordance with ADA Standards and ICC A117.1.

D. Protect from damage until mm-dd-yyyy; repair or replace damaged items.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 10 2113
PHENOLIC TOILET COMPARTMENTS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Phenolic Toilet Compartments, Over Head Braced, Floor Anchored.

B. Urinal screens.

1.02 RELATED REQUIREMENTS

A. Section 05 1200 - Structural Steel Framing: Concealed steel support members.

B. Section 06 1000 - Rough Carpentry: Coordination with cocealed solid wood blocking in walls to secure panels, Screens, wall posts and stiles.

C. Section 09 3000 - Tiling

D. Section 10 2800 - Toilet, Bath, and Laundry Accessories.

1.03 REFERENCE STANDARDS

A. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordination: Coordinate the work with placement of support framing and anchors in walls.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Shop Drawings: Indicate partition plan, elevation views, dimensions, details of wall supports, door swings.

C. Product Data: Provide data on panel construction, hardware, and accessories.

D. Samples: Submit two samples of partition panels, 6 by 6 inch (____by____ mm) in size illustrating panel finish, color, and sheen.

E. Manufacturer's Installation Instructions: Indicate special procedures.

1.06 QUALITY ASSURANCE

A. Manufacturer: Provide products manufactured by a company with a minimum of 10 years successful experience manufacturing similar products.

B. Single Source Requirements: To the greatest extent possible provide products from a single manufacturer.

C. Accessibility Requirements: Comply with requirements applicable in the jurisdiction of the project, including but not limited to ADA and ICC/ANSI A117.1 requirements as applicable.

1.07 WARRANTY

A. Manufacturer’s standard 25 year limited warranty for panels, doors, and stiles against breakage, corrosion, delamination, and defects in factory workmanship. Manufacturer’s standard 10 year guarantee against defects in material and workmanship for stainless steel door hardware and mounting brackets.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis-of-Design Products: Based on the quality and performance requirements of the project, specifications are based solely on the products of Bobrick Washroom Equipment, Inc.. www.bobrick.com.

B. Approved Manufacturers:
   1. Columbia Partitions
   2. Scranton Products
   3. Bobrick
   4. Substitutions: Section01 6000-Product Requirements.

2.02 PHENOLIC TOILET COMPARTMENTS

A. Toilet Compartments: Factory fabricated doors, pilasters, and divider panels made of solid phenolic core panels with integral melamine finish, floor-mounted headrail-braced. **Basis of Design** is Bobrick 1082G.67 (No Gap) Series Compact Laminate (Solid Phenolic) Floor Anchored and 1082.67 Urinal Screen. Provide full height stainless steel partition brackets and self closing hinges. Comply with ADA. Class B Fire Rated.
   1. Color: see Finish Schedule.

B. Screens: Without doors; to match compartments; mounted to wall as shown on brackets with full length brackets.

2.03 ACCESSORIES

A. Hardware and Accessories: Manufacturer's Institutional hardware design, Commercial Operating hardware and accessories.
   1. Material: Stainless Steel 304 standard finish

B. Anchorages and Fasteners: Manufacturer's standard exposed fasteners of stainless steel, finished to match hardware, with theft-resistant-type heads. Provide hex-type bolts for through-bolt applications. Wall hung Urinal Bracket (Stainless Steel with diagonal brace Braced

C. Provide emergency access latch & hinges.

2.04 FABRICATION

A. Floor-Anchored Units: Provide manufacturer's standard corrosion-resistant anchoring assemblies complete with threaded rods, lock washers, and leveling adjustment nuts at pilasters for structural connection to floor. Provide shoes at pilasters to conceal anchorage.

B. Doors: Unless otherwise indicated, provide 24-inch- (610-mm-) wide in-swinging doors for standard toilet compartments and 36-inch- (914-mm-) wide out-swinging doors with a minimum 32-inch- (813-mm-) wide clear opening for compartments indicated to be accessible to people with disabilities.
   1. Hinges: Manufacturer's Full Height Stainless Steel Hinge (self-closing type)
   2. Latch and Keeper: Manufacturer's institutional hardware surface-mounted latch unit designed for emergency access and with combination rubber-faced door strike and keeper. Provide units that comply with accessibility requirements of authorities having jurisdiction at compartments indicated to be accessible to people with disabilities. Complies with ADA Sections 404.2.7 and 309.4.
   3. Coat Hook: Manufacturer's stainless steel combination hook and rubber-tipped bumper, sized to prevent door from hitting compartment-mounted accessories.

4. Door Pull: Manufacturer's institutional hardware unit at out-swinging doors that complies with accessibility requirements of authorities having jurisdiction. Provide units on both sides of doors at compartments indicated to be accessible to people with disabilities.

C. Attachments, Screws, and Bolts: Stainless steel , tamper proof type.
1. For attaching panels and pilasters to brackets: Through-bolts and nuts ; tamper proof.
2. Balanced hinges
3. Door Latch: Slide type with exterior emergency access feature.
4. Door strike and keeper with rubber bumper; mounted on pilaster in alignment with door latch.
5. Coat hook with rubber bumper; one per compartment, mounted on door.

D. Toilet Partition Suspension Members: As specified in Section 05 5000.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify that field measurements are as indicated.

B. Verify correct spacing of and between plumbing fixtures.

C. Verify correct location of built-in framing, anchorage, and bracing.

3.02 INSTALLATION

A. Install products in strict compliance with manufacturer’s written instructions and recommendations, including the following:
1. Verify blocking and supports in walls and ceilings have been installed properly at points of attachment.
2. Verify location does not interfere with door swings or use of fixtures.
3. Use stainless steel fasteners and anchors suitable for substrate and project conditions
4. Install units rigid, straight, plumb, and level.
5. Conceal evidence of drilling, cutting, and fitting to room finish.
6. Test for proper operation.

B. Field touch-up of scratches or damaged finish will not be permitted. Replace damaged or scratched materials with new materials.

3.03 TOLERANCES

A. Maximum Variation From True Position: 1/4 inch (6 mm).

B. Maximum Variation From Plumb: 1/8 inch (3 mm).

3.04 ADJUSTING

A. Adjust and align hardware to uniform clearance at vertical edge of doors, not exceeding 3/16 inch (5 mm).

B. Adjust hinges to position doors in partial opening position when unlatched. Return out-swinging doors to closed position.

C. Adjust adjacent components for consistency of line or plane.

END OF SECTION 10 2113

This page intentionally left blank

SECTION 10 2800
TOILET, BATH, AND LAUNDRY ACCESSORIES

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Commercial toilet accessories.

B. Accessories for toilet rooms.

C. Grab bars.

1.02 RELATED REQUIREMENTS

A. Section 09 3000 - Tiling: Ceramic washroom accessories.

B. Section 10 2113.19 - Plastic Toilet Compartments.

C. Section 22 4000 - Plumbing Fixtures: Under-lavatory pipe and supply covers.

1.03 REFERENCE STANDARDS

A. ASTM A269/A269M - Standard Specification for Seamless and Welded Austenitic Stainless Steel Tubing for General Service; 2015a.

B. ASTM A653/A653M - Standard Specification for Steel Sheet, Zinc-Coated (Galvanized) or Zinc-Iron Alloy-Coated (Galvannealed) by the Hot-Dip Process; 2015.

C. ASTM A666/A666M - Standard Specification for Annealed or Cold-Worked Austenitic Stainless Steel Sheet, Strip, Plate, and Flat Bar; 2024.

D. ASTM B456 - Standard Specification for Electrodeposited Coatings of Copper Plus Nickel Plus Chromium and Nickel Plus Chromium; 2011.

E. GSA CID A-A-3002 - Mirrors, Glass; U.S. General Services Administration; 1996.

1.04 ADMINISTRATIVE REQUIREMENTS

A. Coordinate the work with the placement of internal wall reinforcement, concealed ceiling supports, and reinforcement of toilet partitions to receive anchor attachments.

1.05 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Submit data on accessories describing size, finish, details of function, and attachment methods.

C. Manufacturer's Installation Instructions: Indicate special procedures and conditions requiring special attention.

PART 2 PRODUCTS

2.01 MANUFACTURERS

A. Basis of Design: Bobrick: Refer to Drawings.

B. Commercial Toilet, Shower, and Bath Accessories:
   1. AJW Architectural Products; _____: www.ajw.com/#sle.
   2. American Specialties, Inc; _____: www.americanspecialties.com/#sle.
   3. Bradley Corporation; _____: www.bradleycorp.com/#sle.
   4. Substitutions: Section 01 6000 - Product Requirements.

2.02 MATERIALS

A. Accessories - General: Shop assembled, free of dents and scratches and packaged complete with anchors and fittings, steel anchor plates, adapters, and anchor components for installation.

1. Grind welded joints smooth.
2. Fabricate units made of metal sheet of seamless sheets, with flat surfaces.

B. Keys: Provide _____ keys for each accessory to Owner; master key lockable accessories.

C. Stainless Steel Sheet: ASTM A666/A666M, Type 304.

D. Stainless Steel Tubing: ASTM A269/A269M, Grade TP304 or TP316.

E. Galvanized Sheet Steel: Hot-dipped galvanized steel sheet, ASTM A653/A653M, with G90/Z275 coating.

F. Adhesive: Two component epoxy type, waterproof.

G. Fasteners, Screws, and Bolts: Hot dip galvanized; tamper-proof; security type.

H. Expansion Shields: Fiber, lead, or rubber as recommended by accessory manufacturer for component and substrate.

2.03 FINISHES

A. Stainless Steel: Satin finish, unless otherwise noted.

2.04 COMMERCIAL TOILET ACCESSORIES: REFER TO DRAWINGS FOR PRODUCT NUMBERS AND LOCATIONS.

PART 3 EXECUTION

3.01 EXAMINATION

A. Verify existing conditions before starting work.

B. Verify exact location of accessories for installation.

3.02 INSTALLATION

A. Install accessories in accordance with manufacturers' instructions in locations indicated on drawings.

B. Install plumb and level, securely and rigidly anchored to substrate.

C. Mounting Heights: As required by accessibility regulations, unless otherwise indicated.

END OF SECTION 10 2800

SECTION 12 3600
COUNTERTOPS AND WINDOW SILLS

PART 1 GENERAL

1.01 SECTION INCLUDES

A. Countertops for architectural cabinet work.

B. Countertops for manufactured casework. (Refer to Section 06 4100 - Architectural Plastic Laminate Casework)

C. Wall-hung counters and vanity tops.

1.02 RELATED REQUIREMENTS

A. Section 06 2000 - Finish Carpentry

B. Section 06 4100 - Architectural Wood Casework.

C. Section 07 9005 - Joint Sealants.

1.03 REFERENCE STANDARDS

A. ANSI A208.1 - American National Standard for Particleboard; 2009.

B. ASTM D635 - Standard Test Method for Rate of Burning and/or Extent and Time of Burning of Plastics in a Horizontal Position; 2022.

C. ASTM E84 - Standard Test Method for Surface Burning Characteristics of Building Materials; 2015a.

D. AWI/AWMAC/WI (AWS) - Architectural Woodwork Standards; 2014.

E. AWMAC/WI (NAAWS) - North American Architectural Woodwork Standards, U.S. Version 3.0; 2016.

F. PS 1 - Structural Plywood; 2009.

1.04 SUBMITTALS

A. See Section 01 3000 - Administrative Requirements, for submittal procedures.

B. Product Data: Manufacturer's data sheets on each product to be used, including:
   1. Preparation instructions and recommendations.
   2. Storage and handling requirements and recommendations.
   3. Specimen warranty.

C. Shop Drawings: Complete details of materials and installation ; combine with shop drawings of cabinets and casework specified in other sections.

D. Selection Samples: For each finish product specified, color chips representing manufacturer's full range of available colors and patterns.

E. Certificate: Submit labels and certificates required by quality assurance and quality control programs.

F. Installation Instructions: Manufacturer's installation instructions and recommendations.

G. Maintenance Data: Manufacturer's instructions and recommendations for maintenance and repair of countertop surfaces.

1.05 QUALITY ASSURANCE

A. Installer Qualifications: Company specializing in performing work of the type specified in this section, with not less than three years of documented experience.

B. Quality Certification:
   1. Provide labels or certificates indicating that the installed work complies with AWI/AWMAC/WI (AWS) or AWMAC/WI (NAAWS) requirements for grade or grades specified.
   2. Provide designated labels on shop drawings as required by certification program.
   3. Provide designated labels on installed products as required by certification program.
   4. Submit certifications upon completion of installation that verifies this work is in compliance with specified requirements.

1.06 DELIVERY, STORAGE, AND HANDLING

A. Store products in manufacturer's unopened packaging until ready for installation.

B. Store and dispose of solvent-based materials, and materials used with solvent-based materials, in accordance with requirements of local authorities having jurisdiction.

1.07 FIELD CONDITIONS

A. Maintain environmental conditions (temperature, humidity, and ventilation) within limits recommended by manufacturer for optimum results. Do not install products under environmental conditions outside manufacturer's absolute limits.

PART 2 PRODUCTS

2.01 COUNTERTOPS

A. Quartz countertops: **Refer to finish schedule for color.** Refer to Spec Section 06 4100 - Architectural Wood Casework
   1. Manufacturers:
      a. Corian
      b. Vadara - **Basis of Design**
      c. Cambria
      d. Formica
      e. Wilsonart
   2. 2 cm thickness at countertops and backsplashes. See drawings for locations and additional requirements.
   3. Supporting substrate - 3/4" thick marine plywood sub-tops at sinks and other countertops
   4. Color: See finish schedule.
   5. Overhang front and ends of cabinets 1 inch except where tops butt against cabinet or wall.
   6. Backsplash: Same material as countertops, see drawings
      a. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
      b. Height: 4 inches unless otherwise indicated
   7. Polish all exposed edges, see drawings for details.

2.02 MATERIALS

A. Plywood for Supporting Substrate: PS 1 Exterior Grade, A-C veneer grade, minimum 5-ply; minimum 3/4 inch (19 mm) thick; join lengths using metal splines.

B. Adhesives: Chemical resistant waterproof adhesive as recommended by manufacturer of materials being joined.

C. Joint Sealant: Mildew-resistant silicone sealant, clear.

2.03 FABRICATION

A. Fabricate countertops and backsplashes in the largest sections practicable, with top surface of joints flush.

1. Join lengths of tops using best method recommended by manufacturer.
2. Fabricate to overhang fronts and ends of cabinets 1 inch (25 mm) except where top butts against cabinet or wall.
3. **All overhanging edges at casework to be built up to 1 1/2 inch vertical height.**
4. **Provide 1/8 inch radius at all edges of countertops and backsplashes.**
5. Prepare all cutouts accurately to size; replace tops having improperly dimensioned or unnecessary cutouts or fixture holes.

B. Provide back/end splash wherever counter edge abuts vertical surface unless otherwise indicated.
   1. Secure to countertop with concealed fasteners and with contact surfaces set in waterproof glue.
   2. Height: 4____ inches (___ mm), unless otherwise indicated.

C. Wall-Mounted Counters: Provide skirts, aprons, brackets, and braces as indicated on drawings.

PART 3 EXECUTION

3.01 EXAMINATION

A. Do not begin installation until substrates have been properly prepared.

B. If substrate preparation is the responsibility of another installer, notify Architect of unsatisfactory preparation before proceeding.

C. Verify that wall surfaces have been finished and mechanical and electrical services and outlets are installed in proper locations.

3.02 PREPARATION

A. Clean surfaces thoroughly prior to installation.

B. Prepare surfaces using the methods recommended by the manufacturer for achieving the best result for the substrate under the project conditions.

3.03 INSTALLATION

A. Securely attach countertops to cabinets using concealed fasteners. Make flat surfaces level; shim where required.

B. Seal joint between back/end splashes and vertical surfaces.

3.04 CLEANING

A. Clean countertops surfaces thoroughly.

B. Clean other material thoroughly.

3.05 PROTECTION

A. Protect installed products until completion of project.

B. Touch-up, repair or replace damaged products before Date of Substantial Completion.

END OF SECTION 12 3600

DIVISION 22 SPECIFICATIONS



THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 0514
COMMON WORK RESULTS FOR PLUMBING

PART 1 - GENERAL

1.1 SUMMARY
A. This Section includes the following:
1. Piping materials and installation instructions common to most piping systems.
2. Dielectric fittings.
3. Mechanical sleeve seals.
4. Sleeves.
5. Escutcheons.
6. Grout.
7. Equipment installation requirements common to equipment sections.
8. Concrete bases.
9. Supports and anchorages.

1.2 DEFINITIONS
A. Finished Spaces: Spaces other than plumbing and electrical equipment rooms, furred spaces, pipe chases, unheated spaces immediately below roof, spaces above ceilings, unexcavated spaces, crawlspaces, and tunnels.
B. Exposed, Interior Installations: Exposed to view indoors. Examples include finished occupied spaces and plumbing equipment rooms.
C. Exposed, Exterior Installations: Exposed to view outdoors or subject to outdoor ambient temperatures and weather conditions. Examples include rooftop locations.
D. Concealed, Interior Installations: Concealed from view and protected from physical contact by building occupants. Examples include above ceilings and in chases.
E. Concealed, Exterior Installations: Concealed from view and protected from weather conditions and physical contact by building occupants but subject to outdoor ambient temperatures. Examples include installations within unheated shelters.

1.3 SUBMITTALS
A. Welding certificates.

1.4 QUALITY ASSURANCE
A. Steel Support Welding: Qualify processes and operators according to AWS D1.1, "Structural Welding Code--Steel."
B. Steel Pipe Welding: Qualify processes and operators according to ASME Boiler and Pressure Vessel Code: Section IX, "Welding and Brazing Qualifications."
1. Comply with provisions in ASME B31 Series, "Code for Pressure Piping."
2. Certify that each welder has passed AWS qualification tests for welding processes involved and that certification is current.
C. Electrical Characteristics for Plumbing Equipment: Equipment of higher electrical characteristics may be furnished provided such proposed equipment is approved in writing and connecting electrical services, circuit breakers, and conduit sizes are appropriately modified. If minimum energy ratings or efficiencies are specified, equipment shall comply with requirements.

PART 2 - PRODUCTS

2.1 PIPE, TUBE, AND FITTINGS
A. Refer to individual Division 22 piping Sections for pipe, tube, and fitting materials and joining methods.
B. Pipe Threads: ASME B1.20.1 for factory-threaded pipe and pipe fittings.

2.2 JOINING MATERIALS

A. Refer to individual Division 22 piping Sections for special joining materials not listed below.
B. Pipe-Flange Gasket Materials: ASME B16.21, nonmetallic, flat, asbestos-free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.
C. Plastic, Pipe-Flange Gasket, Bolts, and Nuts: Type and material recommended by piping system manufacturer, unless otherwise indicated.
D. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.
E. Brazing Filler Metals: AWS A5.8, BCuP Series or BAg1, unless otherwise indicated.
F. Welding Filler Metals: Comply with AWS D10.12.
G. Solvent Cements for Joining Plastic Piping:
    1. CPVC Piping: ASTM F 493.
    2. PVC Piping: ASTM D 2564. Include primer according to ASTM F 656.

2.3 DIELECTRIC FITTINGS

A. Description: Combination fitting of copper alloy and ferrous materials with threaded, solder-joint, plain, or weld-neck end connections that match piping system materials.
B. Insulating Material: Suitable for system fluid, pressure, and temperature.
C. Dielectric Unions: Factory-fabricated, union assembly, for 250-psig (1725-kPa) minimum working pressure at 180 deg F (82 deg C).
D. Dielectric Flanges: Factory-fabricated, companion-flange assembly, for 150- or 300-psig (1035- or 2070-kPa) minimum working pressure as required to suit system pressures.
E. Dielectric Couplings: Galvanized-steel coupling with inert and noncorrosive, thermoplastic lining; threaded ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).
F. Dielectric Nipples: Electroplated steel nipple with inert and noncorrosive, thermoplastic lining; plain, threaded, or grooved ends; and 300-psig (2070-kPa) minimum working pressure at 225 deg F (107 deg C).

2.4 MECHANICAL SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, to fill annular space between pipe and sleeve.
B. Sealing Elements: EPDM interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
C. Pressure Plates: Carbon steel. Include two for each sealing element.
D. Connecting Bolts and Nuts: Carbon steel with corrosion-resistant coating of length required to secure pressure plates to sealing elements. Include one for each sealing element.

2.5 SLEEVES

A. Galvanized-Steel Sheet: 0.0239-inch (0.6-mm) minimum thickness; round tube closed with welded longitudinal joint.
B. Steel Pipe: ASTM A 53, Type E, Grade B, Schedule 40, galvanized, plain ends.
C. Cast Iron: Cast or fabricated "wall pipe" equivalent to ductile-iron pressure pipe, with plain ends and integral waterstop, unless otherwise indicated.
D. Stack Sleeve Fittings: Manufactured, cast-iron sleeve with integral clamping flange. Include clamping ring and bolts and nuts for membrane flashing.
    1. Underdeck Clamp: Clamping ring with set screws.

2.6 ESCUTCHEONS

A. Description: Manufactured wall and ceiling escutcheons and floor plates, with an ID to closely fit around pipe, tube, and insulation of insulated piping and an OD that completely covers opening.
B. One-Piece, Deep-Pattern Type: Deep-drawn, box-shaped brass with polished chrome-plated finish.

2.7 GROUT

A. Description: ASTM C 1107, Grade B, non-shrink, and nonmetallic, dry hydraulic-cement grout.

1. Characteristics: Post-hardening, volume-adjusting, non-staining, noncorrosive, nongaseous, and recommended for interior and exterior applications.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.
3. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 PIPING SYSTEMS - COMMON REQUIREMENTS

A. Install piping according to the following requirements and Division 15 Sections specifying piping systems.

B. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicated locations and arrangements were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

C. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

D. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

E. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

F. Install piping to permit valve servicing.

G. Install piping at indicated slopes.

H. Install piping free of sags and bends.

I. Install fittings for changes in direction and branch connections.

J. Install piping to allow application of insulation.

K. Select system components with pressure rating equal to or greater than system operating pressure.

L. Install escutcheons for penetrations of walls, ceilings, and floors.

M. Install sleeves for pipes passing through concrete and masonry walls, gypsum-board partitions, and concrete floor and roof slabs.

N. Aboveground, Exterior-Wall Pipe Penetrations: Seal penetrations using sleeves and mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Install steel pipe for sleeves smaller than 6 inches (150 mm) in diameter.
2. Install cast-iron "wall pipes" for sleeves 6 inches (150 mm) and larger in diameter.
3. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

O. Underground, Exterior-Wall Pipe Penetrations: Install cast-iron "wall pipes" for sleeves. Seal pipe penetrations using mechanical sleeve seals. Select sleeve size to allow for 1-inch (25-mm) annular clear space between pipe and sleeve for installing mechanical sleeve seals.

1. Mechanical Sleeve Seal Installation: Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble mechanical sleeve seals and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

P. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Refer to Division 7 Section "Through-Penetration Firestop Systems" for materials.
Q. Verify final equipment locations for roughing-in.
R. Refer to equipment specifications in other Sections of these Specifications for roughing-in requirements.

3.2 PIPING JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 22 Sections specifying piping systems.
B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.
C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.
D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.
E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.
F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:
    1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
    2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.
G. Welded Joints: Construct joints according to AWS D10.12, using qualified processes and welding operators according to Part 1 "Quality Assurance" Article.
H. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.
I. Plastic Piping Solvent-Cement Joints: Clean and dry joining surfaces. Join pipe and fittings according to the following:

    1. Comply with ASTM F 402, for safe-handling practice of cleaners, primers, and solvent cements.
    2. CPVC Piping: Join according to ASTM D 2846/D 2846M Appendix.
    3. PVC Pressure Piping: Join schedule number ASTM D 1785, PVC pipe and PVC socket fittings according to ASTM D 2672. Join other-than-schedule-number PVC pipe and socket fittings according to ASTM D 2855.
    4. PVC Non-pressure Piping: Join according to ASTM D 2855.
J. Plastic Pressure Piping Gasketed Joints: Join according to ASTM D 3139.
K. Plastic Non-pressure Piping Gasketed Joints: Join according to ASTM D 3212.

3.3 PIPING CONNECTIONS

A. Make connections according to the following, unless otherwise indicated:

    1. Install unions, in piping NPS 2 (DN 50) and smaller, adjacent to each valve and at final connection to each piece of equipment.
    2. Install flanges, in piping NPS 2-1/2 (DN 65) and larger, adjacent to flanged valves and at final connection to each piece of equipment.
    3. Wet Piping Systems: Install dielectric coupling and nipple fittings to connect piping materials of dissimilar metals.

3.4 EQUIPMENT INSTALLATION - COMMON REQUIREMENTS

A. Install equipment to allow maximum possible headroom unless specific mounting heights are not indicated.

B. Install equipment level and plumb, parallel, and perpendicular to other building systems and components in exposed interior spaces, unless otherwise indicated.
C. Install plumbing equipment to facilitate service, maintenance, and repair or replacement of components. Connect equipment for ease of disconnecting, with minimum interference to other installations. Extend grease fittings to accessible locations.
D. Install equipment to allow right of way for piping installed at required slope.

3.5 CONCRETE BASES

A. Concrete Bases: Anchor equipment to concrete base according to equipment manufacturer's written instructions and according to seismic codes at Project.

1. Construct concrete bases of dimensions indicated, but not less than 4 inches (100 mm) larger in both directions than supported unit.
2. Install dowel rods to connect concrete base to concrete floor. Unless otherwise indicated, install dowel rods on 18-inch (450-mm) centers around the full perimeter of the base.
3. Install epoxy-coated anchor bolts for supported equipment that extend through concrete base, and anchor into structural concrete floor.
4. Place and secure anchorage devices. Use supported equipment manufacturer's setting drawings, templates, diagrams, instructions, and directions furnished with items to be embedded.
5. Install anchor bolts to elevations required for proper attachment to supported equipment.
6. Install anchor bolts according to anchor-bolt manufacturer's written instructions.
7. Use 3000-psi (20.7-MPa), 28-day compressive-strength concrete and reinforcement as specified in Division 3 Section "Cast-in-Place Concrete."

3.6 ERECTION OF METAL SUPPORTS AND ANCHORAGES

A. Refer to Division 5 Section "Metal Fabrications" for structural steel.
B. Cut, fit, and place miscellaneous metal supports accurately in location, alignment, and elevation to support and anchor plumbing materials and equipment.
C. Field Welding: Comply with AWS D1.1.

3.7 ERECTION OF WOOD SUPPORTS AND ANCHORAGES

A. Cut, fit, and place wood grounds, nailers, blocking, and anchorages to support, and anchor plumbing materials and equipment.
B. Select fastener sizes that will not penetrate members if opposite side will be exposed to view or will receive finish materials. Tighten connections between members. Install fasteners without splitting wood members.
C. Attach to substrates as required to support applied loads.

3.8 GROUTING

A. Mix and install grout for plumbing equipment base bearing surfaces, pump and other equipment base plates, and anchors.
B. Clean surfaces that will come into contact with grout.
C. Provide forms as required for placement of grout.
D. Avoid air entrapment during placement of grout.
E. Place grout, completely filling equipment bases.
F. Place grout on concrete bases and provide smooth bearing surface for equipment.
G. Place grout around anchors.
H. Cure placed grout.

3.9 GENERAL

A. General and Special Conditions: Refer thereto for all applicable provisions.

B. Scope: Include all equipment, material and labor required for complete operating plumbing, and gas, even though every item involved is not indicated.

C. Codes: Comply with 2018 International Plumbing Code, 2018 International Building Code, AGA, 2018 International Gas Code, ADA and OSHA of the locality. Where conflicts occur between code and contact drawings or specifications, most stringent requirements shall apply.

D. Qualifications: Sub-contractor shall be licensed plumber and gas pipe fitter in the locality.

E. Permits: Provide all permits and arrange for inspections as required by city, county, and state authorities.

F. Drawings: In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, fittings, and equipment with the detail architectural, structural, and electrical drawings and layout work so as to fit in with other parts. Where doubts arise as to the leaning of the plans and specifications, obtain the Architect's decision before proceeding with parts as may be affected; otherwise, the Contractor shall be liable for damage to work and for removing and repairing his own work in proper manner.

G. Changes: If during construction, desirable or necessary changes become apparent, advise the Architect, and secure his decision in writing. Otherwise make no deviation from the system as detailed.

H. Existing Conditions: Bidders shall visit site and become acquainted with all job conditions. No consideration will be given after bid opening for alleged misunderstanding regarding utility connections, permits, fees, etc.

I. Prior Approval: Bidders shall submit equipment for prior approval 10 days before bid date.

J. Warranty: Guarantee in writing to make good without cost any defects in materials and workmanship within one year from the date of acceptance of project.

K. Submittals:

1. Within 25 days the award of the contract and before any orders are planned, the contractor shall submit to the Architect for approval seven (7) copies of a complete list of all proposed materials and all equipment, include catalog data, capacities, model numbers, any accessories, and any pertinent information to indicate full compliance with specification and drawings. Partial list will not be accepted. Rejected items shall be resubmitted until approval has been obtained.

2. The contractor shall submit shop drawings on the following items but not limited to the following items.

   a. List of proposed materials and equipment.
   b. Letter stating coordination of plumbing, mechanical and electrical work, signed by plumbing, mechanical, electrical, and general contractors. Submittals and shop drawings will not be reviewed without receipt of this item.
   c. Shop drawing showing coordination of Plumbing and Electrical.
   d. Showing drawing of Plumbing of a scale of not less than 1/8-inch equals one foot. The drawing shall show coordination with all HVAC, lighting, conduit, equipment, & etc.
   e. Pipe hanger shop drawings including methods of attachment to structure anchors.
   f. Schedule of insulation to be used including thickness. Submittal literature on all insulation, mastics, and materials. Include flame spread and smoke developed ratings.
   g. Access panels.
   h. Notify Architect of all pressure tests to be preformed.
   i. Water closets and accessories.
   j. Lavatories and accessories.
   k. Sink & accessories.
   l. Type water piping and accessories (interior)
   m. Type sanitary drain and vent piping and accessories

n. Water heaters and accessories.
o. Valves
p. Water hammer arrestor.

3.10 PROJECT CLOSE-OUT:

A. Prior to issuance of certificate for final payment, submit to Architect and obtain his approval of the following:

1. A letter signed by the subcontractors for plumbing and electrical work stating that they have jointly checked each power circuit and control circuit and mutually agree that each item is properly wired, and that controls and power circuits will function properly.
2. Record drawings – waste and vent piping (ACAD 2010 or higher).
3. Record drawings – water piping (ACAD 2010 or higher).
4. Record drawings – gas, air, and miscellaneous systems (ACAD 2010 or higher).
5. Lose tee keys for wall hydrants shall be turned over to owner.
6. Water/Air pressure test for waste and water systems.
7. Equipment submittal data (3).
8. Equipment Operating and Maintenance Manuals (3).
9. Maintenance schedule (3).
10. Equipment warranty dates and guarantee (3).
11. List of Owner's Personnel who have received maintenance training.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 0519
METERS AND GAGES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Bimetallic-actuated thermometers.
2. Liquid-in-glass thermometers.
3. Thermowells.
4. Dial-type pressure gages.
5. Gage attachments.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Product certificates.

C. Operation and maintenance data.

PART 2 - PRODUCTS

2.1 BIMETALLIC-ACTUATED THERMOMETERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

B. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

1. Ashcroft Inc.
2. Miljoco Corporation.
3. Trerice, H. O. Co.
4. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.
5. Weiss Instruments, Inc.

C. Standard: ASME B40.200.

D. Case: Liquid-filled and sealed type(s); stainless steel with 5-inch (127-mm) nominal diameter.

E. Dial: Nonreflective aluminum with permanently etched scale markings and scales in deg F (deg C).

F. Connector Type(s): Union joint, adjustable angle, with unified-inch screw threads.

G. Connector Size: 1/2 inch (13 mm), with ASME B1.1 screw threads.

H. Stem: 0.25 or 0.375 inch (6.4 or 9.4 mm) in diameter; stainless steel.

I. Window: Plain glass.

J. Ring: Stainless steel.

K. Element: Bimetal coil.

L. Pointer: Dark-colored metal.

M. Accuracy: Plus, or minus 1 percent of scale range.

2.2 LIQUID-IN-GLASS THERMOMETERS

A. Metal-Case, Industrial-Style, Liquid-in-Glass Thermometers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:
   a. Miljoco Corporation.
   b. Trerice, H. O. Co.
   c. Weiss Instruments, Inc.
3. Standard: ASME B40.200.
4. Case: Cast aluminum; 7-inch (178-mm) nominal size unless otherwise indicated.
5. Case Form: Adjustable angle unless otherwise indicated.
6. Tube: Glass with magnifying lens and blue organic liquid.
7. Tube Background: Nonreflective aluminum with permanently etched scale markings graduated in deg F (deg C).
8. Window: Glass.
9. Stem: Aluminum and of length to suit installation.
   a. Design for Thermowell Installation: Bare stem.
10. Connector: 1-1/4 inches (32 mm), with ASME B1.1 screw threads.
11. Accuracy: Plus, or minus 1 percent of scale range or one scale division, to a maximum of 1.5 percent of scale range.

2.3 THERMOWELLS

A. Thermowells:

1. Standard: ASME B40.200.
2. Description: Pressure-tight, socket-type fitting made for insertion into piping tee fitting.
3. Material for Use with Copper Tubing: CNR.
4. Material for Use with Steel Piping: CRES.
5. Type: Stepped shank unless straight or tapered shank is indicated.
6. External Threads: NPS 1/2, NPS 3/4, or NPS 1, (DN 15, DN 20, or NPS 25,) ASME B1.20.1 pipe threads.
7. Internal Threads: 1/2, 3/4, and 1 inch (13, 19, and 25 mm), with ASME B1.1 screw threads.
8. Bore: Diameter required to match thermometer bulb or stem.
9. Insertion Length: Length required to match thermometer bulb or stem.
10. Lagging Extension: Include on thermowells for insulated piping and tubing.
11. Bushings: For converting size of thermowell's internal screw thread to size of thermometer connection.

B. Heat-Transfer Medium: Mixture of graphite and glycerin.

2.4 PRESSURE GAGES

A. Direct-Mounted, Metal-Case, Dial-Type Pressure Gages:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

2. Basis-of-Design Product: Subject to compliance with requirements, provide product indicated on Drawings or comparable product by one of the following:

   a. Ashcroft Inc.

   b. Miljoco Corporation.

   c. Trerice, H. O. Co.

   d. Watts Regulator Co.; a div. of Watts Water Technologies, Inc.

   e. Weiss Instruments, Inc.

3. Standard: ASME B40.100.

4. Case: Sealed type(s); cast aluminum or drawn steel; 6-inch (152-mm) nominal diameter.

5. Pressure-Element Assembly: Bourdon tube unless otherwise indicated.

6. Pressure Connection: Brass, with NPS 1/4 (DN 8), ASME B1.20.1 pipe threads and bottom-outlet type unless back-outlet type is indicated.

7. Movement: Mechanical, with link to pressure element and connection to pointer.

8. Dial: Nonreflective aluminum with permanently etched scale markings graduated in psi (kPa).

9. Pointer: Dark-colored metal.

10. Window: Glass.

11. Ring: Metal.

12. Accuracy: Grade A, plus or minus 1 percent of middle half of scale range.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install thermowells with socket extending one-third of pipe diameter and in vertical position in piping tees.

B. Install thermowells of sizes required to match thermometer connectors. Include bushings if required to match sizes.

C. Install thermowells with extension on insulated piping.

D. Fill thermowells with heat-transfer medium.

E. Install direct-mounted thermometers in thermowells and adjust vertical and tilted positions.

F. Install remote-mounted thermometer bulbs in thermowells and install cases on panels; connect cases with tubing and support tubing to prevent kinks. Use minimum tubing length.

G. Install direct-mounted pressure gages in piping tees with pressure gage located on pipe at the most readable position.

H. Install remote-mounted pressure gages on panel.

I. Install valve and snubber in piping for each pressure gage for fluids.

J. Install thermometers in the following locations:

1. Inlet and outlet of each water heater.
2. Inlets and outlets of each domestic water heat exchanger.
3. Inlet and outlet of each domestic hot-water storage tank.
4. Inlet and outlet of each remote domestic water chiller.

K. Install pressure gages in the following locations:

1. Building water service entrance into building.
2. Inlet and outlet of each pressure-reducing valve.
3. Suction and discharge of each domestic water pump.

L. Install meters and gages adjacent to machines and equipment to allow service and maintenance of meters, gages, machines, and equipment.

M. Adjust faces of meters and gages to proper angle for best visibility.

3.2 THERMOMETER SCHEDULE

A. Thermometers at inlet and outlet of each domestic water heater shall be one o] the following:

1. Liquid-filled, bimetallic-actuated type.
2. Industrial-style, liquid-in-glass type.

B. Thermometer stems shall be of length to match thermowell insertion length.

3.3 THERMOMETER SCALE-RANGE SCHEDULE

A. Scale Range for Domestic Cold-Water Piping: 0 to 100 deg F (Minus 20 to plus 50 deg C).

3.4 PRESSURE-GAGE SCHEDULE

A. Pressure gages at discharge of each water service into building shall be the following:

1. Sealed, direct-mounted, metal case.

B. Pressure gages at inlet and outlet of each water pressure-reducing valve shall be the following:

1. Sealed, direct-mounted, metal case.

C. Pressure gages at suction and discharge of each domestic water pump shall be the following:

1. Sealed, direct-mounted, metal case.

3.5 PRESSURE-GAGE SCALE-RANGE SCHEDULE

A. Scale Range for Water Service Piping: 0 to 100 psi (0 to 600 kPa).

END OF SECTION

SECTION 22 0523
GENERAL-DUTY VALVES FOR PLUMBING PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Brass ball valves.
   2. Bronze ball valves.
   3. Bronze swing check valves.

B. Related Sections:

   1. Division 2 water distribution piping Sections for general-duty and specialty valves for site construction piping.
   2. Division 22 plumbing piping Sections for specialty valves applicable to those Sections only.
   3. Division 22 Section "Identification for Plumbing Piping and Equipment" for valve tags and schedules.

1.2 SUBMITTALS

A. Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.
B. NSF Compliance: NSF 61 for valve materials for potable-water service.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to valve schedule articles for applications of valves.
B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.
C. Valve Sizes: Same as upstream piping unless otherwise indicated.
D. Valves in Insulated Piping: With 2-inch (50-mm) stem extensions and the following features:
   1. Gate Valves: With rising stem.
   2. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.
E. Valve-End Connections:
   1. Flanged: With flanges according to ASME B16.1 for iron valves.
   2. Solder Joint: With sockets according to ASME B16.18.
   3. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim:
   1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

      a. Jomar Valve (T-100 CG).
      b. Kitz Corporation.

c. Milwaukee Valve Company.
d. NIBCO INC.
e. Red-White Valve Corporation.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two pieces.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE, TFE, or G300.
h. Stem: Brass.
i. Ball: T.E.A. coated or chrome plated brass.
j. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Regular-Port, Bronze Ball Valves with Bronze Trim:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Jomar Valve (T-200 CSSG)
b. Conbraco Industries, Inc.; Apollo Valves.
c. Kitz Corporation.
d. Milwaukee Valve Company.
e. NIBCO INC.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig (1035 kPa).
c. CWP Rating: 600 psig (4140 kPa).
d. Body Design: Two pieces.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Stem: Bronze or stainless steel.
i. Ball: Chrome-plated brass or stainless steel.
j. Port: Regular.

PART 3 - EXECUTION

3.1 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.
B. Locate valves for easy access and provide separate support where necessary.
C. Install valves in horizontal piping with stem at or above center of pipe.
D. Install valves in position to allow full stem movement.
E. Install chainwheels on operators for butterfly, gate, and globe valves NPS 4 (DN 100) and larger and more than 96 inches (2400 mm) above floor. Extend chains to 60 inches (1520 mm) above finished floor.

1. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

3.2 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.3 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:
   1. Shutoff Service: Ball valves.
   2. Throttling Service: Globe valves.
   3. Pump-Discharge Check Valves:
      a. NPS 2 (DN 50) and Smaller: Bronze swing check valves with bronze disc.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP class or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:
   1. For Copper Tubing, NPS 2 (DN 50) and Smaller: Threaded ends except where solder-joint valve-end option is indicated in valve schedules below.
   2. For Copper Tubing, NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Flanged ends except where threaded valve-end option is indicated in valve schedules below.
   3. For Copper Tubing, NPS 5 (DN 125) and Larger: Flanged ends.

3.4 DOMESTIC, HOT- AND COLD-WATER VALVE SCHEDULE

A. Pipe:
   1. Bronze and Brass Valves: May be provided with solder-joint ends instead of threaded ends.
   2. Bronze Angle Valves: Class 125, bronze disc.
   3. Ball Valves: Two-piece, full port, brass or bronze with brass trim.
   4. Bronze Swing Check Valves: Class 125, bronze disc.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 0529
HANGERS AND SUPPORTS FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:
   1. Steel pipe hangers and supports.
   2. Trapeze pipe hangers.
   3. Metal framing systems.
   4. Thermal-hanger shield inserts.
   5. Fastener systems.
   6. Equipment supports.

B. See Division 5 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.
B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Product Data: For the following:
   1. Steel pipe hangers and supports.
   2. Thermal-hanger shield inserts.
   3. Powder-actuated fastener systems.
B. Shop Drawings: Show fabrication and installation details and include calculations for the following:
   1. Trapeze pipe hangers. Include Product Data for components.
   2. Metal framing systems. Include Product Data for components.
   3. Equipment supports.
C. Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

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 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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:

1. AAA Technology & Specialties Co., Inc.
2. Bergen-Power Pipe Supports.
3. B-Line Systems, Inc.; a division of Cooper Industries.
4. Carpenter & Paterson, Inc.
5. Empire Industries, Inc.
6. ERICO/Michigan Hanger Co.
7. Globe Pipe Hanger Products, Inc.
8. Grinnell Corp.
9. GS Metals Corp.
10. National Pipe Hanger Corporation.
11. PHD Manufacturing, Inc.
12. PHS Industries, Inc.
13. Piping Technology & Products, Inc.
14. Tolco Inc.

C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.4 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. B-Line Systems, Inc.; a division of Cooper Industries.
2. ERICO/Michigan Hanger Co.; ERISTRUT Div.
3. GS Metals Corp.
4. Power-Strut Div.; Tyco International, Ltd.
5. Thomas & Betts Corporation.
6. Tolco Inc.
7. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.5 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation inserts encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. ERICO/Michigan Hanger Co.
3. PHS Industries, Inc.
4. Pipe Shields, Inc.
5. Rilco Manufacturing Company, Inc.
6. Value Engineered Products, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.
D. Insulation-Insert Material for Hot Piping: ASTM C 552, Type II cellular glass.
E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.
F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.
G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.6 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
   1. Manufacturers:
      a. Hilti, Inc.
      b. ITW Ramset/Red Head.
      c. Masterset Fastening Systems, Inc.
      d. MKT Fastening, LLC.
      e. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type stainless steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.
   1. Manufacturers:
      a. B-Line Systems, Inc.; a division of Cooper Industries.
      b. Empire Industries, Inc.
      c. Hilti, Inc.
      d. ITW Ramset/Red Head.
      e. MKT Fastening, LLC.
      f. Powers Fasteners.

2.7 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

2.8 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.
B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.
   1. Properties: Non-staining, noncorrosive, and nongaseous.
   2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.
C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.
D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.
E. Use padded hangers for piping that is subject to scratching.
F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
   2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
   3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
   4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
   5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
   6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
   7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.
   8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050) if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

   1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
   2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
   2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
   1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
   2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
   3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
   4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
   5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
   6. C-Clamps (MSS Type 23): For structural shapes.

7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:

    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).

8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
    1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
    2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
    3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:
    1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).
    2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
    3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.
M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.
N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.
B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

    1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
    2. Field fabricate from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.
D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.
E. Fastener System Installation:

    1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.

2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.
G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.
H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.
I. Install lateral bracing with pipe hangers and supports to prevent swaying.

Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

J. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.
K. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.9 (for building services piping) are not exceeded.
L. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
   a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
   b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
   c. Do not exceed pipe stress limits according to ASME B31.9 for building services piping.

2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:
   a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
   b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
   c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
   d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
   e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.
B. Grouting: Place grout under supports for equipment and make smooth bearing surface.
C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.
C. Field Welding: Comply with AWS D1.1 procedure for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:
   1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
   2. Obtain fusion without undercut or overlap.
   3. Remove welding flux immediately.
   4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

   1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 0553
IDENTIFICATION FOR PLUMBING PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.

1.2 SUBMITTAL

A. Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/8 inch (3.2 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded, with lettering indicating service, and showing flow direction.
B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to partially cover circumference of pipe and to attach to pipe without fasteners or adhesive.
C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both

directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.3 VALVE TAGS

A. All valves except equipment service valves shall be equipped with engraved laminated plastic valve tags secured with chains to valve yoke or stem (not handles). Tags shall be 2" x 3" with 1/2" high red numbers on white background. Locate numbers at one end of tag leaving room for future engraving by others. Number tags in sequence from lowest to highest point in building starting with number 1. In each equipment room provide framed valve chart showing number and location of each valve and type of service. Identify location of equipment, valves, etc. above ceilings as specified under 1510 B.6.

B. Provide location labels on ceiling grid for all valves above ceiling plastic label with adhesive backing 3.2mm thick. Provide engraved valve tag #. Background color white. Letter color red for HW. Blue for CW. Black for HWR 1/4” high letters.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surface of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 9 Section "Interior Painting."

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.
7. On piping above removable acoustical ceilings. Omit intermediately spaced labels.

C. Pipe Label Color Schedule:
1. Domestic Water Piping:
   a. Background Color: Green.
   b. Letter Color: White.
2. Domestic Hot Water Piping:
   a. Background Color: Yellow.
   b. Letter Color: Black.

D. All valves except equipment service valves shall be equipped with engraved laminated plastic valve tags secured with chains to valve yoke or stem (not handles). Tags shall be 2" x 3" with 1/2" high red numbers on white background. Locate numbers at one end of tag leaving room for future engraving by others. Number tags in sequence from lowest to highest point in building starting with number 1. In each equipment room provide framed valve chart showing number and location of each valve and type of service. Identify location of equipment, valves, etc. above ceilings as specified under 1510 B.6.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 0719
PLUMBING PIPING INSULATION

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Insulation Materials:
      a. Mineral fiber.
   2. Insulating cements.
   3. Adhesives.
   4. Mastics.
   5. Field-applied jackets.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Shop Drawings:

   1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
   2. Detail attachment and covering of heat tracing inside insulation.
   3. Detail insulation application at pipe expansion joints for each type of insulation.
   4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
   5. Detail removable insulation at piping specialties, equipment connections, and access panels.
   6. Detail application of field-applied jackets.
   7. Detail application at linkages of control devices.
   8. Detail field application for each equipment type.

C. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Fire-Test-Response Characteristics: Insulation and related materials shall have fire-test-response characteristics indicated, as determined by testing identical products per ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction.

   Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing and inspecting agency.

   1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
   2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

B. Insulation to be installed by Licensed Insulation Contractor with minimum 5 years' experience with this type commercial project. Plumbing Contractor is not acceptable.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in Part 3 schedule articles for where insulating materials shall be applied.
B. Products shall not contain asbestos, lead, mercury, or mercury compounds.
C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.
E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.
F. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Fibrex Insulations Inc.; Coreplus 1200.
b. Johns Manville; Micro-Lok.
c. Knauf Insulation; 1000 Pipe Insulation.
d. Manson Insulation Inc.; Alley-K.
e. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory-applied ASJ-SSL. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449/C 449M.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Insulco, Division of MFS, Inc.; SmoothKote.
b. P. K. Insulation Mfg. Co., Inc.; PK No. 127, and Quik-Cote.
c. Rock Wool Manufacturing Company; Delta One Shot.

2.3 ADHESIVES

A. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 80 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. ASJ Adhesive, and FSK and PVDC Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

1. Products: Subject to compliance with requirements, provide one of the following:

a. Childers Products, Division of ITW; CP-82.
b. Foster Products Corporation, H. B. Fuller Company; 85-20.
c. ITW TACC, Division of Illinois Tool Works; S-90/80.
d. Marathon Industries, Inc.; 225.
e. Mon-Eco Industries, Inc.; 22-25.

2. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

2.4 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto PVC Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

C. Aluminum Jacket: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105 or 5005, Temper H-14.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Childers Products, Division of ITW; Metal Jacketing Systems.
    b. PABCO Metals Corporation; Surefit.
    c. RPR Products, Inc.; Insul-Mate.

2. Factory cut and rolled to size.
3. Finish and thickness are indicated in field-applied jacket schedules.
4. Moisture Barrier for Indoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
5. Moisture Barrier for Outdoor Applications: 3-mil- (0.075-mm-) thick, heat-bonded polyethylene and kraft paper.
6. Factory-Fabricated Fitting Covers:

    a. Same material, finish, and thickness as jacket.
    b. Preformed 2-piece or gore, 45- and 90-degree, short- and long-radius elbows.
    c. Tee covers.
    d. Flange and union covers.
    e. End caps.
    f. Beveled collars.
    g. Valve covers.
    h. Field fabricate fitting covers only if factory-fabricated fitting covers are not available.

PART 3 - EXECUTION

3.1 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

C. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.2 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of equipment and piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of equipment and pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 4 inches (100 mm) o.c.

    a. For below ambient services, apply vapor-barrier mastic over staples.

4. Cover joints and seams with tape as recommended by insulation material manufacturer to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.3 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems."

3.4 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity, unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below ambient services, provide a design that maintains vapor barrier.
6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation,or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below ambient services and a breather mastic for above ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes, vessels, and equipment. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges except divide the two-part section on the vertical center line of valve body.

4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches (50 mm) over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.5 MINERAL-FIBER INSULATION INSTALLATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above ambient surfaces, secure laps with outward clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below ambient surfaces, do not staple longitudinal tabs but secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

3.6 FINISHES

A. Equipment and Pipe Insulation with ASJ or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Division 9 painting Sections.

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by the Contracting Officer. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.7 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect field-insulated equipment, randomly selected by the Contracting Officer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each type of equipment defined in the "Equipment Insulation Schedule" Article. For large equipment, remove only a portion adequate to determine compliance.
2. Inspect pipe, fittings, strainers, and valves, randomly selected by the Contracting Officer, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of threaded fittings, three locations of welded fittings, two locations of threaded strainers, two locations of welded strainers, three locations of threaded valves, and three locations of flanged valves for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.8 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Drainage piping located in crawl spaces.
2. Underground piping.
3. Chrome-plated pipes and fittings unless there is a potential for personnel injury.

3.9 INDOOR PIPING INSULATION SCHEDULE

A. Domestic Hot and Recirculated Hot Water: Insulation shall be the following:
1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick on 1 ¼” or smaller.
2. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1.5 inch (25 mm) thick on 1 ½” or larger.

B. Domestic Chilled Water (Potable): Insulation shall be the following:
1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

C. Stormwater and Overflow: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

D. Roof Drain and Overflow Drain Bodies: Insulation shall be the following:

1. Mineral-Fiber, Preformed Pipe Insulation, Type I: 1 inch (25 mm) thick.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 1116

DOMESTIC WATER PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Under-building slab and aboveground domestic water pipes, tubes, fittings, and specialties inside the building.
2. Specialty valves.
3. Water meters.
4. Escutcheons.
5. Sleeves and sleeve seals.

B. Related Section:

1. Division 2 Section "Water Distribution" for water-service piping and water meters outside the building from source to the point where water-service piping enters the building.

2. Scope: Connect to new existing water lines and extend to all plumbing fixtures, etc.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control reports.

1.3 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14 for plastic, potable domestic water piping and components.

C. Comply with NSF 61 for potable domestic water piping and components.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Comply with requirements in "Piping Schedule" Article for applications of pipe, tube, fitting materials, and joining methods for specific services, service locations, and pipe sizes.

2.2 COPPER TUBE/PEX AND FITTINGS

A. Hard Copper Tube: ASTM B 88, Type L (ASTM B 88M, Type B) water tube, drawn temper.
1. Cast-Copper Solder-Joint Fittings: ASME B16.18, pressure fittings.
2. Wrought-Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.
3. Bronze Flanges: ASME B16.24, Class 150, with solder-joint ends.
4. Copper Unions: MSS SP-123, cast-copper-alloy, hexagonal-stock body, with ball-and-socket, metal-to-metal seating surfaces, and solder-joint or threaded ends.

B. Soft Copper Tube: ASTM B 88, Type K (ASTM B 88M, Type A) and ASTM B 88, Type L (ASTM B 88M, Type B) water tube, annealed temper.

1. Copper Solder-Joint Fittings: ASME B16.22, wrought-copper pressure fittings.

C. PEX Class “A”. Uponor Class “A” or equal.

2.3 PIPING JOINING MATERIALS

A. Pipe-Flange Gasket Materials: AWWA C110, rubber, flat face, 1/8 inch (3.2 mm) thick or ASME B16.21, nonmetallic and asbestos free, unless otherwise indicated; full-face or ring type unless otherwise indicated.

B. Metal, Pipe-Flange Bolts and Nuts: ASME B18.2.1, carbon steel unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8/A5.8M, BCuP Series, copper-phosphorus alloys for general-duty brazing unless otherwise indicated.

2.4 SPECIALTY VALVES

A. Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for general-duty metal valves.

B. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves, drain valves, backflow preventers, and vacuum breakers.

2.5 DIELECTRIC FITTINGS

A. General Requirements: Assembly of copper alloy and ferrous materials or ferrous material body with separating nonconductive insulating material suitable for system fluid, pressure, and temperature.

B. Dielectric Unions:

1. Description:

a. Pressure Rating: 150 psig (1035 kPa) at 180 deg F (82 deg C).
b. End Connections: Solder-joint copper alloy and threaded ferrous.

C. Dielectric Flanges:

1. Description:

a. Factory-fabricated, bolted, companion-flange assembly.
b. Pressure Rating: 150 psig (1035 kPa).
c. End Connections: Solder-joint copper alloy and threaded ferrous; threaded solder-joint copper alloy and threaded ferrous.

2.6 ESCUTCHEONS

A. General: Manufactured ceiling, floor, and wall escutcheons and floor plates.
B. One Piece, Cast Brass: Polished, chrome-plated finish with setscrews.

C. One Piece, Deep Pattern: Deep-drawn, box-shaped brass with chrome-plated finish.

D. Split Casting, Cast Brass: Polished, chrome-plated finish with concealed hinge and setscrew.

E. Split Plate, Stamped Steel: Chrome-plated finish with concealed hinge.

F. One-Piece Floor Plates: Cast-iron flange with holes for fasteners.

G. Split-Casting Floor Plates: Cast brass with concealed hinge.

2.7 SLEEVES

A. Galvanized-Steel-Pipe Sleeves: ASTM A 53/A 53M, Type E, Grade B, Schedule 40, zinc-coated, with plain ends.

2.8 SLEEVE SEALS

A. Description: Modular sealing element unit, designed for field assembly, used to fill annular space between pipe and sleeve.

1. Sealing Elements: EPDM-rubber interlocking links shaped to fit surface of pipe. Include type and number required for pipe material and size of pipe.
2. Pressure Plates: Carbon steel.
3. Connecting Bolts and Nuts: Stainless steel of length required to secure pressure plates to sealing elements.

2.9 GROUT

A. Standard: ASTM C 1107, Grade B, post-hardening and volume-adjusting, dry, hydraulic-cement grout.

B. Characteristics: Non-shrink; recommended for interior and exterior applications.

C. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

D. Packaging: Premixed and factory packaged.

PART 3 - EXECUTION

3.1 EARTHWORK

A. Comply with requirements in Division 2 Section "Earthwork" for excavating, trenching, and backfilling.

3.2 PIPING INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of domestic water piping. Indicated locations and arrangements are used to size pipe and calculate friction loss, expansion, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install copper tubing under building slab according to CDA's "Copper Tube Handbook."

C. Install ductile-iron piping under building slab with restrained joints according to AWWA C600 and AWWA M41.

D. Install shutoff valve, hose-end drain valve, strainer, pressure gage, and test tee with valve, inside the building at each domestic water service entrance. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for pressure gages and Division 22 Section "Domestic Water Piping Specialties" for drain valves and strainers.

E. Install shutoff valve immediately upstream of each dielectric fitting.

F. Install water-pressure-reducing valves downstream from shutoff valves. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for pressure- reducing valves.

G. Install domestic water piping level and plumb.

A. Rough-in domestic water piping for water-meter installation according to utility company's requirements.

B. Install piping concealed from view and protected from physical contact by building occupants unless otherwise indicated and except in equipment rooms and service areas.

J. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

K. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal and

coordinate with other services occupying that space.

L. Install piping adjacent to equipment and specialties to allow service and maintenance.

M. Install piping to permit valve servicing.

N. Install nipples, unions, special fittings, and valves with pressure ratings the same as or higher than system pressure rating used in applications below unless otherwise indicated.

O. Install piping free of sags and bends.

P. Install fittings for changes in direction and branch connections.

Q. Install unions in copper tubing at final connection to each piece of equipment, machine, and specialty.

C. Install thermostats in hot-water circulation piping.

S. Install thermometers on outlet piping from each water heater. Comply with requirements in Division 22 Section "Meters and Gages for Plumbing Piping" for thermometers.

3.3 JOINT CONSTRUCTION

A. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

B. Remove scale, slag, dirt, and debris from inside and outside of pipes, tubes, and fittings before assembly.

C. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged.

D. Brazed Joints: Join copper tube and fittings according to CDA's "Copper Tube Handbook," "Brazed Joints" Chapter.

E. Soldered Joints: Apply ASTM B 813, water-flushable flux to end of tube. Join copper tube and fittings according to ASTM B 828 or CDA's "Copper Tube Handbook."

F. Flanged Joints: Select appropriate asbestos-free, nonmetallic gasket material in size, type, and thickness suitable for domestic water service. Join flanges with gasket and bolts according to ASME B31.9.

G. Dissimilar-Material Piping Joints: Make joints using adapters compatible with materials of both piping systems.

3.4 VALVE INSTALLATION

A. General-Duty Valves: Comply with requirements in Division 22 Section "General-Duty Valves for Plumbing Piping" for valve installations.

B. Install shutoff valve close to water main on each branch and riser serving plumbing fixtures or equipment, on each water supply to equipment, and on each water supply to plumbing fixtures that do not have supply stops. Use ball valves for piping NPS 2 (DN 50) and smaller. Use butterfly or gate valves for piping NPS 2-1/2 (DN 65) and larger.

C. Install drain valves for equipment at base of each water riser, at low points in horizontal piping, and where required to drain water piping. Drain valves are specified in Division 22 Section "Domestic

Water Piping Specialties."

1. Hose-End Drain Valves: At low points in water mains, risers, and branches.
2. Stop-and-Waste Drain Valves: Instead of hose-end drain valves where indicated.

D. Install balancing valve in each hot-water circulation return branch and discharge side of each pump and circulator. Set balancing valves partly open to restrict but not stop flow. Use ball valves for piping. Comply with requirements in Division 22 Section "Domestic Water Piping Specialties" for balancing valves.

3.5 DIELECTRIC FITTING INSTALLATION

A. Install dielectric fittings in piping at connections of dissimilar metal piping and tubing.

B. Dielectric Fittings for NPS 2 (DN 50) and Smaller: Use dielectric couplings.

C. Dielectric Fittings for NPS 2-1/2 to NPS 4 (DN 65 to DN 100): Use dielectric flanges.

3.6 FLEXIBLE CONNECTOR INSTALLATION

A. Install flexible connectors in suction and discharge piping connections to each domestic water pump.

3.7 HANGER AND SUPPORT INSTALLATION

A. Comply with requirements in Division 22 Section "Hangers and Supports for Plumbing Piping and Equipment" for pipe hanger and support products and installation.

1. Vertical Piping: MSS Type 8 or 42, clamps.
2. Individual, Straight, Horizontal Piping Runs:
   a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
   b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
3. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Support vertical piping and tubing at base and at each floor.

C. Rod diameter may be reduced one size for double-rod hangers, to a minimum of 3/8 inch (10 mm).

D. Install hangers for copper tubing with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 3/4 (DN 20) and Smaller: 60 inches (1500 mm) with 3/8-inch (10-mm) rod.
2. NPS 1 and NPS 1-1/4 (DN 25 and DN 32): 72 inches (1800 mm) with 3/8-inch (10-mm) rod.
3. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 96 inches (2400 mm) with 3/8-inch (10-mm) rod.
4. NPS 2-1/2 (DN 65): 108 inches (2700 mm) with 1/2-inch (13-mm) rod.
5. NPS 3 to NPS 5 (DN 80 to DN 125): 10 feet (3 m) with 1/2-inch (13-mm) rod.
6. NPS 6 (DN 150): 10 feet (3 m) with 5/8-inch (16-mm) rod.

E. Install supports for vertical copper tubing every 10 feet (3 m).

3.8 CONNECTIONS

A. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment and machines to allow service and maintenance.

C. Connect domestic water piping to exterior water-service piping. Use transition fitting to join dissimilar piping materials.

D. Connect domestic water piping to water-service piping with shutoff valve; extend and connect to the following:
1. Water Heaters: Cold-water inlet and hot-water outlet piping in sizes indicated, but not smaller

than sizes of water heater connections.

2. Plumbing Fixtures: Cold- and hot-water supply piping in sizes indicated, but not smaller than required by plumbing code. Comply with requirements in Division 22 plumbing fixture Sections for connection sizes.
3. Equipment: Cold- and hot-water supply piping as indicated, but not smaller than equipment connections. Provide shutoff valve and union for each connection. Use flanges instead of unions for NPS 2-1/2 (DN 65) and larger.

3.9 ESCUTCHEON INSTALLATION

A. Install escutcheons for penetrations of walls, ceilings, and floors.

B. Escutcheons for New Piping:

1. Piping with Fitting or Sleeve Protruding from Wall: One-piece, deep pattern.
2. Bare Piping at Wall and Floor Penetrations in Finished Spaces: One-piece, cast brass with polished chrome-plated finish.
3. Bare Piping at Ceiling Penetrations in Finished Spaces: One-piece or split casting, cast brass with polished chrome-plated finish.
4. Bare Piping in Unfinished Service Spaces: One-piece, cast brass with polished chrome-plated finish.
5. Bare Piping in Equipment Rooms: One-piece, stamped steel with set screw or stamped steel with spring clips.
6. Bare Piping at Floor Penetrations in Equipment Rooms: One-piece floor plate.

3.10 SLEEVE INSTALLATION

A. General Requirements: Install sleeves for pipes and tubes passing through penetrations in floors, partitions, roofs, and walls.

B. Sleeves are not required for core-drilled holes.

C. Permanent sleeves are not required for holes formed by removable PE sleeves.

D. Cut sleeves to length for mounting flush with both surfaces unless otherwise indicated.

E. Install sleeves in new partitions, slabs, and walls as they are built.

F. For interior wall penetrations, seal annular space between sleeve and pipe or pipe insulation using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.

G. For exterior wall penetrations above grade, seal annular space between sleeve and pipe using joint sealants appropriate for size, depth, and location of joint. Comply with requirements in Division 7 Section "Joint Sealants" for joint sealants.

H. For exterior wall penetrations below grade, seal annular space between sleeve and pipe using sleeve seals specified in this Section.

I. Seal space outside of sleeves in concrete slabs and walls with grout.

J. Install sleeves that are large enough to provide 1/4-inch (6.4-mm) annular clear space between sleeve and pipe or pipe insulation unless otherwise indicated.

K. Install sleeve materials according to the following applications:

1. Sleeves for Piping Passing through Concrete Floor Slabs: Steel pipe.
2. Sleeves for Piping Passing through Concrete Floor Slabs of Mechanical Equipment Areas or Other Wet Areas: Steel pipe.

    a. Extend sleeves 2 inches (50 mm) above finished floor level.
    For pipes penetrating floors with membrane waterproofing, extend cast-iron sleeve

fittings below floor slab as required to secure clamping ring if ring is specified. Secure flashing between clamping flanges. Install section of cast- iron soil pipe to extend sleeve to 2 inches (50 mm) above finished floor level. Comply with requirements in Division 7 Section "Sheet Metal Flashing and Trim" for flashing.

3. Sleeves for Piping Passing through Gypsum-Board Partitions:
    a. Steel pipe sleeves for pipes smaller than NPS 6 (DN 150).
    b. Exception: Sleeves are not required for water supply tubes and waste pipes for individual plumbing fixtures if escutcheons will cover openings.
4. Sleeves for Piping Passing through Concrete Roof Slabs: Steel pipe.
5. Sleeves for Piping Passing through Exterior Concrete Walls:
    a. Steel pipe sleeves for pipes smaller than NPS 6 (DN 150).
    b. Cast-iron wall pipe sleeves for pipes NPS 6 (DN 150) and larger.
    c. Install sleeves that are large enough to provide 1-inch (25-mm) annular clear space between sleeve and pipe or pipe insulation when sleeve seals are used.

L. Fire-Barrier Penetrations: Maintain indicated fire rating of walls, partitions, ceilings, and floors at pipe penetrations. Seal pipe penetrations with firestop materials. Comply with requirements in Division 7 Section "Through-Penetration Firestop Systems" for firestop materials and installations.

3.11 SLEEVE SEAL INSTALLATION

A. Install sleeve seals in sleeves in exterior concrete walls at water-service piping entries into building.

B. Select type and number of sealing elements required for pipe material and size. Position pipe in center of sleeve. Assemble sleeve seal components and install in annular space between pipe and sleeve. Tighten bolts against pressure plates that cause sealing elements to expand and make watertight seal.

3.12 IDENTIFICATION

A. Identify system components. Comply with requirements in Division 22 Section "Identification for Plumbing Piping and Equipment" for identification materials and installation.

B. Label pressure piping with system operating pressure.

3.13 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Piping Inspections:

1. Do not enclose, cover, or put piping into operation until it has been inspected and approved by authorities having jurisdiction.
2. During installation, notify authorities having jurisdiction at least one day before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction:
    a. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
    b. Final Inspection: Arrange final inspection for authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.
3. Re-inspection: If authorities having jurisdiction find that piping will not pass tests or inspections, make required corrections, and arrange for re-inspection.
4. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

C. Piping Tests:

1. Fill domestic water piping. Check components to determine that they are not air bound and that

piping is full of water.

2. Test for leaks and defects in new piping and parts of existing piping that have been altered, extended, or repaired. If testing is performed in segments, submit a separate report for each test, complete with diagram of portion of piping tested.
3. Leave new, altered, extended, or replaced domestic water piping uncovered and unconcealed until it has been tested and approved. Expose work that was covered or concealed before it was tested.
4. Cap and subject piping to static water pressure of 50 psig (345 kPa) above operating pressure, without exceeding pressure rating of piping system materials. Isolate test source and allow to stand for four hours. Leaks and loss in test pressure constitute defects that must be repaired.
5. Repair leaks and defects with new materials and retest piping or portion thereof until satisfactory results are obtained.
6. Prepare reports for tests and for corrective action required.

D. Domestic water piping will be considered defective if it does not pass tests and inspections.

E. Prepare test and inspection reports.

3.14 CLEANING

A. Clean and disinfect potable domestic water piping as follows:

1. Purge new piping and parts of existing piping that have been altered, extended, or repaired before using.
2. Use purging and disinfecting procedures prescribed by authorities having jurisdiction; if methods are not prescribed, use procedures described in either AWWA C651 or AWWA C652 or follow procedures described below:

   a. Flush piping system with clean, potable water until dirty water does not appear at outlets.
   b. Fill and isolate system according to either of the following:

      1) Fill system or part thereof with water/chlorine solution with at least 50 ppm (50 mg/L) of chlorine. Isolate with valves and allow to stand for 24 hours.
      2) Fill system or part thereof with water/chlorine solution with at least 200 ppm (200 mg/L) of chlorine. Isolate and allow to stand for three hours.

   c. Flush system with clean, potable water until no chlorine is in water coming from system after the standing time.
   d. Submit water samples in sterile bottles to authorities having jurisdiction. Repeat procedures if biological examination shows contamination.

B. Prepare and submit reports of purging and disinfecting activities.

C. Clean interior of domestic water piping system. Remove dirt and debris as work progresses.

3.15 PIPING SCHEDULE

A. Transition and special fittings with pressure ratings at least equal to piping rating may be used in applications below unless otherwise indicated.

B. Aboveground domestic water piping, NPS 2 (DN 50) and smaller, shall be the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and soldered joints.

C. Aboveground domestic water piping, NPS 2-1/2 to NPS 4 (DN 65 to DN 100), shall be the following:

1. Hard copper tube, ASTM B 88, Type L (ASTM B 88M, Type B); cast- or wrought- copper solder-joint fittings; and brazed joints.

3.16 VALVE SCHEDULE

A. Drawings indicate valve types to be used. Where specific valve types are not indicated, the following requirements apply:

1. Shutoff Duty: Use ball valves for piping NPS 2 (DN 50) and smaller. Use ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
2. Throttling Duty: Use ball or globe valves for piping NPS 2 (DN 50) and smaller. Use butterfly or ball valves with flanged ends for piping NPS 2-1/2 (DN 65) and larger.
3. Hot-Water Circulation Piping, Balancing Duty: Memory-stop balancing valves.
4. Drain Duty: Hose-end drain valves.

B. Use check valves to maintain correct direction of domestic water flow to and from equipment.

C. Iron grooved-end valves may be used with grooved-end piping.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 1119

DOMESTIC WATER PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following domestic water piping specialties:

1. Vacuum breakers.
2. Backflow preventers.
3. Balancing valves.
4. Temperature-actuated water mixing valves.
5. Hose bibbs.
6. Water hammer arresters.
7. Trap-seal primer valves.

B. See Division 22 Section "Domestic Water Piping" for water meters.

1.2 PERFORMANCE REQUIREMENTS

A. Minimum Working Pressure for Domestic Water Piping Specialties: 125 psig (860 kPa), unless otherwise indicated.

1.3 SUBMITTALS

A. Product Data: For each type of product indicated.

B. Field quality-control test reports.

C. Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. NSF Compliance:
1. Comply with NSF 61, "Drinking Water System Components - Health Effects; Sections 1 through 9."

PART 2 - PRODUCTS

2.1 VACUUM BREAKERS

A. Pipe-Applied, Atmospheric-Type Vacuum Breakers:

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. Ames Co.
b. Conbraco Industries, Inc.
c. FEBCO; SPX Valves & Controls.
d. Watts Industries, Inc.; Water Products Div.
e. Zurn Plumbing Products Group; Wilkins Div.

3. Standard: ASSE 1001.
4. Size: NPS 1/4 to NPS 3 (DN 8 to DN 80), as required to match connected piping.
5. Body: Bronze.
6. Inlet and Outlet Connections: Threaded.

7. Finish: Chrome plated.

B. Hose-Connection Vacuum Breakers:

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. Arrowhead Brass Products, Inc.
   b. Watts Industries, Inc.; Water Products Div.
   c. Woodford Manufacturing Company.
   d. Zurn Plumbing Products Group.

3. Standard: ASSE 1001.
4. Body: Bronze, nonremovable, with manual drain.
5. Outlet Connection: Garden-hose threaded complying with ASME B1.20.7.
6. Finish: Chrome or nickel plated.

2.2 BACKFLOW PREVENTERS

A. Double-Check Backflow-Prevention Assemblies:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

   a. Ames Co.
   b. Conbraco Industries, Inc.
   c. FEBCO; SPX Valves & Controls.
   d. Flomatic Corporation.
   e. Watts Industries, Inc.; Water Products Div.
   f. Zurn Plumbing Products Group; Wilkins Div.

4. Standard: ASSE 1015.
5. Operation: Continuous-pressure applications, unless otherwise indicated.
6. Pressure Loss: 5 psig (35 kPa) maximum, through middle 1/3 of flow range.
7. Body: Bronze for NPS 2 (DN 50) and smaller; cast iron with interior lining complying with AWWA C550 or that is FDA approved for NPS 2-1/2 (DN 65) and larger.
8. End Connections: Threaded for NPS 2 (DN 50) and smaller; flanged for NPS 2-1/2 (DN 65) and larger.
9. Configuration: Designed for horizontal flow.
10. Accessories:

    a. Valves: Ball type with threaded ends on inlet and outlet of NPS 2 (DN 50) and smaller; outside screw and yoke gate-type with flanged ends on inlet and outlet of NPS 2-1/2 (DN 65) and larger.

2.3 TEMPERATURE-ACTUATED WATER MIXING VALVES

A. Primary, Thermostatic, Water Mixing Valves:

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:

3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:
   a. Lawler Manufacturing Company, Inc.
   b. Leonard Valve Company.
   c. Powers; a Watts Industries Co.
   d. Symmons Industries, Inc.

4. Standard: ASSE 1017.
5. Pressure Rating: 125 psig (860 kPa).
6. Type: Exposed-mounting, thermostatically controlled water mixing valve.
7. Material: Bronze body with corrosion-resistant interior components.
8. Connections: Threaded or union inlets and outlet.
9. Accessories: Manual temperature control, check stops on hot- and cold-water supplies, and adjustable, temperature-control handle.
10. Valve Pressure Rating: 125 psig (860 kPa) minimum, unless otherwise indicated.
11. Valve Finish: Rough bronze.
12. Piping Finish: Copper.

2.4 LIMITING VALVES:

A. Temperature Limiting Valve: Zurn ZW3870XLT, Leonard 170D-LF and Sioux Chief Model 696 for all lavatories, sinks, etc., or equivalent by Watts, Acorn, Powers, Symmons, or T&S. Mount in recessed access box with finished frame. Provide access panel.

2.5 WATER HAMMER ARRESTERS

A. Water Hammer Arresters:

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. AMTROL, Inc.
   b. Josam Company.
   c. MIFAB, Inc.
   d. PPP Inc.
   e. Sioux Chief Manufacturing Company, Inc.
   f. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
   g. Tyler Pipe; Wade Div.
   h. Watts Drainage Products Inc.
   i. Zurn Plumbing Products Group; Specification Drainage Operation.
3. Standard: ASSE 1010 or PDI-WH 201.
4. Type: Copper tube with piston.
5. Size: ASSE 1010, Sizes AA and A through F or PDI-WH 201, Sizes A through F.

2.6 TRAP-SEAL PRIMER VALVES

A. Supply-Type, Trap-Seal Primer Valves:

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. MIFAB, Inc.
   b. PPP Inc.

c. Sioux Chief Manufacturing Company, Inc.
d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
e. Watts Industries, Inc.; Water Products Div.

3. Standard: ASSE 1018.
4. Pressure Rating: 125 psig (860 kPa) minimum.
5. Body: Bronze.
6. Inlet and Outlet Connections: NPS 1/2 (DN 15) threaded, union, or solder joint.
7. Gravity Drain Outlet Connection: NPS 1/2 (DN 15) threaded or solder joint.
8. Finish: Chrome plated, or rough bronze for units used with pipe or tube that is not chrome finished.
9. Trap Guard or equal by Zurn or A. O. Smith.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section for piping joining materials, joint construction, and basic installation requirements.

B. Install backflow preventers in each water supply to mechanical equipment and systems and to other equipment and water systems that may be sources of contamination. Comply with authorities having jurisdiction.

1. Locate backflow preventers in same room as connected equipment or system
2. Install drain for backflow preventers with atmospheric-vent drain connection with airgap fitting, fixed airgap fitting, or equivalent positive pipe separation of at least two pipe diameters in drain piping and pipe to floor drain. Locate air-gap device attached to or under backflow preventer. Simple air breaks are not acceptable for this application.
3. Do not install bypass piping around backflow preventers.

C. Install water regulators with inlet and outlet shutoff valves and bypass with memory-stop balancing valve. Install pressure gages on inlet and outlet.

D. Install balancing valves in locations where they can easily be adjusted.

E. Install temperature-actuated water mixing valves with check stops or shutoff valves on inlets and with shutoff valve on outlet.

1. Install thermometers and water regulators if specified.
2. Install cabinet-type units recessed in or surface mounted on wall as specified.

F. Install water hammer arresters in water piping according to PDI-WH 201.

G. Install supply-type, trap-seal primer valves with outlet piping pitched down toward drain trap a minimum of 1 percent, and connect to floor-drain body, trap, or inlet fitting. Adjust valve for proper flow.

H. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping and specialties.

I. Equipment Nameplates and Signs: Install engraved plastic-laminate equipment nameplate or sign on or near each of the following:

1. Double-check backflow-prevention assemblies.
2. Water pressure-reducing valves.
3. Primary, thermostatic, water mixing valves.
4. Supply-type, trap-seal primer valves.

J. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section.

3.2 FIELD QUALITY CONTROL

A. Perform the following tests and prepare test reports:

1. Test each double-check backflow-prevention assembly according to authorities having jurisdiction and the device's reference standard.

B. Remove and replace malfunctioning domestic water piping specialties and retest as specified above.

3.3 ADJUSTING

A. Set field-adjustable pressure set points of water pressure-reducing valves.
B. Set field-adjustable flow of balancing valves.
C. Set field-adjustable temperature set points of temperature-actuated water mixing valves.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 1316

SANITARY WASTE AND VENT PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following soil and waste, sanitary drainage, and vent piping inside the building:

1. Pipe, tube, and fittings.
2. Special pipe fittings.

1.2 PERFORMANCE REQUIREMENTS

A. Components and installation shall be capable of withstanding the following minimum working pressure, unless otherwise indicated:

1. Soil, Waste, and Vent Piping: 10-foot head of water (30 kPa).

1.3 SUBMITTALS

A. Field quality-control inspection and test reports.

1.4 QUALITY ASSURANCE

A. Piping materials shall bear label, stamp, or other markings of specified testing agency.

B. Comply with NSF 14, "Plastics Piping Systems Components and Related Materials," for plastic piping components. Include marking with "NSF-dwv" for plastic drain, waste, and vent piping; and "NSF-drain" for plastic drain piping.

PART 2 - PRODUCTS

2.1 PIPING MATERIALS

A. Solid-Wall PVC Pipe: ASTM D 2665, solid-wall drain, waste, and vent.

1. PVC Socket Fittings: ASTM D 2665, socket type, made to ASTM D 3311, drain, waste, and vent patterns.
2. Solvent Cement and Adhesive Primer:
    a. Use PVC solvent cement that has a VOC content of 510 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).
    b. Use adhesive primer that has a VOC content of 550 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Copper DWV Tube: ASTM B 306, drainage tube, drawn temper.

1. Copper Drainage Fittings: ASME B16.23, cast copper or ASME B16.29, wrought-copper, solder-joint fittings.

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Special pipe fittings with pressure ratings at least equal to piping pressure ratings may be used in applications below, unless otherwise indicated.

B. Flanges and unions may be used on aboveground pressure piping, unless otherwise indicated.

C. Aboveground, soil, waste, and vent piping shall be the following:

1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.
2. Copper DWV tube, copper drainage fittings, and soldered joints.

D. Underground, soil, waste, and vent piping shall be the following:

1. Solid-wall PVC pipe, PVC socket fittings, and solvent-cemented joints.

3.2 PIPING INSTALLATION

A. Sanitary sewer piping outside the building is specified in Division 2 Section "Sanitary Sewerage."

B. Basic piping installation requirements are specified in Division 22 Section.

C. Install cleanouts at grade and extend to where building sanitary drains connect to building sanitary sewers.

D. Install cast-iron sleeve with water stop and mechanical sleeve seal at each service pipe penetration through foundation wall. Select number of interlocking rubber links required to make installation watertight. Sleeves and mechanical sleeve seals are specified in Division 22 Section.

E. Install wall penetration system at each service pipe penetration through foundation wall. Make installation watertight. Wall penetration systems are specified in Division 22 Section.

F. Make changes in direction for soil and waste drainage and vent piping using appropriate branches, bends, and long-sweep bends. Sanitary tees and short-sweep 1/4 bends may be used on vertical stacks if change in direction of flow is from horizontal to vertical. Use long-turn, double Y-branch and 1/8-bend fittings if 2 fixtures are installed back-to-back or side by side with common drainpipe. Straight tees, elbows, and crosses may be used on vent lines. Do not change direction of flow more than 90 degrees. Use proper size of standard increasers and reducers if pipes of different sizes are connected. Reducing size of drainage piping in direction of flow is prohibited.

G. Lay buried building drainage piping beginning at low point of each system. Install true to grades and alignment indicated, with unbroken continuity of invert. Place hub ends of piping upstream. Install required gaskets according to manufacturer's written instructions for use of lubricants, cements, and other installation requirements. Maintain swab in piping and pull past each joint as completed.

H. Install soil and waste drainage and vent piping at the following minimum slopes, unless otherwise indicated:

1. Building Sanitary Drain: 2 percent downward in direction of flow for piping NPS 3 (DN 80) and smaller; 1 percent downward in direction of flow for piping NPS 4 (DN 100) and larger.
2. Horizontal Sanitary Drainage Piping: 2 percent downward in direction of flow.
3. Vent Piping: 1 percent down toward vertical fixture vent or toward vent stack.

I. Sleeves are not required for cast-iron soil piping passing through concrete slabs-on-grade if slab is without membrane waterproofing.

J. Install PVC soil and waste drainage and vent piping according to ASTM D 2665.

K. Install underground PVC soil and waste drainage piping according to ASTM D 2321.

L. Do not enclose, cover, or put piping into operation until it is inspected and approved by authorities having jurisdiction.

3.3 JOINT CONSTRUCTION

A. Basic piping joint construction requirements are specified in Division 22 Section.

B. Soldered Joints: Use ASTM B 813, water-flushable, lead-free flux; ASTM B 32, lead-free-alloy solder; and ASTM B 828 procedure, unless otherwise indicated.

C. PVC Non-pressure Piping Joints: Join piping according to ASTM D 2665.

3.4 VALVE INSTALLATION

A. General-duty valves are specified in Division 22 Section "Valves."

B. Backwater Valves: Install backwater valves in piping subject to sewage backflow.

1. Install backwater valves in accessible locations.

3.5 HANGER AND SUPPORT INSTALLATION

A. Pipe hangers and supports are specified in Division 22 Section "Hangers and Supports." Install the following:

1. Vertical Piping: MSS Type 8 or Type 42, clamps.
2. Individual, Straight, Horizontal Piping Runs: According to the following:
    a. 100 Feet (30 m) and Less: MSS Type 1, adjustable, steel clevis hangers.
    b. Longer Than 100 Feet (30 m): MSS Type 43, adjustable roller hangers.
    c. Longer Than 100 Feet (30 m), if Indicated: MSS Type 49, spring cushion rolls.
3. Multiple, Straight, Horizontal Piping Runs 100 Feet (30 m) or Longer: MSS Type 44, pipe rolls. Support pipe rolls on trapeze.
4. Base of Vertical Piping: MSS Type 52, spring hangers.

B. Install supports according to Division 22 Section "Hangers and Supports."

C. Support vertical piping and tubing at base and at each floor.

D. Rod diameter may be reduced 1 size for double-rod hangers, with 3/8-inch (10-mm) minimum rods.

E. Install hangers for cast-iron soil piping with the following maximum horizontal spacing and minimum rod diameters:

1. NPS 1-1/2 and NPS 2 (DN 40 and DN 50): 48 inches with 3/8-inch (10-mm) rod.
2. NPS 3 (DN 80): 48 inches with 1/2-inch (13-mm) rod.
3. NPS 4 and NPS 5 (DN 100 and DN 125): 48 inches with 5/8-inch (16-mm) rod.
4. NPS 6 (DN 150): 48 inches with 3/4-inch (19-mm) rod.

F. Install supports for vertical PVC piping every 48 inches (1200 mm).

G. Support piping and tubing not listed above according to MSS SP-69 and manufacturer's written instructions.

3.6 CONNECTIONS

A. Connect soil and waste piping to exterior sanitary sewerage piping. Use transition fitting to join dissimilar piping materials.

B. Connect drainage and vent piping to the following:

1. Plumbing Fixtures: Connect drainage piping in sizes indicated, but not smaller than required by plumbing code.
2. Plumbing Fixtures and Equipment: Connect atmospheric vent piping in sizes indicated, but not smaller than required by authorities having jurisdiction.
3. Plumbing Specialties: Connect drainage and vent piping in sizes indicated, but not smaller than required by plumbing code.
4. Equipment: Connect drainage piping as indicated. Provide shutoff valve, if indicated, and union for each connection.

3.7 FIELD QUALITY CONTROL

A. During installation, notify authorities having jurisdiction at least 24 hours before inspection must be made. Perform tests specified below in presence of authorities having jurisdiction.

1. Roughing-in Inspection: Arrange for inspection of piping before concealing or closing-in after roughing-in and before setting fixtures.
2. Final Inspection: Arrange for final inspection by authorities having jurisdiction to observe tests specified below and to ensure compliance with requirements.

B. Re-inspection: If authorities having jurisdiction find that piping will not pass test or inspection, make required corrections, and arrange for re-inspection.

C. Reports: Prepare inspection reports and have them signed by authorities having jurisdiction.

D. Test sanitary drainage and vent piping according to procedures of authorities having jurisdiction.

1. Repair leaks and defects with new materials and retest piping, or portion thereof, until satisfactory results are obtained.
2. Prepare reports for tests and required corrective action.

3.8 CLEANING

A. Clean interior of piping. Remove dirt and debris as work progresses.

B. Protect drains during remainder of construction period to avoid clogging with dirt and debris and to prevent damage from traffic and construction work.

C. Place plugs in ends of uncompleted piping at end of day and when work stops.

3.9 PROTECTION

A. Exposed PVC Piping: Protect plumbing vents exposed to sunlight with two coats of water-based latex paint.

END OF SECTION

SECTION 22 1319
SANITARY WASTE PIPING SPECIALTIES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following sanitary drainage piping specialties:

1. Cleanouts.
2. Roof flashing assemblies.
3. Miscellaneous sanitary drainage piping specialties.
4. Flashing materials.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated. Include rated capacities, operating characteristics, and accessories for grease interceptors.

1.3 QUALITY ASSURANCE

A. Drainage piping specialties shall bear label, stamp, or other markings of specified testing agency.

PART 2 - PRODUCTS

2.1 CLEANOUTS

A. Exposed Cast-Iron Cleanouts:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.

4. Standard: ASME A112.36.2M for cast iron for cleanout test tee.

5. Size: Same as connected drainage piping
6. Body Material: As required to match connected piping.
7. Closure: Brass plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.

B. Cast-Iron Floor Cleanouts:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. Oatey.
    c. Sioux Chief Manufacturing Company, Inc.
    d. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    e. Tyler Pipe; Wade Div.
    f. Watts Drainage Products Inc.
    g. Zurn Plumbing Products Group; Light Commercial Operation.
    h. Zurn Plumbing Products Group; Specification Drainage Operation.

4. Standard: ASME A112.36.2M for adjustable housing cleanout.
5. Size: Same as connected branch.
6. Type: Adjustable housing.
7. Body or Ferrule: Cast iron.
8. Clamping Device: Required.
9. Outlet Connection: Threaded.
10. Closure: Brass plug with straight threads and gasket.
11. Adjustable Housing Material: Cast iron with threads.
12. Frame and Cover Material and Finish: Nickel-bronze, copper alloy.
13. Frame and Cover Shape: Round.
14. Top Loading Classification: Extra Heavy Duty.
15. Riser: ASTM A 74, Extra-Heavy class, cast-iron drainage pipe fitting and riser to cleanout.

C. Cast-Iron Wall Cleanouts:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Specification Drainage Operation.

4. Standard: ASME A112.36.2M. Include wall access.
5. Size: Same as connected drainage piping.
6. Body: Hub-and-spigot, cast-iron soil pipe T-branch as required to match connected piping.
7. Closure: Countersunk plug.
8. Closure Plug Size: Same as or not more than one size smaller than cleanout size.
9. Wall Access: Round, flat, chrome-plated brass, or stainless-steel cover plate with screw.
10. Wall Access: Round stainless-steel wall-installation frame and cover.

D. Cleanouts: Provide in PVC sanitary piping at all changes in direction, at ends of branches, at intervals not exceeding 50 feet on 3" and smaller and 75' on 4" and larger on straight runs, and elsewhere as shown. Cleanouts shall be full opening type, completely accessible. Size same

as lines in which they occur, but not larger than 4 inch. Tees and extensions shall be of same weight as soil pipe. Plugs countersunk or raised head type with gasket or gasketed access cover. Catalog numbers from J.R. Smith, MI-FAB and Zurn. Cleanout head shall not extend out past finish wall, except in unfinished spaces..

In tile floors: Zurn ZN1400-SZ1, MI-FAB C1100-5, adjustable, cast-iron body with ABS plug or gasketed access cover and satin finished square adjustable scoriated secured nickel bronze top or stainless-steel top or J. R. Smith 4051, where soft tile occurs provide ZN1400-TX or J. R. Smith 4171 recessed square adjustable secured nickel bronze or stainless-steel top.

In concrete floors: Zurn Z1400, MI-FAB C1100-XR or J. R. Smith 4237, cast iron with round adjustable scoriated cast iron top with non-tilt tractor cover ferrule with ABS plug or gasketed access cover.

In outside lines: Zurn Z1402, MI-FAB C1230 or J. R.Smith 4291, terminate at grade or pavement in 18" x 18" x 6" concrete pad with tooled edges.

In accessible unfinished spaces: Zurn Z1445, MI-FAB C1460 or J. R. Smith 4511S or cast iron with ABS plug as appropriate.

In finished walls: J. R. Smith 4531, MI-FAB C1460-RD or Zurn Z1446 cast iron cleanout tee with countersunk ABS plug and stainless-steel wall plate cover. Where distance from plug to finish wall will exceed 4 inches provide 4402 or MI-FAB C1450-RD extended over from sanitary tee to bring plug within 4 inches.

In terrazzo floors: J. R. Smith 4191, MI-FAB C1100-UR or Zurn ZN1400-Z adjustable cast iron head and ferrule, ABS plug and round adjustable secured nickel bronze or stainless-steel top with 1/2" recess.

2.2 FLOOR DRAINS

A. Cast-Iron Floor Drains:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Josam Company; Josam Div.
    b. MIFAB, Inc.
    c. Smith, Jay R. Mfg. Co.; Division of Smith Industries, Inc.
    d. Tyler Pipe; Wade Div.
    e. Watts Drainage Products Inc.
    f. Zurn Plumbing Products Group; Light Commercial Operation.
    g. Zurn Plumbing Products Group; Specification Drainage Operation.

4. Standard: ASME A112.6.3.
5. Pattern: Area drain.
6. Body Material: Gray iron.
7. Seepage Flange: Required.
8. Anchor Flange: Required.
9. Clamping Device: Required.

10. Outlet: Bottom.
11. Coating on Interior and Exposed Exterior Surfaces: Acid-resistant enamel.
12. Sediment Bucket: As required.
13. Top or Strainer Material: Bronze.
14. Top of Body and Strainer Finish: Rough bronze.
15. Top Shape: Round.
16. Top Loading Classification: Extra Heavy-Duty.
17. Funnel: Not required.
18. Inlet Fitting: Gray iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
19. Trap Material: Bronze.
20. Trap Pattern: Deep-seal P-trap.
21. Trap Features: Cleanout and trap-seal primer valve drain connection.

B. Floor Drains: Size outlets same as pipe to which they connect. Install temporary closures during construction. Each drain to have cast iron P-trap. Provide types as scheduled below.

C. Typical Floor Drains: Smith 2005B, MI-FAB1100-C-S or Zurn ZN415-SZ1 two-piece cast iron drains with speedi-set type outlet and adjustable nickel bronze or stainless-steel strainer and rim. Strainer tops for 2" drains 5" x 5", for 3" drains 6" x 6". Membrane clamp where required. Floor drains shall have tap for trap primer as required by code and deep seal 'P' traps.

D. Mechanical Room Drains: Smith 2230Y, MI-FAB F1340-TFB-4 or Zurn Z541 two-piece cast iron drain with speedi-set outlet, sediment bucket and cast-iron grate. Membrane clamp as required.

2.3 ROOF FLASHING ASSEMBLIES

A. Roof Flashing Assemblies:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Acorn Engineering Company; Elmdor/Stoneman Div.
    b. Thaler Metal Industries Ltd.

B. Description: Manufactured assembly made of 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch- (1.6-mm-) thick, lead flashing collar and skirt extending at least 8 inches (200 mm) from pipe, with galvanized-steel boot reinforcement and counterflashing fitting.

1. Open-Top Vent Cap: Without cap.
2. Low-Silhouette Vent Cap: With vandal-proof vent cap.
3. Extended Vent Cap: With field-installed, vandal-proof vent cap.

2.4 MISCELLANEOUS SANITARY DRAINAGE PIPING SPECIALTIES

A. Open Drains:

1. Description: Shop or field fabricate from ASTM A 74, Service class, hub-and-spigot, cast-iron, soil-pipe fittings. Include P-trap, hub-and-spigot riser section; and where required, increaser fitting joined with ASTM C 564, rubber gaskets.
2. Size: Same as connected waste piping with increaser fitting of size indicated.

B. Deep-Seal Traps:

1. Description: Cast-iron or bronze casting, with inlet and outlet matching connected piping and cleanout trap-seal primer valve connection.
2. Size: Same as connected waste piping.

    a. NPS 2 (DN 50): 4-inch- (100-mm-) minimum water seal.
    b. NPS 2-1/2 (DN 65) and Larger: 5-inch- (125-mm-) minimum water seal.

C. Floor-Drain, Trap-Seal Primer Fittings:

1. Description: Cast iron, with threaded inlet and threaded or spigot outlet, and trap-seal primer valve connection.
2. Size: Same as floor drain outlet with NPS 1/2 (DN 15) side inlet.

D. Air-Gap Fittings:

1. Standard: ASME A112.1.2, for fitting designed to ensure fixed, positive air gap between installed inlet and outlet piping.
2. Body: Bronze or cast iron.
3. Inlet: Opening in top of body.
4. Outlet: Larger than inlet.
5. Size: Same as connected waste piping and with inlet large enough for associated indirect waste piping.

E. Sleeve Flashing Device:

1. Description: Manufactured, cast-iron fitting, with clamping device, that forms sleeve for pipe floor penetrations of floor membrane. Include galvanized-steel pipe extension in top of fitting that will extend 1 inch (25 mm) above finished floor and galvanized-steel pipe extension in bottom of fitting that will extend through floor slab.
2. Size: As required for close fit to riser or stack piping.

F. Stack Flashing Fittings:

1. Description: Counterflashing-type, cast-iron fitting, with bottom recess for terminating roof membrane, and with threaded or hub top for extending vent pipe.
2. Size: Same as connected stack vent or vent stack.

G. Vent Caps:

1. Description: Cast-iron body with threaded or hub inlet and vandal-proof design. Include vented hood and setscrews to secure to vent pipe.
2. Size: Same as connected stack vent or vent stack.

2.5 FLASHING MATERIALS

A. Lead Sheet: ASTM B 749, Type L51121, copper bearing, with the following minimum weights and thicknesses, unless otherwise indicated:

1. General Use: 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness.
2. Vent Pipe Flashing: 3.0-lb/sq. ft. (15-kg/sq. m), 0.0469-inch (1.2-mm) thickness.
3. Burning: 6-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness.

B. Fasteners: Metal compatible with material and substrate being fastened.

C. Metal Accessories: Sheet metal strips, clamps, anchoring devices, and similar accessory units required for installation; matching or compatible with material being installed.

D. Solder: ASTM B 32, lead-free alloy.

E. Bituminous Coating: SSPC-Paint 12, solvent-type, bituminous mastic

PART 3 - EXECUTION

3.1 INSTALLATION

A. Refer to Division 22 Section "Common Work Results for Plumbing" for piping joining materials, joint construction, and basic installation requirements.

B. Install cleanouts in aboveground piping and building drain piping according to the following, unless otherwise indicated:

1. Size same as drainage piping up to NPS 4 (DN 100). Use NPS 4 (DN 100) for larger drainage piping unless larger cleanout is indicated.
2. Locate at each change in direction of piping greater than 45 degrees.
3. Locate at minimum intervals of 50 feet (15 m) for piping NPS 4 (DN 100) and smaller and 100 feet (30 m) for larger piping.
4. Locate at base of each vertical soil and waste stack.

C. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

D. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

1. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

2. Position floor drains for easy access and maintenance.

3. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:
   a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
   b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
   c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

E. For floor cleanouts for piping below floors, install cleanout

F. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

E. For floor cleanouts for piping below floors, install cleanout deck plates with top flush with finished floor.

G. For cleanouts located in concealed piping, install cleanout wall access covers, of types indicated, with frame and cover flush with finished wall.

H. Install floor drains at low points of surface areas to be drained. Set grates of drains flush with finished floor, unless otherwise indicated.

1. Position floor drains for easy access and maintenance.
2. Set floor drains below elevation of surrounding finished floor to allow floor drainage. Set with grates depressed according to the following drainage area radii:

    a. Radius, 30 Inches (750 mm) or Less: Equivalent to 1 percent slope, but not less than 1/4-inch (6.35-mm) total depression.
    b. Radius, 30 to 60 Inches (750 to 1500 mm): Equivalent to 1 percent slope.
    c. Radius, 60 Inches (1500 mm) or Larger: Equivalent to 1 percent slope, but not greater than 1-inch (25-mm) total depression.

I. Install roof flashing assemblies on sanitary stack vents and vent stacks that extend through roof.

J. Install flashing fittings on sanitary stack vents and vent stacks that extend through roof.

K. Assemble open drain fittings and install with top of hub 1 inch (25 mm) above floor.

L. Install deep-seal traps on floor drains and condensate waste outlets.

M. Install floor-drain, trap-seal primer fittings on inlet to floor drains that require trap-seal primer connection.

1. Exception: Fitting may be omitted if trap has trap-seal primer connection.
2. Size: Same as floor drain inlet.

N. Install air-gap fittings on draining-type backflow preventers and on indirect-waste piping discharge into sanitary drainage system.

O. Install sleeve flashing device with each riser and stack passing through floors with waterproof membrane.

P. Install vent caps on each vent pipe passing through roof.

Q. Install traps on plumbing specialty drain outlets.

R. Install escutcheons at wall, floor, and ceiling penetrations in exposed finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding pipe fittings.

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Install piping adjacent to equipment to allow service and maintenance.

3.3 FLASHING INSTALLATION

A. Fabricate flashing from single piece unless large pans, sumps, or other drainage shapes are required. Join flashing according to the following if required:

1. Lead Sheets: Burn joints of lead sheets 6.0-lb/sq. ft. (30-kg/sq. m), 0.0938-inch (2.4-mm) thickness or thicker. Solder joints of lead sheets 4.0-lb/sq. ft. (20-kg/sq. m), 0.0625-inch (1.6-mm) thickness or thinner.

B. Install sheet flashing on pipes, sleeves, and specialties passing through or embedded in floors and roofs with waterproof membrane.

1. Pipe Flashing: Sleeve type, matching pipe size, with minimum length of 10 inches (250 mm), and skirt or flange extending at least 8 inches (200 mm) around pipe.
2. Sleeve Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around sleeve.
3. Embedded Specialty Flashing: Flat sheet, with skirt or flange extending at least 8 inches (200 mm) around specialty.

C. Set flashing on floors and roofs in solid coating of bituminous cement.

D. Secure flashing into sleeve and specialty clamping ring or device.

E. Install flashing for piping passing through roofs with counterflashing or commercially made flashing fittings, according to Division 7 Section "Sheet Metal Flashing and Trim."

F. Extend flashing up vent pipe passing through roofs and turn down into pipe, or secure flashing into cast-iron sleeve having calking recess.

3.4 LABELING AND IDENTIFYING

A. Distinguish among multiple units, inform operator of operational requirements, indicate safety and emergency precautions, and warn of hazards and improper operations, in addition to identifying unit. Nameplates and signs are specified in Division 22 Section "Identification for Plumbing Piping and Equipment."

3.5 PROTECTION

A. Protect drains during remainder of construction period to avoid clogging with dirt or debris and to prevent damage from traffic or construction work.

B. Place plugs in ends of uncompleted piping at end of each day or when work stops.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 22 4000

PLUMBING FIXTURES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Plumbing fixtures.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated.

1.3 QUALITY ASSURANCE

A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.

B. Regulatory Requirements: Comply with requirements in ICC A117.1, "Accessible and Usable Buildings and Facilities "Public Law 101-336, "Americans with Disabilities Act"; for plumbing fixtures for people with disabilities.

C. Regulatory Requirements: Comply with requirements in Public Law 102-486, "Energy Policy Act," about water flow and consumption rates for plumbing fixtures.

D. NSF Standard: Comply with NSF 61, "Drinking Water System Components--Health Effects," for fixture materials that will be in contact with potable water.

E. Select combinations of fixtures and trim, faucets, fittings, and other components that are compatible.

F. Comply with the following applicable standards and other requirements specified for plumbing fixtures:

1. Enameled, Cast-Iron Fixtures: ASME A112.19.1M.
2. Porcelain-Enameled, Formed-Steel Fixtures: ASME A112.19.4M.
3. Solid-Surface-Material Lavatories and Sinks: ANSI/ICPA SS-1.
4. Stainless-Steel Residential Sinks: ASME A112.19.3.
5. Vitreous-China Fixtures: ASME A112.19.2M.
6. Water-Closet, Flush Valve, Tank Trim: ASME A112.19.5.

G. Comply with the following applicable standards and other requirements specified for lavatory and sink faucets:

1. Backflow Protection Devices for Faucets with Side Spray: ASME A112.18.3M.
2. Backflow Protection Devices for Faucets with Hose-Thread Outlet: ASME A112.18.3M.
3. Diverter Valves for Faucets with Hose Spray: ASSE 1025.
4. Faucets: ASME A112.18.1.
5. Hose-Connection Vacuum Breakers: ASSE 1011.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Integral, Atmospheric Vacuum Breakers: ASSE 1001.
8. NSF Potable-Water Materials: NSF 61.
9. Pipe Threads: ASME B1.20.1.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Supply Fittings: ASME A112.18.1.
12. Brass Waste Fittings: ASME A112.18.2.

H. Comply with the following applicable standards and other requirements specified for shower faucets:

1. Backflow Protection Devices for Hand-Held Showers: ASME A112.18.3M.
2. Combination, Pressure-Equalizing and Thermostatic-Control Antiscald Faucets: ASSE 1016.
3. Faucets: ASME A112.18.1.
4. Hand-Held Showers: ASSE 1014.
5. High-Temperature-Limit Controls for Thermal-Shock-Preventing Devices: ASTM F 445.
6. Hose-Coupling Threads: ASME B1.20.7.
7. Manual-Control Antiscald Faucets: ASTM F 444.
8. Pipe Threads: ASME B1.20.1.
9. Pressure-Equalizing-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.
10. Sensor-Actuated Faucets and Electrical Devices: UL 1951.
11. Thermostatic-Control Antiscald Faucets: ASTM F 444 and ASSE 1016.

I. Comply with the following applicable standards and other requirements specified for miscellaneous fittings:

1. Atmospheric Vacuum Breakers: ASSE 1001.
2. Brass and Copper Supplies: ASME A112.18.1.
3. Dishwasher Air-Gap Fittings: ASSE 1021.
4. Manual-Operation Flushometers: ASSE 1037.
5. Plastic Tubular Fittings: ASTM F 409.
6. Brass Waste Fittings: ASME A112.18.2.
7. Sensor-Operation Flushometers: ASSE 1037 and UL 1951.

J. Comply with the following applicable standards and other requirements specified for miscellaneous components:

1. Disposers: ASSE 1008 and UL 430.
2. Dishwasher Air-Gap Fittings: ASSE 1021.
3. Flexible Water Connectors: ASME A112.18.6.
4. Grab Bars: ASTM F 446.
5. Hose-Coupling Threads: ASME B1.20.7.
6. Off-Floor Fixture Supports: ASME A112.6.1M.
7. Pipe Threads: ASME B1.20.1.
8. Plastic Toilet Seats: ANSI Z124.5.
9. Supply and Drain Protective Shielding Guards: ICC A117.1.

PART 2 - PRODUCTS

2.1 FIXTURES AND MISCELLANEOUS ITEMS:

A. Fixture Trim: Exposed metal parts to be of heavy weight polished brass, heavily chromium plates, of best quality as regularly furnished by the plumbing fixture manufacturer. Supplies to all fixtures and equipment shall be provided with stop valves.

B. Scheduled Items:

WC-1 ADA FLOOR MOUNTED FLUSH VALVE

ZURN Z5665-BWL-1 (1.6 gpf) ADA height floor mount top spud flush valve toilet; Toto: TET1LB (Touchless-Hydro powered flush valve) YB YC YK piston-operated manual flush. Provide Bemis 1955 SS CT white seat with Sta-Tight fastening system, closet bolt/wax ring kit. No carrier required. Equal by Kohler, American Standard or Toto. Flush valve equal to Toto or Sloan Crown.

L-1 LAVATORY WALL HUNG ADA

ZURN Z5348 20 X 18" wall hung concealed arm lavatory with Z831 Touchless Faucet: Hydro powered: Toto Model T28S51ET. Z8746-PC off set grid drain, Z8700PC cast 1 ¼" p-trap, ZH8824 XL PC heavy duty stops with Z8860-XL-12-SS stainless braided supplies and Z8946-3-NT trap protector. Provide Zurn ZW3870XLT nickel plated thermostatic mixing valve or equal by Symmons. Furnish Zurn Z1231EZ concealed lavatory carrier or equal by J. R. Smith. Equal units by Kohler, American Standard, Toto, T & S and McGuire. Mount 34" rim to finished floor.

S-1 SINGLE COMPARTMENT ADA STAINLESS STEEL SINK

ELKAY LRAD 1918 45 single compartment 18-guage 304 stainless steel sink, 19 X 18 X 4.5" deep. Furnish Toto T26T51 Touchless Hydro powered faucet, Elkay LKAD-18 off set grid drain, Zurn ZH 8824XL-LR stops, Z8860-XL-12-SS flexible stainless-steel supplies, Z8702PC 1 ½" cast p-trap and Z8946-3-NT trap protector. Provide Zurn ZW3870XLT nickel plated thermostatic mixing valve. Equal fixtures by Just, T & S, Symmons or McGuire.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Assemble plumbing fixtures, trim, fittings, and other components according to manufacturers' written instructions.

B. Install off-floor supports, affixed to building substrate, for wall-mounting fixtures.

1. Use carrier supports with waste fitting and seal for back-outlet fixtures.
2. Use carrier supports without waste fitting for fixtures with tubular waste piping.
3. Use chair-type carrier supports with rectangular steel uprights for accessible fixtures.

C. Install back-outlet, wall-mounting fixtures onto waste fitting seals and attach to supports.

D. Install floor-mounting fixtures on closet flanges or other attachments to piping or building substrate.

E. Install wall-mounting fixtures with tubular waste piping attached to supports.

F. Install fixtures level and plumb according to roughing-in drawings.

G. Install water-supply piping with stop on each supply to each fixture to be connected to water distribution piping. Attach supplies to supports or substrate within pipe spaces behind fixtures. Install stops in locations where they can be easily reached for operation.

H. Install trap and tubular waste piping on drain outlet of each fixture to be directly connected to sanitary drainage system.

I. Install tubular waste piping on drain outlet of each fixture to be indirectly connected to drainage system.

J. Install flushometer valves for accessible water closets and urinals with handle mounted on wide side of compartment. Install other actuators in locations that are easy for people with disabilities to reach.

K. Install tanks for accessible, tank-type water closets with lever handle mounted on wide side of compartment.

L. Install toilet seats on water closets.

M. Install faucet-spout fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

N. Install water-supply flow-control fittings with specified flow rates in fixture supplies at stop valves.

O. Install faucet flow-control fittings with specified flow rates and patterns in faucet spouts if faucets are not available with required rates and patterns. Include adapters if required.

P. Install shower flow-control fittings with specified maximum flow rates in shower arms.

Q. Install traps on fixture outlets.

1. Exception: Omit trap on fixtures with integral traps.
2. Exception: Omit trap on indirect wastes, unless otherwise indicated.

R. Install disposer in outlet of each sink indicated to have disposer. Install switch where indicated or in wall adjacent to sink if location is not indicated.

S. Install dishwasher airgap fitting at each sink indicated to have airgap fitting. Install in sink deck. Connect inlet hose to dishwasher and outlet hose to disposer.

T. Install escutcheons at piping wall and ceiling penetrations in exposed, finished locations and within cabinets and millwork. Use deep-pattern escutcheons if required to conceal protruding fittings. Escutcheons are specified in Division 22 Section.

U. Set showers in leveling bed of cement grout. Grout is specified in Division 22 Section.

V. Seal joints between fixtures and walls, floors, and countertops using sanitary-type, one-part, mildew-resistant silicone sealant. Match sealant color to fixture color. Sealants are specified in Division 7 Section "Joint Sealants."

3.2 CONNECTIONS

A. Piping installation requirements are specified in other Division 22 Sections. Drawings indicate general arrangement of piping, fittings, and specialties.

B. Connect fixtures with water supplies, stops, and risers, and with traps, soil, waste, and vent piping. Use size fittings required to match fixtures.

3.3 FIELD QUALITY CONTROL

A. Verify that installed plumbing fixtures are categories and types specified for locations where installed.

B. Check that plumbing fixtures are complete with trim, faucets, fittings, and other specified components.

C. Inspect installed plumbing fixtures for damage. Replace damaged fixtures and components.

D. Test installed fixtures after water systems are pressurized for proper operation. Replace malfunctioning fixtures and components, then retest. Repeat procedure until units operate properly.

E. Install fresh batteries in sensor-operated mechanisms.

3.4 PROTECTION

A. Provide protective covering for installed fixtures and fittings.

B. Do not allow use of plumbing fixtures for temporary facilities unless approved in writing by the Contracting Officer.

END OF SECTION

DIVISION 23 SPECIFICATIONS



THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 23 0500
GENERAL HVAC REQUIREMENTS

PART 1 – GENERAL

1.1 SUMMARY

A. Section includes general requirements for the HVAC systems.

1.3 QUALIFICATIONS OF SUB-CONTRACTORS

A. Must be properly licensed and established as a Heating and Air Conditioning Contractor at the location of the work and shall maintain locally adequate service facilities. He shall have had previous experience in the satisfactory installation of at least three systems of this type and size.

1.4 SCOPE

A. Include all equipment, material and labor required for complete operation of heating, air conditioning and ventilation systems, even though every item involved is not indicated. Included in the scope but not limited by the scope are the following complete new operating systems.

1.5 CODES

A. Comply with applicable 2021 International Building Code, 2013 ASHRAE 90.1 Standard and 2021 International Mechanical Code requirements and conform to ordinances and codes of the locality. Where conflicts occur between code and construction drawings or specifications, most stringent requirements shall apply. Any work provided contrary to these requirements shall be removed and replaced at contractor's expense.

1.6 PERMITS

A. Provide all permits and arrange for inspections as required by local, city, county and state authorities. Furnish certificate of final inspection from local building inspector indicating that installation complies with all regulations governing the same. Provide additional materials, parts, labor, etc. and modify the work as required by city and state inspections and regulations.

1.7 DRAWINGS

A. In the interest of clearness, the work is not always shown to scale or exact location. Check all measurements, location of pipe, ducts, and equipment with the detail architectural, structural, and electrical drawings, and lay out work so as to fit with ceiling grids, lighting and other parts. Where doubt arises as to the meaning of the plans and specifications, obtain the Architect's decision before proceeding with parts affected; otherwise assume liability for damage to other work and for making necessary corrections to work in question.

B. The Plans are not intended to show all ductwork, pipes valves, fittings, connections, and details of the work to be done. The piping, duct and equipment locations shall be adhered to as closely as possible; however, any changes necessary to avoid columns, beams, lighting fixtures, ductwork, sprinkler piping, etc., shall be made at no additional cost to the owner. Do not scale plumbing or HVAC drawing. Refer to Architectural drawings for dimensions.

1.8 CHANGES AND CONFLICTS

A. If during construction desirable or necessary changes become apparent, advise the Architect, and secure his decision in writing. Otherwise make no deviation from the system as detailed.

1.9 WARRANTY

A. Contractor shall provide a one-year full parts and labor warranty for materials and workmanship for all items starting at substantial completion of entire project. The following items: but not limited to the following, shall have extended warranties remain in effect past the one-year warranty. All warranty shall start at substantial completion of entire project.

1. AC Equipment: Provide 1-year parts and labor warranty for entire system.
2. Control System - Provide 2-year parts and labor warranty for entire system.
3. Filters - Contractor to provide new filters for all systems at substantial completion and four set of spares to be stored as directed by owner.
4. Variable frequency drivers – Contractor shall provide a spare drive for each horsepower provided on project.
5. Belts: Contractor shall provide spare belt for each motor for Blower Coil Units and EFs.

1.10 MISCELLANEOUS REQUIREMENTS

A. Materials and Equipment: New and of best quality in every respect. All pipes and fittings shall conform to the ASTM Standard designated for pipe of each material.

Equipment shall be essentially the standard product of the manufacturer and shall be UL approved where required by Code. Where two or more units of the same class of equipment are required, these units shall be products of a single manufacturer; however, the component parts of the system need not be.

B. Listed Equipment: Being listed as "A supplier of comparable products" means the listed manufacturer will receive consideration if in accordance with all documents, delivery, and space requirements. Being listed does not indicate nor imply the manufacturer's equipment is acceptable for the project. Only the "Base" manufacturer's equipment has been verified for compliance with the documents. The burden of approval of the equipment rests solely with the contractor.

C. Equipment Protection: Protect during construction, duct openings against the entrance of foreign materials and protect all equipment from damage by mortar, paint, weather, etc. Damaged equipment shall be replaced at no expense to project. Make provisions to protect equipment.

D. Finishes: Manufacturer's standard unless otherwise stated. Submit color cards for selection where such choice is specified or available.

E. Charges, Grease, Filters, etc.: Furnish first charges of refrigerant grease, oils, etc., and be responsible for such full charges for the guarantee period, except when loss is due to negligence of Owner. Where disposable type filters are specified, furnish two sets for each air conditioning unit; one set to be used during test period, other set to be installed just prior to occupancy. Contractor shall change all disposable filters every two months for first year. Sets of filters to be installed during one-year guarantee period. Where permanent type is specified, provide disposable type for testing and operating prior to occupancy. Provide Owner a typed list (O & M Manual) of all filter sizes and required quantity.

F. Cleaning and Adjusting: Upon completion of work, clear drains, traps, ducts and pipelines. Adjust all valves, remove rubbish, and leave work in clean and operating condition. Install final permanent type filters only after cleaning of building is completed.

G. Cutting and Patching: Openings are to be laid out and built in; furnish detailed layout drawings to other trades in advance of their work. Piping within or behind walls must be installed before wall is erected. Otherwise walls, etc. affected must be reworked by trade which erected same at

expense of HVAC Contractor; chasing and cutting of new work will not be accepted. HVAC Contractor shall prepare shop drawings of required opening to General Contractor and Architect for review.

H. Foundations: Provide foundations, supports, etc., not specified under other Sections and as required to mount equipment in a workman like and structurally sound manner. Consult drawings pertaining to other trades to determine extent of their work.

I. Roof Flashing: Roofing work is specified under Roofing Section. Roofer shall be advised of all requirements and all furnished items to be installed before roofing is installed. Roofer shall install all mechanical roof penetration and provide full roof warranty.

J. Vibration and Noise Control: All items of mechanical equipment including air handling units, and fans shall be properly isolated from the structure by means of approved vibration absorbing accessories, foundations or supports.

Elimination of objectionable vibration and noise is the responsibility of the Contractor, who must provide all foundations, isolators, flexible connections, etc., required thereby. Pay special attention to vibration problems at year end inspection and correct all deficiencies noted.

K. Operating and Maintenance Instructions: Provide the services of a competent person to thoroughly instruct representatives appointed by the owner in the proper operation and care of all equipment and control systems. Furnish a complete set of Operating and Maintenance (O & M Manuals) (and PDF files of all information) instructions in 3 copies (including equipment data, spare parts lists, operating instructions, filter sizes, valves services, control, and wiring diagrams) in bound folder form prior to final acceptance. O & M Manuals, Test and Balance report to be submitted 2 weeks prior to final inspection.

L. Painting and Finishing: Clean and paint with two coats of asphalt varnish all exposed ferrous metal parts of mechanical equipment located above ceilings, etc.). Surfaces in finished areas are to be painted by Painting Contractor. Where factory finished items are marred or scratched item must be replaced, or upon approval, may be refinished or touched-up as required to bring to a like-new condition.

M. Where device occurs above a lift-out acoustical ceiling panel, identify the panel with a 3/8" #8 round head self-threading sheet metal screw, screwed into panel with only the head showing. Before inserting, paint head of screw with appropriate color as specified under Pipe Identification and Color Coding. Furnish sample for approval.

N. Dis-similar Metal: Separate all dis-similar metals as required for services. Dis-similar metal shall not touch.

O. Coordination:

1. Mechanical contractor shall submit written verification that he has coordinated all electrical requirements for HVAC with electrical subcontractor. Written document shall indicate any difference between design requirements and actual verified requirements and shall recommend solutions to any conflicts found. Refer to “EXAMPLE” form at end of this section.

NOTE: Mechanical submittals will not be reviewed without this document included.

PART 2 – PRODUCTS (not applicable)

PART 3 – EXECUTION (not applicable)

END OF SECTION

(See Attachment A)

ATTACHMENT ‘A’

THIS PAGE INTENTIONALLY LEFT BLANK

Morris Davis Engineering LLC

James H. Morris, P.E. - Mechanical
Hunter B. Davis, P.E. - Mechanical

903 South Perry Street
Montgomery, AL 36104
TEL. 334-269-0329 FAX 334-269-1559

COORDINATION OF ELECTRICAL REQUIREMENTS FOR HVAC AND PLUMBING EQUIPMENT

PROJECT: XYZ High School - Montgomery, AL DATE: 1-10-11

EQUIP. MARK	DESIGN CHARACTERISTICS					SUBMITTED REQUIREMENTS					CHANGE REQ'D (Y/N)	RECOMMENDED SOLUTION
	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE		
AH-1	208/3	2 HP	15/3P	30A3P	3#12 & 1#12(G)-1/2"c	208/3	3 HP	20/3P	30A3P	3#12 & 1#12(G)-1/2"c	Y	Change 15/3 CB to 20/3 CB
AH-2	208/3	5 HP	40/3P	60A3P	3#8 & 1#10(G)-3/4"c	208/3	5 HP	40/3P	60A3P	3#8 & 1#10(G)-3/4"c	N	
ACCU-7	208/3	45.3A	60/3P	60A3P	3#6 & 1#10(G)-3/4"c	208/3	43.7A	60/3P	60A3P	3#6 & 1#10(G)-3/4"c	N	
ACCU-9	208/3	15.2A	20/3P	30A3P	3#12 & 1#12(G)-1/2"c	208/3	18.1A	30/3P	30A3P	3#10 & 1#10(G)-3/4"c	Y	See Note 1 below.
CH-1	480/3	155A	200/3P	N/A	3#3/0 &1 #6(G)-2"c	480/3	183A	250/3P	N/A	3#250M&1#4(G)-2 1/2"c	Y	See Note 2 below.

NOTES:
1. ACCU-9 - Change 20/3P CB to 30/3P CB and change circuit to 3#10&1#10G-1/2"c.
2. CH-1 - Change 200/3P CB to 250/3P CB and change circuit to 3#250 MCM&1#4G-2 1/2"c.

EXAMPLE

The above referenced contractors have coordinated all electrical requirements for the HVAC and plumbing equipment and agree to all changes. The mechanical and plumbing contractors acknowledge that they are responsible for any cost difference for the electrical contractor's changes.

James Doe	Henry Smith	Joe Thomas
Electrical Contractor	Mechanical Contractor	Plumbing Contractor
ABC Electic, Inc.	Smith Heating & Air	Joe's Plumbing Company
Company	Company	Company

THIS PAGE INTENTIONALLY LEFT BLANK

Morris Davis Engineering LLC

James H. Morris, P.E. - Mechanical
Hunter B. Davis, P.E. - Mechanical

903 South Perry Street
Montgomery, AL 36104
TEL. 334-269-0329 FAX 334-269-1559

COORDINATION OF ELECTRICAL REQUIREMENTS FOR HVAC AND PLUMBING EQUIPMENT

PROJECT: _____ DATE: _____

EQUIP. MARK	DESIGN CHARACTERISTICS					SUBMITTED REQUIREMENTS					CHANGE REQ'D (Y/N)	RECOMMENDED SOLUTION
	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE	V/PH	HP/A/KW	CKT BKR	DISC SW	FEEDER SIZE		

NOTES:

The above referenced contractors have coordinated all electrical requirements for the HVAC and plumbing equipment and agree to all changes. The mechanical and plumbing contractors acknowledge that they are responsible for any cost difference for the electrical contractor's changes.

Electrical Contractor	Mechanical Contractor	Plumbing Contractor
Company	Company	Company

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 230523
GENERAL-DUTY VALVES FOR HVAC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Brass ball valves.
2. Bronze ball valves.
3. Iron, single-flange butterfly valves.
4. Bronze swing check valves.
5. Iron swing check valves.
6. Iron swing check valves with closure control.
7. Bronze globe valves.
8. Iron globe valves.

B. Related Sections:

1. Division 23 HVAC piping Sections for specialty valves applicable to those Sections only.
2. Division 23 Section "Identification for HVAC Piping and Equipment" for valve tags and schedules.

1.2 SUBMITTALS

A. Submit Product Data: For each type of valve indicated.

1.3 QUALITY ASSURANCE

A. Source Limitations for Valves: Obtain each type of valve from single source from single manufacturer.

B. ASME Compliance: ASME B16.10 and ASME B16.34 for ferrous valve dimensions and design criteria.

C. All valves shall have 2-year warranty minimum.

PART 2 - PRODUCTS

2.1 GENERAL REQUIREMENTS FOR VALVES

A. Refer to HVAC valve schedule articles for applications of valves.

B. Valve Pressure and Temperature Ratings: Not less than indicated and as required for system pressures and temperatures.

C. Valve Sizes: Same as upstream piping unless otherwise indicated.

D. Valve Actuator Types:

1. Gear Actuator: For quarter-turn valves NPS 8 and larger.
2. Handwheel: For valves other than quarter-turn types.
3. Handlever: For quarter-turn valves NPS 6 and smaller except plug valves.

E. Valves in Insulated Piping: With 2-inch stem extensions and the following features:

1. Ball Valves: With extended operating handle of non-thermal-conductive material, and protective sleeve that allows operation of valve without breaking the vapor seal or disturbing insulation.

2. Butterfly Valves: With extended neck.

F. Valve-End Connections:

1. Flanged: With flanges according to ASME B16.1 for iron valves.
2. Threaded: With threads according to ASME B1.20.1.

2.2 BRASS BALL VALVES

A. Two-Piece, Full-Port, Brass Ball Valves with Brass Trim (provide stainless steel ball and stem):
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Grinnell (Anvil).
b. American Valve.
c. Nibco.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Forged brass.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Port: Full.

2.3 BRONZE BALL VALVES

A. Two-Piece, Full-Port, Bronze Ball Valves with Bronze Trim (provide stainless steel ball and stem):
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Grinnell (Anvil)
b. American Valve.
c. Nibco.

2. Description:

a. Standard: MSS SP-110.
b. SWP Rating: 150 psig.
c. CWP Rating: 600 psig.
d. Body Design: Two piece.
e. Body Material: Bronze.
f. Ends: Threaded.
g. Seats: PTFE or TFE.
h. Port: Full.

2.4 IRON, SINGLE-FLANGE BUTTERFLY VALVES

A. 150 CWP, Iron, Single-Flange Butterfly Valves with EPDM Seat for service up to 225°F and Bronze Disc:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Grinnell (Anvil).

b. Watts.
c. Nibco.

2. Description:
a. Standard: MSS SP-67, Type I.
b. CWP Rating: 150 psig.

2.5 BRONZE SWING CHECK VALVES

A. Class 150, Bronze Swing Check Valves with Bronze Disc:
1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Grinnell (Anvil).
b. Nibco.
c. Mueller.

2. Description:

a. Standard: MSS SP-80, Type 3.
b. CWP Rating: 300 psig.
c. Body Design: Horizontal flow.
d. Body Material: ASTM B 62, bronze.
e. Ends: Threaded.
f. Disc: Bronze.

2.6 IRON SWING CHECK VALVES

A. Class 250, Iron Swing Check Valves with Metal Seats:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. Grinnell (Anvil)
b. Nibco.
c. Mueller

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12, CWP Rating: 500 psig.
c. NPS 14 to NPS 24, CWP Rating: 300 psig.
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.

2.7 IRON SWING CHECK VALVES WITH CLOSURE CONTROL

A. Class 125, Iron Swing Check Valves with Lever- and Spring-Closure Control:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Grinnell (Anvil).
b. Nibco.
c. Mueller.

2. Description:

a. Standard: MSS SP-71, Type I.
b. NPS 2-1/2 to NPS 12, CWP Rating: 200 psig.
c. NPS 14 to NPS 24, CWP Rating: 150 psig.
d. Body Design: Clear or full waterway.
e. Body Material: ASTM A 126, gray iron with bolted bonnet.
f. Ends: Flanged.
g. Trim: Bronze.
h. Gasket: Asbestos free.
i. Closure Control: Factory-installed, exterior lever and spring.

2.8 IRON GLOBE VALVES

A. Class 125, Iron Globe Valves:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
a. NIBCO.
b. Red-White Valve Company.
c. Watts.

2. Description:

a. Standard: MSS SP-85, Type I.
b. CWP Rating: 200 psig.
c. Body Material: ASTM A 126, gray iron with bolted bonnet.
d. Ends: Flanged.
e. Trim: Bronze.
f. Packing and Gasket: Asbestos free.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine valve interior for cleanliness, freedom from foreign matter, and corrosion. Remove special packing materials, such as blocks, used to prevent disc movement during shipping and handling.

B. Operate valves in positions from fully open to fully closed. Examine guides and seats made accessible by such operations.

C. Examine threads on valve and mating pipe for form and cleanliness.

D. Examine mating flange faces for conditions that might cause leakage. Check bolting for proper size, length, and material. Verify that gasket is of proper size, that its material composition is suitable for service, and that it is free from defects and damage.

E. Do not attempt to repair defective valves; replace with new valves.

3.2 VALVE INSTALLATION

A. Install valves with unions or flanges at each piece of equipment arranged to allow service, maintenance, and equipment removal without system shutdown.

B. Locate valves for easy access and provide separate support where necessary.

C. Install valves in horizontal piping with stem at or above center of pipe.

D. Install valves in position to allow full stem movement.

E. Install swing check valves for proper direction of flow and in horizontal position with hinge pin level.

F. No gate valves are allowed.

3.3 ADJUSTING

A. Adjust or replace valve packing after piping systems have been tested and put into service but before final adjusting and balancing. Replace valves if persistent leaking occurs.

3.4 GENERAL REQUIREMENTS FOR VALVE APPLICATIONS

A. If valve applications are not indicated, use the following:

1. Shutoff Service: Ball valves.
2. Throttling Service: Globe valves.
3. Pump-Discharge Check Valves:

    a. NPS 2 and Smaller: Bronze swing check valves with bronze disc.
    b. NPS 2-1/2 and Larger: Iron swing check valves with lever and weight or with spring.

B. If valves with specified SWP classes or CWP ratings are not available, the same types of valves with higher SWP classes or CWP ratings may be substituted.

C. Select valves, except wafer types, with the following end connections:

1. For Copper Tubing, NPS 2 and Smaller: Threaded ends.
2. For Steel Piping, NPS 2-1/2 to NPS 4: Flanged ends except where threaded valve-end option is indicated in valve schedules below.

3.5 CHILLED-WATER AND HOT-WATER VALVE SCHEDULE

A. Pipe NPS 2 and Smaller:

1. Bronze and Brass Valves: Threaded ends or pro-press.
2. Bronze Angle Valves: Class 150 disc.
3. Ball Valves: Two-piece, full port, with stainless steel ball and trim.
4. Bronze Swing Check Valves: Class 150 disc
5. Bronze Globe Valves: Class 150, stainless steel disc.

B. Pipe NPS 2-1/2 and Larger:

1. Iron Valves, NPS 2-1/2 to NPS 4: Flanged ends.
2. Iron, Single-Flange Butterfly Valves, NPS 2-1/2 to NPS 12: 200 CWP, EPDM seat, aluminum-bronze disc.
3. Iron Swing Check Valves: Class 250, metal seats.
4. Iron Swing Check Valves with Closure Control, NPS 2-1/2 to NPS 12: Class 125, lever and spring weight.
5. Iron Gate Valves: Class 125.

6. Iron Globe Valves: Class 125.

C. Pipe NPS 4”:

1. Provide chain wheel for operation.

END OF SECTION

SECTION 23 0529
HANGERS AND SUPPORTS FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Steel pipe hangers and supports.
2. Trapeze pipe hangers.
3. Metal framing systems.
4. Thermal-hanger shield inserts.
5. Fastener systems.
6. Equipment supports.
7. Strut Mounted Insulation Couplings with Strut Clamp

B. See Division 05 Section "Metal Fabrications" for structural-steel shapes and plates for trapeze hangers for pipe and equipment supports.

C. See Division 21 Section "Fire-Suppression Piping" for fire protection piping.

D. See Division 23 Section "Expansion Fittings and Loops for HVAC Piping" for pipe guides and anchors.

E. See Division 23 Section(s) "Metal Ducts" for duct hangers and supports.

1.2 DEFINITIONS

A. Terminology: As defined in MSS SP-90, "Guidelines on Terminology for Pipe Hangers and Supports."

1.3 PERFORMANCE REQUIREMENTS

A. Design supports for multiple pipes capable of supporting combined weight of supported systems, system contents, and test water.

B. Design equipment supports capable of supporting combined operating weight of supported equipment and connected systems and components.

1.4 SUBMITTALS

A. Submit Product Data for the following:

1. Steel pipe hangers and supports.
2. Thermal-hanger shield inserts.
3. Powder-actuated fastener systems.

B. Submit Shop Drawings: Show fabrication and installation details and include calculations for the following:

1. Trapeze pipe hangers. Include Product Data for components.
2. Metal framing systems. Include Product Data for components.
3. Equipment supports.

C. Submit Welding certificates.

1.5 QUALITY ASSURANCE

A. Welding: Qualify procedures and personnel according to ASME Boiler and Pressure Vessel Code: Section IX.

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 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. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

2.2 STEEL PIPE HANGERS AND SUPPORTS

A. Description: MSS SP-58, Types 1 through 58, factory-fabricated components. Refer to Part 3 "Hanger and Support Applications" Article for where to use specific hanger and support types.

B. Manufacturers:
1. Anvil International.
2. Grinnell Corp.
3. National Pipe Hanger Corporation.

C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

E. Padded Hangers: Hanger with fiberglass or other pipe insulation pad or cushion for support of bearing surface of piping.

2.3 STRUT MOUNTED INSULATION COUPLINGS WITH STRUT CLAMP

A. Description: Use on all strut mounted insulated piping with OD from ¼” to 4-1/8”. Provide coupling, clamp halves with welded fastener and locknut. Meets 25/50 flame spread/smoke developed index. Insulation shall be inserted inside coupling with insulation contracting internal wall of coupling.

B. Manufacturers:
1. Anvil International.
2. Hydra-Zorb
3. National Pipe Hanger Corporation.

C. Galvanized, Metallic Coatings: Pre-galvanized or hot dipped.

D. TPO Plastic clamp is acceptable for refrigerant piping insulated with flexible elastomeric insulation.

2.4 TRAPEZE PIPE HANGERS

A. Description: MSS SP-69, Type 59, shop- or field-fabricated pipe-support assembly made from structural-steel shapes with MSS SP-58 hanger rods, nuts, saddles, and U-bolts.

2.5 METAL FRAMING SYSTEMS

A. Description: MFMA-3, shop- or field-fabricated pipe-support assembly made of steel channels and other components.

B. Manufacturers:

1. Anvil International.
2. Grinnell Corp.
3. Unistrut Corp.; Tyco International, Ltd.

C. Coatings: Manufacturer's standard finish unless bare metal surfaces are indicated.

D. Nonmetallic Coatings: Plastic coating, jacket, or liner.

2.6 THERMAL-HANGER SHIELD INSERTS

A. Description: 100-psig- (690-kPa-) minimum, compressive-strength insulation inserts encased in sheet metal shield.

B. Manufacturers:

1. Carpenter & Paterson, Inc.
2. PHS Industries, Inc.
3. Pipe Shields, Inc.

C. Insulation-Insert Material for Cold Piping: ASTM C 552, Type II cellular glass with vapor barrier.

D. Insulation-Insert Material for Hot Piping: Water-repellent treated, ASTM C 533, Type I calcium silicate or ASTM C 552, Type II cellular glass.

E. For Trapeze or Clamped Systems: Insert and shield shall cover entire circumference of pipe.

F. For Clevis or Band Hangers: Insert and shield shall cover lower 180 degrees of pipe.

G. Insert Length: Extend 2 inches (50 mm) beyond sheet metal shield for piping operating below ambient air temperature.

2.7 FASTENER SYSTEMS

A. Powder-Actuated Fasteners: Threaded-steel stud, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti, Inc.
b. ITW Ramset/Red Head.
c. Powers Fasteners.

B. Mechanical-Expansion Anchors: Insert-wedge-type zinc-coated steel, for use in hardened portland cement concrete with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

1. Manufacturers:

a. Hilti,Inc.
b. ITW Ramset/Red Head.
c. Powers Fasteners.

2.8 EQUIPMENT SUPPORTS

A. Description: Welded, shop- or field-fabricated equipment support made from structural-steel shapes.

B. Pipe on roof supports and condensate piping: Refrigerant piping Blok DB Series or approved equal.

2.9 MISCELLANEOUS MATERIALS

A. Structural Steel: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

B. Grout: ASTM C 1107, factory-mixed and -packaged, dry, hydraulic-cement, non-shrink and nonmetallic grout; suitable for interior and exterior applications.

1. Properties: Non-staining, noncorrosive, and nongaseous.
2. Design Mix: 5000-psi (34.5-MPa), 28-day compressive strength.

PART 3 - EXECUTION

3.1 HANGER AND SUPPORT APPLICATIONS

A. Specific hanger and support requirements are specified in Sections specifying piping systems and equipment.

B. Comply with MSS SP-69 for pipe hanger selections and applications that are not specified in piping system Sections.

C. Use hangers and supports with galvanized, metallic coatings for piping and equipment that will not have field-applied finish.

D. Use nonmetallic coatings on attachments for electrolytic protection where attachments are in direct contact with copper tubing.

E. Use padded hangers for piping that is subject to scratching.

F. Horizontal-Piping Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Adjustable, Steel Clevis Hangers (MSS Type 1): For suspension of non-insulated or insulated stationary pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
2. Yoke-Type Pipe Clamps (MSS Type 2): For suspension of 120 to 450 deg F (49 to 232 deg C) pipes, NPS 4 to NPS 16 (DN 100 to DN 400), requiring up to 4 inches (100 mm) of insulation.
3. Carbon- or Alloy-Steel, Double-Bolt Pipe Clamps (MSS Type 3): For suspension of pipes, NPS 3/4 to NPS 24 (DN 20 to DN 600), requiring clamp flexibility and up to 4 inches (100 mm) of insulation.
4. Adjustable, Steel Band Hangers (MSS Type 7): For suspension of non-insulated stationary pipes, NPS 1/2 to NPS 8 (DN 15 to DN 200).
5. U-Bolts (MSS Type 24): For support of heavy pipes, NPS 1/2 to NPS 30 (DN 15 to DN 750).
6. Pipe Saddle Supports (MSS Type 36): For support of pipes, NPS 4 to NPS 36 (DN 100 to DN 900), with steel pipe base stanchion support and cast-iron floor flange.
7. Single Pipe Rolls (MSS Type 41): For suspension of pipes, NPS 1 to NPS 30 (DN 25 to DN 750), from 2 rods if longitudinal movement caused by expansion and contraction might occur.

8. Complete Pipe Rolls (MSS Type 44): For support of pipes, NPS 2 to NPS 42 (DN 50 to DN 1050), if longitudinal movement caused by expansion and contraction might occur but vertical adjustment is not necessary.

G. Vertical-Piping Clamps: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Extension Pipe or Riser Clamps (MSS Type 8): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500).
2. Carbon- or Alloy-Steel Riser Clamps (MSS Type 42): For support of pipe risers, NPS 3/4 to NPS 20 (DN 20 to DN 500), if longer ends are required for riser clamps.

H. Hanger-Rod Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Turnbuckles (MSS Type 13): For adjustment up to 6 inches (150 mm) for heavy loads.
2. Steel Clevises (MSS Type 14): For 120 to 450 deg F (49 to 232 deg C) piping installations.

I. Building Attachments: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel or Malleable Concrete Inserts (MSS Type 18): For upper attachment to suspend pipe hangers from concrete ceiling.
2. Top-Beam C-Clamps (MSS Type 19): For use under roof installations with bar-joist construction to attach to top flange of structural shape.
3. Side-Beam or Channel Clamps (MSS Type 20): For attaching to bottom flange of beams, channels, or angles.
4. Center-Beam Clamps (MSS Type 21): For attaching to center of bottom flange of beams.
5. Welded Beam Attachments (MSS Type 22): For attaching to bottom of beams if loads are considerable and rod sizes are large.
6. C-Clamps (MSS Type 23): For structural shapes.
7. Welded-Steel Brackets: For support of pipes from below, or for suspending from above by using clip and rod. Use one of the following for indicated loads:
    a. Light (MSS Type 31): 750 lb (340 kg).
    b. Medium (MSS Type 32): 1500 lb (680 kg).
    c. Heavy (MSS Type 33): 3000 lb (1360 kg).
8. Side-Beam Brackets (MSS Type 34): For sides of steel or wooden beams.
9. Plate Lugs (MSS Type 57): For attaching to steel beams if flexibility at beam is required.

J. Saddles and Shields: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Steel Pipe-Covering Protection Saddles (MSS Type 39): To fill interior voids with insulation that matches adjoining insulation.
2. Protection Shields (MSS Type 40): Of length recommended in writing by manufacturer to prevent crushing insulation.
3. Thermal-Hanger Shield Inserts: For supporting insulated pipe.

K. Spring Hangers and Supports: Unless otherwise indicated and except as specified in piping system Sections, install the following types:

1. Spring Cushions (MSS Type 48): For light loads if vertical movement does not exceed 1-1/4 inches (32 mm).

2. Spring-Cushion Roll Hangers (MSS Type 49): For equipping Type 41 roll hanger with springs.
3. Variable-Spring Base Supports (MSS Type 52): Preset to indicated load and limit variability factor to 25 percent to absorb expansion and contraction of piping system from base support.

L. Comply with MSS SP-69 for trapeze pipe hanger selections and applications that are not specified in piping system Sections.

M. Comply with MFMA-102 for metal framing system selections and applications that are not specified in piping system Sections.

N. Use mechanical-expansion anchors instead of building attachments where required in concrete construction.

3.2 HANGER AND SUPPORT INSTALLATION

A. Steel Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Install hangers, supports, clamps, and attachments as required to properly support piping from building structure.

B. Trapeze Pipe Hanger Installation: Comply with MSS SP-69 and MSS SP-89. Arrange for grouping of parallel runs of horizontal piping and support together on field-fabricated trapeze pipe hangers.

1. Pipes of Various Sizes: Support together and space trapezes for smallest pipe size or install intermediate supports for smaller diameter pipes as specified above for individual pipe hangers.
2. Field fabricates from ASTM A 36/A 36M, steel shapes selected for loads being supported. Weld steel according to AWS D1.1.

C. Metal Framing System Installation: Arrange for grouping of parallel runs of piping and support together on field-assembled metal framing systems.

D. Thermal-Hanger Shield Installation: Install in pipe hanger or shield for insulated piping.

E. Fastener System Installation:

1. Install powder-actuated fasteners in concrete after concrete is placed and completely cured. Use operators that are licensed by powder-actuated tool manufacturer. Install fasteners according to powder-actuated tool manufacturer's operating manual.
2. Install mechanical-expansion anchors in concrete after concrete is placed and completely cured. Install fasteners according to manufacturer's written instructions.

F. Install hangers and supports complete with necessary inserts, bolts, rods, nuts, washers, and other accessories.

G. Equipment Support Installation: Fabricate from welded-structural-steel shapes.

H. Install hangers and supports to allow controlled thermal and seismic movement of piping systems, to permit freedom of movement between pipe anchors, and to facilitate action of expansion joints, expansion loops, expansion bends, and similar units.

I. Install lateral bracing with pipe hangers and supports to prevent swaying.

J. Install building attachments within concrete slabs or attach to structural steel. Install additional attachments at concentrated loads, including valves, flanges, and strainers, NPS 2-1/2 (DN 65) and larger and at changes in direction of piping. Install concrete inserts before concrete is placed; fasten inserts to forms and install reinforcing bars through openings at top of inserts.

K. Load Distribution: Install hangers and supports so piping live and dead loads and stresses from movement will not be transmitted to connected equipment.

L. Pipe Slopes: Install hangers and supports to provide indicated pipe slopes and so maximum pipe deflections allowed by ASME B31.1 (for power piping) and ASME B31.9 (for building services piping) are not exceeded.

M. Insulated Piping: Comply with the following:

1. Attach clamps and spacers to piping.
    a. Piping Operating above Ambient Air Temperature: Clamp may project through insulation.
    b. Piping Operating below Ambient Air Temperature: Use thermal-hanger shield insert with clamp sized to match OD of insert.
    c. Do not exceed pipe stress limits according to ASME B31.1 for power piping and ASME B31.9 for building services piping.
2. Install MSS SP-58, Type 39, protection saddles if insulation without vapor barrier is indicated. Fill interior voids with insulation that matches adjoining insulation.
3. Install MSS SP-58, Type 40, protective shields on cold piping with vapor barrier. Shields shall span an arc of 180 degrees.
4. Shield Dimensions for Pipe: Not less than the following:
    a. NPS 1/4 to NPS 3-1/2 (DN 8 to DN 90): 12 inches (305 mm) long and 0.048 inch (1.22 mm) thick.
    b. NPS 4 (DN 100): 12 inches (305 mm) long and 0.06 inch (1.52 mm) thick.
    c. NPS 5 and NPS 6 (DN 125 and DN 150): 18 inches (457 mm) long and 0.06 inch (1.52 mm) thick.
    d. NPS 8 to NPS 14 (DN 200 to DN 350): 24 inches (610 mm) long and 0.075 inch (1.91 mm) thick.
    e. NPS 16 to NPS 24 (DN 400 to DN 600): 24 inches (610 mm) long and 0.105 inch (2.67 mm) thick.
5. Pipes NPS 8 (DN 200) and Larger: Include wood inserts.
6. Insert Material: Length at least as long as protective shield.
7. Thermal-Hanger Shields: Install with insulation same thickness as piping insulation.

3.3 EQUIPMENT SUPPORTS

A. Fabricate structural-steel stands to suspend equipment from structure overhead or to support equipment above floor.

B. Grouting: Place grout under supports for equipment and make smooth bearing surface.

C. Provide lateral bracing, to prevent swaying, for equipment supports.

3.4 METAL FABRICATIONS

A. Cut, drill, and fit miscellaneous metal fabrications for trapeze pipe hangers and equipment supports.

B. Fit exposed connections together to form hairline joints. Field weld connections that cannot be shop welded because of shipping size limitations.

C. Field Welding: Comply with AWS D1.1 procedures for shielded metal arc welding, appearance and quality of welds, and methods used in correcting welding work, and with the following:

1. Use materials and methods that minimize distortion and develop strength and corrosion resistance of base metals.
2. Obtain fusion without undercut or overlap.
3. Remove welding flux immediately.
4. Finish welds at exposed connections so no roughness shows after finishing and contours of welded surfaces match adjacent contours.

3.5 ADJUSTING

A. Hanger Adjustments: Adjust hangers to distribute loads equally on attachments and to achieve indicated slope of pipe.

3.6 PAINTING

A. Touch Up: Clean field welds and abraded areas of shop paint. Paint exposed areas immediately after erecting hangers and supports. Use same materials as used for shop painting. Comply with SSPC-PA 1 requirements for touching up field-painted surfaces.

1. Apply paint by brush or spray to provide minimum dry film thickness of 2.0 mils (0.05 mm).

B. Galvanized Surfaces: Clean welds, bolted connections, and abraded areas and apply galvanizing-repair paint to comply with ASTM A 780.

END OF SECTION

SECTION 230548.13
VIBRATION CONTROLS FOR HVAC PIPING AND EQUIPMENT

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. Isolation pads.
2. Spring hangers.
3. Pipe hanger supports.

1.3 SUBMITTALS

A. Submit Product Data: For the following:

1. Include rated load, rated deflection, and overload capacity for each vibration isolation device.
2. Illustrate and indicate style, material, strength, fastening provision, and finish for each type and size of seismic-restraint component used.

1.4 QUALITY ASSURANCE

A. Testing Agency Qualifications: An independent agency, with the experience and capability to conduct the testing indicated, that is a nationally recognized testing laboratory (NRTL) as defined by OSHA in 29 CFR 1910.7, and that is acceptable to authorities having jurisdiction.

PART 2 - PRODUCTS

2.1 VIBRATION ISOLATORS

A. Available Manufacturers: Subject to compliance with requirements, manufacturers offering products that may be incorporated into the Work include, but are not limited to, the following:

B. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

C. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

1. Kinetics Noise Control
2. Mason Industries.
3. Vibration Isolation.

D. Pads: Arranged in single or multiple layers of sufficient stiffness for uniform loading over pad area, molded with a nonslip pattern and galvanized-steel baseplates, and factory cut to sizes that match requirements of supported equipment.

1. Resilient Material: Oil- and water-resistant neoprene.

E. Spring Hangers: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene. Steel-washer-reinforced cup to support spring and bushing projecting through bottom of frame.
7. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

F. Spring Hangers with Vertical-Limit Stop: Combination coil-spring and elastomeric-insert hanger with spring and insert in compression and with a vertical-limit stop.

1. Frame: Steel, fabricated for connection to threaded hanger rods and to allow for a maximum of 30 degrees of angular hanger-rod misalignment without binding or reducing isolation efficiency.
2. Outside Spring Diameter: Not less than 80 percent of the compressed height of the spring at rated load.
3. Minimum Additional Travel: 50 percent of the required deflection at rated load.
4. Lateral Stiffness: More than 80 percent of rated vertical stiffness.
5. Overload Capacity: Support 200 percent of rated load, fully compressed, without deformation or failure.
6. Elastomeric Element: Molded, oil-resistant rubber or neoprene.
7. Adjustable Vertical Stop: Steel washer with neoprene washer "up-stop" on lower threaded rod.
8. Self-centering hanger rod cap to ensure concentricity between hanger rod and support spring coil.

G. Pipe Riser Resilient Support: All-directional, acoustical pipe anchor consisting of 2 steel tubes separated by a minimum of 1/2-inch- (13-mm-) thick neoprene. Include steel and neoprene vertical-limit stops arranged to prevent vertical travel in both directions. Design support for a maximum load on the isolation material of 500 psig (3.45 MPa) and for equal resistance in all directions.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine areas and equipment to receive vibration isolation-control devices for compliance with requirements for installation tolerances and other conditions affecting performance.

B. Examine roughing-in of reinforcement and cast-in-place anchors to verify actual locations before installation.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 ADJUSTING

A. Adjust isolators after piping system is at operating weight.

B. Adjust limit stops on restrained spring isolators to mount equipment at normal operating height. After equipment installation is complete, adjust limit stops so they are out of contact during normal operation.

C. Adjust active height of spring isolators.

D. Adjust restraints to permit free movement of equipment within normal mode of operation.

3.3 DEMONSTRATION

A. Engage a factory-authorized service representative to train Owner's maintenance personnel to adjust, operate, and maintain systems. Refer to Division 1 Section "Demonstration and Training."

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 23 0553
IDENTIFICATION FOR HVAC PIPING AND EQUIPMENT

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Equipment labels.
2. Warning signs and labels.
3. Pipe labels.
4. Valve Tags.

1.2 SUBMITTAL

A. Submit Product Data: For each type of product indicated.

PART 2 - PRODUCTS

2.1 EQUIPMENT LABELS

A. Plastic Labels for Equipment:

1. Material and Thickness: Multilayer, multicolor, plastic labels for mechanical engraving, 1/16 inch (1.6 mm) thick, and having predrilled holes for attachment hardware.
2. Letter Color: White.
3. Background Color: Black.
4. Maximum Temperature: Able to withstand temperatures up to 160 deg F (71 deg C).
5. Minimum Label Size: Length and width vary for required label content, but not less than 2-1/2 by 3/4 inch (64 by 19 mm).
6. Minimum Letter Size: 1/4 inch (6.4 mm) for name of units if viewing distance is less than 24 inches (600 mm), 1/2 inch (13 mm) for viewing distances up to 72 inches (1830 mm), and proportionately larger lettering for greater viewing distances. Include secondary lettering two-thirds to three-fourths the size of principal lettering.
7. Fasteners: Stainless-steel rivets or self-tapping screws.
8. Adhesive: Contact-type permanent adhesive, compatible with label and with substrate.

B. Label Content: Include equipment's Drawing designation or unique equipment number, drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified.

C. Equipment Label Schedule: For each item of equipment to be labeled, on 8-1/2-by-11-inch (A4) bond paper. Tabulate equipment identification number and identify Drawing numbers where equipment is indicated (plans, details, and schedules), plus the Specification Section number and title where equipment is specified. Equipment schedule shall be included in operation and maintenance data.

2.2 PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded per ASTM/ASME A13.1, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of piping service using same designations or abbreviations as used on Drawings, pipe size, and an arrow indicating flow direction.

1. Flow-Direction Arrows: Integral with piping system service lettering to accommodate both directions, or as separate unit on each pipe label to indicate flow direction.
2. Lettering Size: At least 1-1/2 inches (38 mm) high.

2.3 REFRIGERANT PIPE LABELS

A. General Requirements for Manufactured Pipe Labels: Preprinted, color-coded per ASTM/ASME A13.1, with lettering indicating service, and showing flow direction.

B. Pretensioned Pipe Labels: Pre-coiled, semirigid plastic formed to cover full circumference of pipe and to attach to pipe without fasteners or adhesive.

C. Pipe Label Contents: Include identification of outdoor unit and indoor unit using same designations or abbreviations as used on Drawings.

1. Lettering Size: At least 1 inch high.

2.4 VALVE TAGS

A. All valves except equipment service valves shall be equipped with engraved laminated plastic valve tags secured with chains to valve yoke or stem (not handles). Tags shall be 2" x 3" with 1/2" high red numbers on white background. Locate numbers at one end of tag leaving room for future engraving by others. Number tags in sequence from lowest to highest point in building starting with number 1. In each equipment room provide framed valve chart showing number and location of each valve and type of service. Identify location of equipment, valves, etc. above ceilings push pins or colored tacks.

PART 3 - EXECUTION

3.1 PREPARATION

A. Clean piping and equipment surfaces of substances that could impair bond of identification devices, including dirt, oil, grease, release agents, and incompatible primers, paints, and encapsulants.

3.2 EQUIPMENT LABEL INSTALLATION

A. Install or permanently fasten labels on each major item of mechanical equipment.

B. Locate equipment labels where accessible and visible.

3.3 PIPE LABEL INSTALLATION

A. Piping Color-Coding: Painting of piping is specified in Division 9 Section "Interior Painting."

B. Locate pipe labels where piping is exposed or above accessible ceilings in finished spaces; machine rooms; accessible maintenance spaces such as shafts, tunnels, and plenums; and exterior exposed locations as follows:

1. Near each valve and control device.
2. Near each branch connection, excluding short takeoffs for fixtures and terminal units. Where flow pattern is not obvious, mark each pipe at branch.
3. Near penetrations through walls, floors, ceilings, and inaccessible enclosures.
4. At access doors, manholes, and similar access points that permit view of concealed piping.
5. Near major equipment items and other points of origination and termination.
6. Spaced at maximum intervals of 50 feet (15 m) along each run. Reduce intervals to 25 feet (7.6 m) in areas of congested piping and equipment.

7. On piping above removable acoustical ceilings.

C. Pipe Label Color Schedule:

1. Chilled-Water Piping:

   a. Background Color: Green.
   b. Letter Color: White.

2. Refrigerant Piping:

   a. Background Color: Black.
   b. Letter Color: White.

3. Hot Water – Water Piping:

   a. Background color: Yellow.
   b. Letter Color: Black.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 23 0593
TESTING, ADJUSTING, AND BALANCING

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. Balancing Air Systems:
    a. Constant-volume air systems.
    b. Variable-volume air systems.
2. Balancing Hydronic Piping Systems:
    a. Constant-flow hydronic systems.
    b. Primary-Secondary hydronic systems.

1.3 DEFINITIONS

A. AABC: Associated Air Balance Council.

B. NEBB: National Environmental Balancing Bureau.

C. TAB: Testing, adjusting, and balancing.

D. TABB: Testing, Adjusting, and Balancing Bureau.

E. TAB Specialist: An entity engaged to perform TAB Work.

1.4 INFORMATIONAL SUBMITTALS

A. Submit Qualification Data: Within 30 days of Contractor's Notice to Proceed, submit documentation that the TAB contractor and this Project's TAB team members meet the qualifications specified in "Quality Assurance" Article.

B. Submit Certified TAB reports.

C. Submit sample report forms.

D. Submit instrument calibration reports, to include the following:

1. Instrument type and make.
2. Serial number.
3. Application.
4. Dates of use.
5. Dates of calibration.

1.5 QUALITY ASSURANCE

A. TAB Contractor Qualifications: Engage a TAB entity certified by AABC or NEBB.

1. TAB Technician: Employee of the TAB contractor and who is certified by AABC or NEBB as a TAB technician.

B. TAB Conference: Meet with Construction Manager on approval of the TAB strategies and procedures plan to develop a mutual understanding of the details. Require the participation of the TAB field supervisor and technicians. Provide seven days' advance notice of scheduled meeting time and location.

1. Agenda Items:

a. The Contract Documents examination report.
b. The TAB plans.
c. Coordination and cooperation of trades and subcontractors.
d. Coordination of documentation and communication flow.

C. Certify TAB field data reports and perform the following:

1. Review field data reports to validate accuracy of data and to prepare certified TAB reports.
2. Certify that the TAB team complied with the approved TAB plan and the procedures specified and referenced in this Specification.

D. Instrumentation Type, Quantity, Accuracy, and Calibration: As described in ASHRAE 111, Section 5, "Instrumentation."

E. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1, Section 7.2.2 - "Air Balancing."

1.6 COORDINATION

A. Notice: Provide seven days' advance notice for each test. Include scheduled test dates and times.

B. Perform TAB after leakage and pressure tests on air and water distribution systems have been satisfactorily completed.

PART 2 - EXECUTION

2.1 TAB SPECIALISTS

A. Subject to compliance with requirements, engage one of the following:

1. Southeast T&B.
2. Superior TABs.
3. System Analysis.
4. Performance Testing and Balancing.

2.2 EXAMINATION

A. Examine the Contract Documents to become familiar with Project requirements and to discover conditions in systems' designs that may preclude proper TAB of systems and equipment.

B. Examine systems for installed balancing devices, such as test ports, gage cocks, thermometer wells, flow-control devices, balancing valves and fittings, and manual volume dampers. Verify that locations of these balancing devices are accessible.

C. Examine the approved submittals for HVAC systems and equipment.

D. Examine design data including HVAC system descriptions, statements of design assumptions for environmental conditions and systems' output, and statements of philosophies and assumptions about HVAC system and equipment controls.

E. Examine ceiling plenums and underfloor air plenums used for supply, return, or relief air to verify that they meet the leakage class of connected ducts as specified in Section 23 "Metal Ducts" and are properly separated from adjacent areas. Verify that penetrations in plenum walls are sealed and fire-stopped if required.

F. Examine equipment performance data including fan and pump curves.

1. Relate performance data to Project conditions and requirements, including system effects that can create undesired or unpredicted conditions that cause reduced capacities in all or part of a system.
2. Calculate system-effect factors to reduce performance ratings of HVAC equipment when installed under conditions different from the conditions used to rate equipment performance. To calculate system effects for air systems, use tables and charts found in AMCA 201, "Fans and Systems," or in SMACNA's "HVAC Systems - Duct Design." Compare results with the design data and installed conditions.

G. Examine system and equipment installations and verify that field quality-control testing, cleaning, and adjusting specified in individual Sections have been performed.

H. Examine test reports specified in individual system and equipment Sections.

I. Examine HVAC equipment and filters and verify that bearings are greased, belts are aligned and tight, and equipment with functioning controls is ready for operation.

J. Examine strainers. Verify that startup screens are replaced by permanent screens with indicated perforations.

K. Examine three-way valves for proper installation for their intended function of diverting or mixing fluid flows.

L. Examine heat-transfer coils for correct piping connections and for clean and straight fins.

M. Examine system pumps to ensure absence of entrained air in the suction piping.

N. Examine operating safety interlocks and controls on HVAC equipment.

O. Report deficiencies discovered before and during performance of TAB procedures. Observe and record system reactions to changes in conditions. Record default set points if different from indicated values.

2.3 PREPARATION

A. Prepare a TAB plan that includes strategies and step-by-step procedures.

B. Complete system-readiness checks and prepare reports. Verify the following:

1. Permanent electrical-power wiring is complete.
2. Hydronic systems are filled, clean, and free of air.
3. Automatic temperature-control systems are operational.
4. Equipment and duct access doors are securely closed.
5. Balance, smoke, and fire dampers are open.
6. Isolating and balancing valves are open and control valves are operational.
7. Ceilings are installed in critical areas where air-pattern adjustments are required and access to balancing devices is provided.
8. Windows and doors can be closed so indicated conditions for system operations can be met.

2.4 GENERAL PROCEDURES FOR TESTING AND BALANCING

A. Perform testing and balancing procedures on each system according to the procedures contained in AABC's "National Standards for Total System Balance" and in this Section.

1. Comply with requirements in ASHRAE 62.1, "Air Balancing."

B. Cut insulation, ducts, pipes, and equipment cabinets for installation of test probes to the minimum extent necessary for TAB procedures.

1. After testing and balancing, patch probe holes in ducts with same material and thickness as used to construct ducts.
2. Install and join new insulation that matches removed materials. Restore insulation, coverings, vapor barrier, and finish according to Section 23 "Duct Insulation" and Section 23 "HVAC Piping Insulation."

C. Mark equipment and balancing devices, including damper-control positions, valve position indicators, fan-speed-control levers, and similar controls and devices, with paint or other suitable, permanent identification material to show final settings.

D. Take and report testing and balancing measurements in inch-pound (IP) units.

2.5 GENERAL PROCEDURES FOR BALANCING AIR SYSTEMS

A. Prepare test reports for both fans and outlets. Obtain manufacturer's outlet factors and recommended testing procedures. Crosscheck the summation of required outlet volumes with required fan volumes.

B. Prepare schematic diagrams of systems' "as-built" duct layouts.

C. Determine the best locations in main and branch ducts for accurate duct-airflow measurements.

D. Check airflow patterns from the outdoor-air louvers and dampers and the return- and exhaust-air dampers through the supply-fan discharge and mixing dampers.

E. Locate start-stop and disconnect switches, electrical interlocks, and motor starters.

F. Verify that motor starters are equipped with properly sized thermal protection.

G. Check dampers for proper position to achieve desired airflow path.

H. Check for airflow blockages.

I. Check condensate drains for proper connections and functioning.

J. Check for proper sealing of air-handling-unit components.

K. Verify that air duct system is sealed as specified in Section 23 "Metal Ducts."

2.6 PROCEDURES FOR CONSTANT-VOLUME AIR SYSTEMS

A. Adjust fans to deliver total indicated airflows within the maximum allowable fan speed listed by fan manufacturer.

1. Measure total airflow.

a. Where sufficient space in ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow.

2. Measure fan static pressures as follows to determine actual static pressure:

a. Measure outlet static pressure as far downstream from the fan as practical and upstream from restrictions in ducts such as elbows and transitions.

b. Measure static pressure directly at the fan outlet or through the flexible connection.
c. Measure inlet static pressure of single-inlet fans in the inlet duct as near the fan as possible, upstream from the flexible connection, and downstream from duct restrictions.
d. Measure inlet static pressure of double-inlet fans through the wall of the plenum that houses the fan.

3. Measure static pressure across each component that makes up an air-handling unit, rooftop unit, and other air-handling and -treating equipment.

a. Report the cleanliness status of filters and the time static pressures are measured.

4. Measure static pressures entering and leaving other devices, such as sound traps, heat-recovery equipment, and air washers, under final balanced conditions.
5. Review Record Documents to determine variations in design static pressures versus actual static pressures. Calculate actual system-effect factors. Recommend adjustments to accommodate actual conditions.
6. Obtain approval from Engineer for adjustment of fan speed higher or lower than indicated speed. Comply with requirements in HVAC Sections for air-handling units for adjustment of fans, belts, and pulley sizes to achieve indicated air-handling-unit performance.
7. Do not make fan-speed adjustments that result in motor overload. Consult equipment manufacturers about fan-speed safety factors. Modulate dampers and measure fan-motor amperage to ensure that no overload will occur. Measure amperage in full-cooling, full-heating, economizer, and any other operating mode to determine the maximum required brake horsepower.

B. Adjust volume dampers for main duct, submain ducts, and major branch ducts to indicated airflows within specified tolerances.

1. Measure airflow of submain and branch ducts.

a. Where sufficient space in submain and branch ducts is unavailable for Pitot-tube traverse measurements, measure airflow at terminal outlets and inlets and calculate the total airflow for that zone.

2. Measure static pressure at a point downstream from the balancing damper and adjust volume dampers until the proper static pressure is achieved.
3. Remeasure each submain and branch duct after all have been adjusted. Continue to adjust submain and branch ducts to indicated airflows within specified tolerances.

C. Measure air outlets and inlets without making adjustments.

1. Measure terminal outlets using a direct-reading hood or outlet manufacturer's written instructions and calculating factors.

D. Adjust air outlets and inlets for each space to indicated airflows within specified tolerances of indicated values. Make adjustments using branch volume dampers rather than extractors and the dampers at air terminals.

1. Adjust each outlet in same room or space to within specified tolerances of indicated quantities without generating noise levels above the limitations prescribed by the Contract Documents.
2. Adjust patterns of adjustable outlets for proper distribution without drafts.

2.7 GENERAL PROCEDURES FOR HYDRONIC SYSTEMS

A. Prepare test reports with pertinent design data, and number in sequence starting at pump to end of system. Check the sum of branch-circuit flows against the approved pump flow rate. Correct variations that exceed plus or minus 5 percent.

B. Prepare schematic diagrams of systems' "as-built" piping layouts.

C. Prepare hydronic systems for testing and balancing according to the following, in addition to the general preparation procedures specified above:

1. Open all manual valves for maximum flow.
2. Check liquid level in expansion tank.
3. Check makeup water-station pressure gage for adequate pressure for highest vent.
4. Check flow-control valves for specified sequence of operation and set at indicated flow.
5. Set differential-pressure control valves at the specified differential pressure. Do not set at fully closed position when pump is positive-displacement type unless several terminal valves are kept open.
6. Set system controls so automatic control valves are wide open to heat exchangers.
7. Check pump-motor load. If motor is overloaded, throttle main flow-balancing device (on constant flow pumps) so motor nameplate rating is not exceeded.
8. Check air vents for a forceful liquid flow exiting from vents when manually operated.

2.8 PROCEDURES FOR CONSTANT-FLOW HYDRONIC SYSTEMS

A. Measure water flow at pumps. Use the following procedures except for positive-displacement pumps:

1. Verify impeller size by operating the pump with the discharge valve closed. Read pressure differential across the pump. Convert pressure to head and correct for differences in gage heights. Note the point on manufacturer's pump curve at zero flow and verify that the pump has the intended impeller size.

    a. If impeller sizes must be adjusted to achieve pump performance, obtain approval from Architect Owner Construction Manager Engineer Commissioning Authority, and comply with requirements in Section 23 "Hydronic Pumps."

2. Check system resistance. With all valves open, read pressure differential across the pump and mark pump manufacturer's head-capacity curve. Adjust pump discharge valve until indicated water flow is achieved.

    a. Monitor motor performance during procedures and do not operate motors in overload conditions.

3. Verify pump-motor brake horsepower. Calculate the intended brake horsepower for the system based on pump manufacturer's performance data. Compare calculated brake horsepower with nameplate data on the pump motor. Report conditions where actual amperage exceeds motor nameplate amperage.
4. Report flow rates that are not within plus or minus 10 percent of design.

B. Measure flow at all automatic flow control valves to verify that valves are functioning as designed.

C. Measure flow at all pressure-independent characterized control valves, with valves in fully open position, to verify that valves are functioning as designed.

D. Set calibrated balancing valves, if installed, at calculated pre-settings.

E. Measure flow at all stations and adjust, where necessary, to obtain first balance.

1. System components that have Cv rating or an accurately cataloged flow-pressure-drop relationship may be used as a flow-indicating device.

F. Measure flow at main balancing station and set main balancing device to achieve flow that is 5 percent greater than indicated flow.

G. Adjust balancing stations to within specified tolerances of indicated flow rate as follows:

1. Determine the balancing station with the highest percentage over indicated flow.
2. Adjust each station in turn, beginning with the station with the highest percentage over indicated flow and proceeding to the station with the lowest percentage over indicated flow.
3. Record settings and mark balancing devices.

H. Measure pump flow rate and make final measurements of pump amperage, voltage, rpm, pump heads, and systems' pressures and temperatures including outdoor-air temperature.

I. Measure the differential-pressure-control-valve settings existing at the conclusion of balancing.

J. Check settings and operation of each safety valve. Record settings.

2.9 PROCEDURES FOR VARIABLE-FLOW HYDRONIC SYSTEMS

A. Balance systems with automatic two- and three-way control valves by setting systems at maximum flow through heat-exchange terminals and proceed as specified above for hydronic systems.

2.10 PROCEDURES FOR HEAT EXCHANGERS

A. Measure water flow through all circuits.

B. Adjust water flow to within specified tolerances.

C. Measure inlet and outlet water temperatures.

D. Check settings and operation of safety and relief valves. Record settings.

2.11 PROCEDURES FOR MOTORS

A. Motors, 1/2 HP and Larger: Test at final balanced conditions and record the following data:

1. Manufacturer's name, model number, and serial number.
2. Motor horsepower rating.
3. Motor rpm.
4. Efficiency rating.
5. Nameplate and measured voltage, each phase.
6. Nameplate and measured amperage, each phase.
7. Starter thermal-protection-element rating.

B. Motors Driven by Variable-Frequency Controllers: Test for proper operation at speeds varying from minimum to maximum. Record observations including name of controller manufacturer, model number, serial number, and nameplate data.

2.12 PROCEDURES FOR HEAT-TRANSFER COILS

A. Measure, adjust, and record the following data for each water coil:

1. Entering- and leaving-water temperature.
2. Water flow rate.
3. Water pressure drop.
4. Dry-bulb temperature of entering and leaving air.
5. Wet-bulb temperature of entering and leaving air for cooling coils.
6. Airflow.
7. Air pressure drop.

B. Measure, adjust, and record the following data for each electric heating coil:

1. Nameplate data.
2. Airflow.
3. Entering- and leaving-air temperature at full load.

4. Voltage and amperage input of each phase at full load and at each incremental stage.
5. Calculated kilowatt at full load.
6. Fuse or circuit-breaker rating for overload protection.

C. Measure, adjust, and record the following data for each refrigerant coil:

1. Dry-bulb temperature of entering and leaving air.
2. Wet-bulb temperature of entering and leaving air.
3. Airflow.
4. Air pressure drop.
5. Refrigerant suction pressure and temperature.

2.13 TOLERANCES

A. Set HVAC system's air flow rates and water flow rates within the following tolerances:

1. Supply, Return, and Exhaust Fans and Equipment with Fans: Plus, or minus 10 percent.
2. Air Outlets and Inlets: Plus, or minus 10 percent.
3. Heating-Water Flow Rate: Plus, or minus 10 percent.
4. Cooling-Water Flow Rate: Plus, or minus 10 percent.

2.14 REPORTING

A. Initial Construction-Phase Report: Based on examination of the Contract Documents as specified in "Examination" Article, prepare a report on the adequacy of design for systems' balancing devices. Recommend changes and additions to systems' balancing devices to facilitate proper performance measuring and balancing. Recommend changes and additions to HVAC systems and general construction to allow access for performance measuring and balancing devices.

B. Status Reports: Prepare monthly progress reports to describe completed procedures, procedures in progress, and scheduled procedures. Include a list of deficiencies and problems found in systems being tested and balanced. Prepare a separate report for each system and each building floor for systems serving multiple floors.

2.15 FINAL REPORT

A. General: Prepare a certified written report; tabulate and divide the report into separate sections for tested systems and balanced systems.

1. Include a certification sheet at the front of the report's binder, signed and sealed by the certified testing and balancing engineer.
2. Include a list of instruments used for procedures, along with proof of calibration.

B. Final Report Contents: In addition to certified field-report data, include the following:

1. Pump curves.
2. Fan curves.
3. Manufacturers' test data.
4. Field test reports prepared by system and equipment installers.
5. Other information relative to equipment performance; do not include Shop Drawings and product data.

C. General Report Data: In addition to form titles and entries, include the following data:

1. Title page.
2. Name and address of the TAB contractor.
3. Project name.
4. Project location.
5. Architect's name and address.

6. Engineer's name and address.
7. Contractor's name and address.
8. Report date.
9. Signature of TAB supervisor who certifies the report.
10. Table of Contents with the total number of pages defined for each section of the report. Number each page in the report.
11. Summary of contents including the following:

    a. Indicated versus final performance.
    b. Notable characteristics of systems.
    c. Description of system operation sequence if it varies from the Contract Documents.

12. Nomenclature sheets for each item of equipment.
13. Notes to explain why certain final data in the body of reports vary from indicated values.
14. Test conditions for fans and pump performance forms including the following:

    a. Settings for outdoor-, return-, and exhaust-air dampers.
    b. Conditions of filters.
    c. Cooling coil, wet- and dry-bulb conditions.
    d. Face and bypass damper settings at coils.
    e. Fan drive settings including settings and percentage of maximum pitch diameter.
    f. Inlet vane settings for variable-air-volume systems.
    g. Settings for supply-air, static-pressure controller.
    h. Other system operating conditions that affect performance.

D. System Diagrams: Include schematic layouts of air and hydronic distribution systems. Present each system with single-line diagram and include the following:

1. Quantities of outdoor, supply, return, and exhaust airflows.
2. Water flow rates.
3. Duct, outlet, and inlet sizes.
4. Pipe and valve sizes and locations.
5. Balancing stations.
6. Position of balancing devices.

E. Air-Handling-Unit Test Reports: For air-handling units with coils, include the following:

1. Unit Data:

    a. Unit identification.
    b. Location.
    c. Make and type.
    d. Model number and unit size.
    e. Manufacturer's serial number.
    f. Unit arrangement and class.
    g. Discharge arrangement.
    h. Sheave make, size in inches (mm), and bore.
    i. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
    j. Number, make, and size of belts.
    k. Number, type, and size of filters.

2. Motor Data:

    a. Motor make, and frame type and size.
    b. Horsepower and rpm.
    c. Volts, phase, and hertz.
    d. Full-load amperage and service factor.

e. Sheave make, size in inches (mm), and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

3. Test Data (Indicated and Actual Values):

a. Total air flow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Filter static-pressure differential in inches wg (Pa).
f. Preheat-coil static-pressure differential in inches wg (Pa).
g. Cooling-coil static-pressure differential in inches wg (Pa).
h. Re-heating-coil static-pressure differential in inches wg (Pa).
i. Outdoor airflow in cfm (L/s).
j. Return airflow in cfm (L/s).
k. Outdoor-air damper position.
l. Return-air damper position.
m. VFD setting.

F. Apparatus-Coil Test Reports:

1. Coil Data:

a. System identification.
b. Location.
c. Coil type.
d. Number of rows.
e. Fin spacing in fins per inch (mm) o.c.
f. Make and model number.
g. Face area in sq. ft. (sq. m).
h. Tube size in NPS (DN).
i. Tube and fin materials.
j. Circuiting arrangement.

2. Test Data (Indicated and Actual Values):

a. Air flow rate in cfm (L/s).
b. Average face velocity in fpm (m/s).
c. Air pressure drop in inches wg (Pa).
d. Outdoor-air, wet- and dry-bulb temperatures in deg F (deg C).
e. Return-air, wet- and dry-bulb temperatures in deg F (deg C).
f. Entering-air, wet- and dry-bulb temperatures in deg F (deg C).
g. Leaving-air, wet- and dry-bulb temperatures in deg F (deg C).
h. Water flow rate in gpm (L/s).
i. Water pressure differential in feet of head or psig (kPa).
j. Entering-water temperature in deg F (deg C).
k. Leaving-water temperature in deg F (deg C).

3. Test Data (Indicated and Actual Values):

a. Heat output in Btu/h (kW).
b. Air flow rate in cfm (L/s).
c. Air velocity in fpm (m/s).
d. Entering-air temperature in deg F (deg C).
e. Leaving-air temperature in deg F (deg C).
f. Voltage at each connection.
g. Amperage for each phase.

G. Fan Test Reports: For supply, return, and exhaust fans, include the following:

1. Fan Data:

a. System identification.
b. Location.
c. Make and type.
d. Model number and size.
e. Manufacturer's serial number.
f. Arrangement and class.
g. Sheave make, size in inches (mm), and bore.
h. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).

2. Motor Data:

a. Motor make, and frame type and size.
b. Horsepower and rpm.
c. Volts, phase, and hertz.
d. Full-load amperage and service factor.
e. Sheave make, size in inches (mm), and bore.
f. Center-to-center dimensions of sheave, and amount of adjustments in inches (mm).
g. Number, make, and size of belts.

3. Test Data (Indicated and Actual Values):

a. Total airflow rate in cfm (L/s).
b. Total system static pressure in inches wg (Pa).
c. Fan rpm.
d. Discharge static pressure in inches wg (Pa).
e. Suction static pressure in inches wg (Pa).

H. Round and Rectangular Duct Traverse Reports: Include a diagram with a grid representing the duct cross-section and record the following:

1. Report Data:

a. System and air-handling-unit number.
b. Location and zone.
c. Traverse air temperature in deg F (deg C).
d. Duct static pressure in inches wg (Pa).
e. Duct size in inches (mm).
f. Duct area in sq. ft. (sq. m).
g. Indicated air flow rate in cfm (L/s).
h. Indicated velocity in fpm (m/s).
i. Actual air flow rate in cfm (L/s).
j. Actual average velocity in fpm (m/s).
k. Barometric pressure in psig (Pa).

I. Pump Test Reports: Calculate impeller size by plotting the shutoff head on pump curves and include the following:

1. Unit Data:

a. Unit identification.
b. Location.
c. Service.
d. Make and size.
e. Model number and serial number.

f. Water flow rate in gpm (L/s).
g. Water pressure differential in feet of head or psig (kPa).
h. Required net positive suction head in feet of head or psig (kPa).
i. Pump rpm.
j. Impeller diameter in inches (mm).
k. Motor make and frame size.
l. Motor horsepower and rpm.
m. Voltage at each connection.
n. Amperage for each phase.
o. Full-load amperage and service factor.
p. Seal type.

2. Test Data (Indicated and Actual Values):

a. Static head in feet of head or psig (kPa).
b. Pump shutoff pressure in feet of head or psig (kPa).
c. Actual impeller size in inches (mm).
d. Full-open flow rate in gpm (L/s).
e. Full-open pressure in feet of head or psig (kPa).
f. Final discharge pressure in feet of head or psig (kPa).
g. Final suction pressure in feet of head or psig (kPa).
h. Final total pressure in feet of head or psig (kPa).
i. Final water flow rate in gpm (L/s).
j. Voltage at each connection.
k. Amperage for each phase.

J. Instrument Calibration Reports:

1. Report Data:

a. Instrument type and make.
b. Serial number.
c. Application.
d. Dates of use.
e. Dates of calibration.

2.16 INSPECTIONS

A. Initial Inspection:

1. After testing and balancing are complete, operate each system and randomly check measurements to verify that the system is operating according to the final test and balance readings documented in the final report.

B. Final Inspection:

1. After initial inspection is complete and documentation by random checks verifies that testing and balancing are complete and accurately documented in the final report, request that a final inspection be made by the Engineer.

C. TAB Work will be considered defective if it does not pass final inspections. If TAB Work fails, proceed as follows:

1. Recheck all measurements and make adjustments. Revise the final report and balancing device settings to include all changes; resubmit the final report and request a second final inspection.

2. If the second final inspection also fails, Owner may contract the services of another TAB contractor to complete TAB Work according to the Contract Documents and deduct the cost of the services from the original TAB contractor's final payment.

D. Prepare test and inspection reports.

2.17 ADDITIONAL TESTS

A. Within 90 days of completing TAB, perform additional TAB to verify that balanced conditions are being maintained throughout and to correct unusual conditions.

B. Seasonal Periods: If initial TAB procedures were not performed during near-peak summer and winter conditions, perform additional TAB during near-peak summer and winter conditions.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 23 0713
DUCT INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following duct services:

1. Indoor, concealed supply air.
2. Indoor, exposed supply air.
3. Indoor, concealed return air and outdoor air.
4. Indoor, exposed return air and outdoor air.
5. Indoor, commercial, kitchen hood exhaust.
6. Outdoor, supply and return.

B. Related Sections:

1. Section 23 0719 "HVAC Piping Insulation."
2. Section 23 3113 "Metal Ducts" for duct liners.

1.3 ACTION SUBMITTALS

A. Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory- and field-applied if any).

B. Shop Drawings: Submit plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail insulation application at elbows, fittings, dampers, specialties and flanges for each type of insulation.
3. Detail application of field-applied jackets.
4. Detail application at linkages of control devices.

1.4 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.5 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with duct Installer for duct insulation application. Before preparing ductwork Shop Drawings, establish and maintain clearance requirements for

installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

1.6 SCHEDULING

A. Schedule insulation application after pressure testing systems and, where required, after installing and testing heat tracing. Insulation application may begin on segments that have satisfactory test results.

B. Complete installation and concealment of plastic materials as rapidly as possible in each area of construction.

PART 2 - PRODUCTS

2.1 INSULATION MATERIALS

A. Comply with requirements in "Duct Insulation Schedule, General," "Indoor Duct and Plenum Insulation Schedule," and Outdoor Duct and Plenum Insulation Schedule" articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type II for sheet materials.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Aeroflex USA, Inc.; Aerocel.
   b. Armacell LLC; AP Armaflex.
   c. K-Flex USA; Insul-Sheet, K-Flex Gray Duct Liner, and K-FLEX LS.

G. Mineral-Fiber Blanket Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 553, Type II and ASTM C 1290, Type III with factory-applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

   a. CertainTeed Corp.; SoftTouch Duct Wrap.
   b. Johns Manville; Microlite.
   c. Knauf Insulation; Friendly Feel Duct Wrap.

H. Mineral-Fiber Board Insulation: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 612, Type IA or Type IB. For duct and plenum applications, provide insulation with factory applied FSK jacket. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; Commercial Board.
b. Johns Manville; 800 Series Spin-Glas.
c. Knauf Insulation; Insulation Board.

2.2 FIRE-RATED INSULATION SYSTEMS

A. Fire-Rated Blanket: High-temperature, flexible, blanket insulation with FSK jacket that is tested and certified to provide a 2-hour fire rating by an NRTL acceptable to authorities having jurisdiction.

1. Products: Subject to compliance with requirements, provide one of the following:

a. CertainTeed Corp.; FlameChek.
b. Thermal Ceramics; FireMaster Duct Wrap.
c. 3M: Fire Barrier Wrap Products.

2.3 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Flexible Elastomeric Adhesive: Comply with MIL-A-24179A, Type II, Class I.

C. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

D. ASJ Adhesive, and FSK Jacket Adhesive: Comply with MIL-A-3316C, Class 2, Grade A for bonding insulation jacket lap seams and joints.

2.4 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96/E 96M, Procedure B, 0.013 perm (0.009 metric perm) at 43-mil (1.09-mm) dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F (Minus 29 to plus 82 deg C).
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.03 metric perm) at 35-mil (0.9-mm) dry film thickness.
2. Service Temperature Range: 0 to 180 deg F (Minus 18 to plus 82 deg C).
3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
4. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm (0.033 metric perm) at 30-mil (0.8-mm) dry film thickness.
2. Service Temperature Range: Minus 50 to plus 220 deg F (Minus 46 to plus 104 deg C).
3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4. Color: White.

2.5 SEALANTS

A. FSK and Metal Jacket Flashing Sealants:

1. Materials shall be compatible with insulation materials, jackets, and substrates.
2. Fire- and water-resistant, flexible, elastomeric sealant.
3. Service Temperature Range: Minus 40 to plus 250 deg F (Minus 40 to plus 121 deg C).
4. Color: Aluminum.

2.6 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

2.7 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches (75 mm).
2. Thickness: 6.5 mils (0.16 mm).
3. Adhesion: 90 ounces force/inch (1.0 N/mm) in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch (7.2 N/mm) in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.8 SECUREMENTS

A. Bands:

1. Aluminum: ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch (0.51 mm) thick, 1/2 inch (13 mm) wide with wing seal or closed seal.

B. Insulation Pins and Hangers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.

2. Metal, Adhesively Attached, Perforated-Base Insulation Hangers: Baseplate welded to projecting spindle that is capable of holding insulation, of thickness indicated, securely in position indicated when self-locking washer is in place. Comply with the following requirements:

   a. Baseplate: Perforated, galvanized carbon-steel sheet, 0.030-inch (0.76 mm) thick by 2 inches (50 mm) square.
   b. Spindle: Aluminum, fully annealed, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated.
   c. Adhesive: Recommended by hanger manufacturer. Product with demonstrated capability to bond insulation hanger securely to substrates indicated without damaging insulation, hangers, and substrates.

3. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick, galvanized-steel sheet, with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

a. Protect ends with capped self-locking washers incorporating a spring steel insert to ensure permanent retention of cap in exposed locations.

C. Staples: Outward-clinching insulation staples, nominal 3/4-inch- (19-mm-) wide, stainless steel or Monel.

D. Wire: 0.062-inch (1.6-mm) soft-annealed, galvanized steel.

2.9 CORNER ANGLES

A. Aluminum Corner Angles: 0.040 inch (1.0 mm) thick, minimum 1 by 1 inch (25 by 25 mm), aluminum according to ASTM B 209 (ASTM B 209M), Alloy 3003, 3005, 3105, or 5005; Temper H-14.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.

B. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces, free of voids throughout the length of ducts and fittings.

B. Install insulation materials, vapor barriers or retarders, jackets, and thicknesses required for each item of duct system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Keep insulation materials dry during application and finishing.

G. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

H. Install insulation with least number of joints practical.

I. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.

J. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

K. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- (75-mm-) wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches (100 mm) o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches (38 mm). Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches (50 mm) o.c.
    a. For below ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to duct flanges and fittings.

L. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

M. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

N. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches (100 mm) beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches (50 mm) below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.

2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches (50 mm).
4. Seal jacket to wall flashing with flashing sealant.

C. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

D. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Terminate insulation at fire damper sleeves for fire-rated wall and partition penetrations. Externally insulate damper sleeves to match adjacent insulation and overlap duct insulation at least 2 inches (50 mm).

1. Comply with requirements per Section referencing "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

E. Insulation Installation at Floor Penetrations:

1. Duct: For penetrations through fire-rated assemblies, terminate insulation at fire damper sleeves and externally insulate damper sleeve beyond floor to match adjacent duct insulation. Overlap damper sleeve and duct insulation at least 2 inches (50 mm).
2. Seal penetrations through fire-rated assemblies. Comply with requirements in per Section referencing "Through-Penetration Firestop Systems."

3.5 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.6 INSTALLATION OF MINERAL-FIBER INSULATION

A. Blanket Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
b. On duct sides with dimensions larger than 18 inches (450 mm), place pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
d. Do not over compress insulation during installation.
e. Impale insulation over pins and attach speed washers.
f. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1-inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

    a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
    b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Overlap unfaced blankets a minimum of 2 inches (50 mm) on longitudinal seams and end joints. At end joints, secure with steel bands spaced a maximum of 18 inches (450 mm) o.c.
6. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
7. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

B. Board Insulation Installation on Ducts and Plenums: Secure with adhesive and insulation pins.

1. Apply adhesives according to manufacturer's recommended coverage rates per unit area, for 100 percent coverage of duct and plenum surfaces.
2. Apply adhesive to entire circumference of ducts and to all surfaces of fittings and transitions.
3. Install either capacitor-discharge-weld pins and speed washers or cupped-head, capacitor-discharge-weld pins on sides and bottom of horizontal ducts and sides of vertical ducts as follows:

    a. On duct sides with dimensions 18 inches (450 mm) and smaller, place pins along longitudinal centerline of duct. Space 3 inches (75 mm) maximum from insulation end joints, and 16 inches (400 mm) o.c.
    b. On duct sides with dimensions larger than 18 inches (450 mm), space pins 16 inches (400 mm) o.c. each way, and 3 inches (75 mm) maximum from insulation joints. Install additional pins to hold insulation tightly against surface at cross bracing.
    c. Pins may be omitted from top surface of horizontal, rectangular ducts and plenums.
    d. Do not over compress insulation during installation.
    e. Cut excess portion of pins extending beyond speed washers or bend parallel with insulation surface. Cover exposed pins and washers with tape matching insulation facing.

4. For ducts and plenums with surface temperatures below ambient, install a continuous unbroken vapor barrier. Create a facing lap for longitudinal seams and end joints with insulation by removing 2 inches (50 mm) from one edge and one end of insulation

segment. Secure laps to adjacent insulation section with 1/2-inch (13-mm) outward-clinching staples, 1-inch (25 mm) o.c. Install vapor barrier consisting of factory- or field-applied jacket, adhesive, vapor-barrier mastic, and sealant at joints, seams, and protrusions.

a. Repair punctures, tears, and penetrations with tape or mastic to maintain vapor-barrier seal.
b. Install vapor stops for ductwork and plenums operating below 50 deg F (10 deg C) at 18-foot (5.5-m) intervals. Vapor stops shall consist of vapor-barrier mastic applied in a Z-shaped pattern over insulation face, along butt end of insulation, and over the surface. Cover insulation face and surface to be insulated a width equal to two times the insulation thickness, but not less than 3 inches (75 mm).

5. Install insulation on rectangular duct elbows and transitions with a full insulation section for each surface. Groove and score insulation to fit as closely as possible to outside and inside radius of elbows. Install insulation on round and flat-oval duct elbows with individually mitered gores cut to fit the elbow.
6. Insulate duct stiffeners, hangers, and flanges that protrude beyond insulation surface with 6-inch- (150-mm-) wide strips of same material used to insulate duct. Secure on alternating sides of stiffener, hanger, and flange with pins spaced 6 inches (150 mm) o.c.

3.7 FIELD-APPLIED JACKET INSTALLATION

A. Where glass-cloth jackets are indicated, install directly over bare insulation or insulation with factory-applied jackets.

1. Draw jacket smooth and tight to surface with 2-inch (50-mm) overlap at seams and joints.
2. Embed glass cloth between two 0.062-inch- (1.6-mm-) thick coats of lagging adhesive.
3. Completely encapsulate insulation with coating, leaving no exposed insulation.

B. Where FSK jackets are indicated, install as follows:

1. Draw jacket material smooth and tight.
2. Install lap or joint strips with same material as jacket.
3. Secure jacket to insulation with manufacturer's recommended adhesive.
4. Install jacket with 1-1/2-inch (38-mm) laps at longitudinal seams and 3-inch- (75-mm-) wide joint strips at end joints.
5. Seal openings, punctures, and breaks in vapor-retarder jackets and exposed insulation with vapor-barrier mastic.

C. Where PVC jackets are indicated, install with 1-inch (25-mm) overlap at longitudinal seams and end joints; for horizontal applications, install with longitudinal seams along top and bottom of tanks and vessels. Seal with manufacturer's recommended adhesive.

1. Apply two continuous beads of adhesive to seams and joints, one bead under lap and the finish bead along seam and joint edge.

D. Where metal jackets are indicated, install with 2-inch (50-mm) overlap at longitudinal seams and end joints. Overlap longitudinal seams arranged to shed water. Seal end joints with weatherproof sealant recommended by insulation manufacturer. Secure jacket with stainless-steel bands 12 inches (300 mm) o.c. and at end joints.

3.8 FIRE-RATED INSULATION SYSTEM INSTALLATION

A. Where fire-rated insulation system is indicated, secure system to ducts and duct hangers and supports to maintain a continuous fire rating.

B. Insulate duct access panels and doors to achieve same fire rating as duct.

C. Install firestopping at penetrations through fire-rated assemblies. Fire-stop systems are specified in Section referencing "Through-Penetration Firestop Systems."

3.9 FINISHES

A. Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section referencing "Exterior Painting" and "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: Interior Installed - after adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating. Exterior Installed – cover with aluminum jacket and aluminum bands.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum or stainless-steel jackets.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect ductwork, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to one location(s) for each duct system defined in the "Duct Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 DUCT INSULATION SCHEDULE, GENERAL

A. Plenums and Ducts Requiring Insulation:
1. Indoor, concealed supply air.
2. Indoor, exposed supply air.
3. Indoor, concealed return air and outdoor air.
4. Indoor, exposed return air and outdoor air.
5. Indoor, commercial, kitchen hood exhaust.
6. Outdoor, supply and return.

B. Items Not Insulated:

1. Metal ducts with duct liner of sufficient thickness to comply with energy code and ASHRAE/IESNA 90.1.
2. Factory-insulated flexible ducts.

3. Factory-insulated plenums and casings.
4. Flexible connectors.
5. Vibration-control devices.
6. Factory-insulated access panels and doors.

3.12 INDOOR DUCT AND PLENUM INSULATION SCHEDULE

A. Concealed, supply-air duct insulation shall be the following:

1. Mineral-Fiber Blanket: 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.
   a. Ductwork in attic and crawl space: 3” insulation
   b. Ductwork inside building: 2” insulation.

B. Concealed, return-air and outdoor air duct insulation shall be the following:
1. Mineral-Fiber Blanket: 0.75-lb/cu. ft. (12-kg/cu. m) nominal density.
   a. Ductwork in attic and crawl space: 3” insulation.
   b. Ductwork inside building: 2” insulation.

C. Concealed, exhaust-air plenum insulation shall be the following:

1. No insulation.

D. Exposed, supply-air duct insulation shall be the following:

1. Internally lined (See ductwork).

E. Exposed, return-air and outdoor air duct insulation shall be the following:

1. Internally lined (See ductwork).

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 23 0719
HVAC PIPING INSULATION

PART 1 - GENERAL

1.1 RELATED DOCUMENTS

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

1.2 SUMMARY

A. Section includes insulating the following HVAC piping systems:

1. Condensate drain piping, indoors.
2. Chilled-water piping, indoors.
3. Hot water piping indoors.
4. Refrigerant suction and hot-gas piping.

B. Related Sections:

1. Section 230713 "Duct Insulation."

1.3 ACTION SUBMITTALS

A. Submit Product Data: For each type of product indicated. Include thermal conductivity, water-vapor permeance thickness, and jackets (both factory and field applied if any).

B. Submit Shop Drawings: Include plans, elevations, sections, details, and attachments to other work.

1. Detail application of protective shields, saddles, and inserts at hangers for each type of insulation and hanger.
2. Detail attachment and covering of heat tracing inside insulation.
3. Detail insulation application at pipe expansion joints for each type of insulation.
4. Detail insulation application at elbows, fittings, flanges, valves, and specialties for each type of insulation.
5. Detail removable insulation at piping specialties.
6. Detail application of field-applied jackets.
7. Detail application at linkages of control devices.

1.4 INFORMATIONAL SUBMITTALS

A. Qualification Data: For qualified Installer.

1.5 QUALITY ASSURANCE

A. Surface-Burning Characteristics: For insulation and related materials, as determined by testing identical products according to ASTM E 84, by a testing and inspecting agency acceptable to authorities having jurisdiction. Factory label insulation and jacket materials and adhesive, mastic, tapes, and cement material containers, with appropriate markings of applicable testing agency.

1. Insulation Installed Indoors: Flame-spread index of 25 or less, and smoke-developed index of 50 or less.
2. Insulation Installed Outdoors: Flame-spread index of 75 or less, and smoke-developed index of 150 or less.

1.6 COORDINATION

A. Coordinate sizes and locations of supports, hangers, and insulation shields specified in Section 230529 "Hangers and Supports for HVAC Piping and Equipment."

B. Coordinate clearance requirements with piping Installer for piping insulation application. Before preparing piping Shop Drawings, establish and maintain clearance requirements for installation of insulation and field-applied jackets and finishes and for space required for maintenance.

C. Coordinate installation and testing of heat tracing.

PART 2 - PRODUCTS

2.1 **INSULATION MATERIALS**

A. Comply with requirements articles for where insulating materials shall be applied.

B. Products shall not contain asbestos, lead, mercury, or mercury compounds.

C. Products that come in contact with stainless steel shall have a leachable chloride content of less than 50 ppm when tested according to ASTM C 871.

D. Insulation materials for use on austenitic stainless steel shall be qualified as acceptable according to ASTM C 795.

E. Foam insulation materials shall not use CFC or HCFC blowing agents in the manufacturing process.

F. Cellular Glass: Inorganic, incombustible, foamed or cellulated glass with annealed, rigid, hermetically sealed cells. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

1. Block Insulation: ASTM C 552, Type I.
2. Special-Shaped Insulation: ASTM C 552, Type III.
3. Board Insulation: ASTM C 552, Type IV.
4. Preformed Pipe Insulation without Jacket: Comply with ASTM C 552, Type II, Class 1.
5. Preformed Pipe Insulation with Factory-Applied ASJ: Comply with ASTM C 552, Type II, Class 2.
6. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.

G. Flexible Elastomeric Insulation: Closed-cell, sponge- or expanded-rubber materials. Comply with ASTM C 534, Type I for tubular materials.

H. Phenolic:

1. Products: Subject to compliance with requirements, provide one of the following:

   a. Kingspan Tarec Industrial Insulation NV; Koolphen K.
   b. Resolco International BV; Insul-phen.

2. Preformed pipe insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type III, Grade 1.
3. Block insulation of rigid, expanded, closed-cell structure. Comply with ASTM C 1126, Type II, Grade 1.
4. Factory fabricate shapes according to ASTM C 450 and ASTM C 585.
5. Factory-Applied Jacket: Requirements are specified in "Factory-Applied Jackets" Article.

   a. Preformed Pipe Insulation: ASJ.

I. Mineral-Fiber, Preformed Pipe Insulation:

1. Products: Subject to compliance with requirements, provide one of the following:

a. Johns Manville; Micro-Lok.
b. Knauf Insulation; 1000-Degree Pipe Insulation.
c. Owens Corning; Fiberglas Pipe Insulation.

2. Type I, 850 deg F (454 deg C) Materials: Mineral or glass fibers bonded with a thermosetting resin. Comply with ASTM C 547, Type I, Grade A, with factory applied ASJ. Factory-applied jacket requirements are specified in "Factory-Applied Jackets" Article.

2.2 INSULATING CEMENTS

A. Mineral-Fiber, Hydraulic-Setting Insulating and Finishing Cement: Comply with ASTM C 449.

B. Mineral-Fiber Adhesive: Comply with MIL-A-3316C, Class 2, Grade A.

2.3 INSTALLATION OF MINERAL-FIBER PREFORMED PIPE INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of preformed pipe insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient surfaces, secure laps with outward-clinched staples at 6 inches (150 mm) o.c.
4. For insulation with factory-applied jackets on below-ambient surfaces, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with mineral-fiber blanket insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch (25 mm), and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed insulation elbows and fittings are not available, install mitered sections of pipe insulation, to a thickness equal to adjoining pipe insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of same material as straight segments of pipe insulation when available.
2. When preformed sections are not available, install mitered sections of pipe insulation to valve body.
3. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
4. Install insulation to flanges as specified for flange insulation application.

2.4 ADHESIVES

A. Materials shall be compatible with insulation materials, jackets, and substrates and for bonding insulation to itself and to surfaces to be insulated unless otherwise indicated.

B. Cellular-Glass Adhesive: Two-component, thermosetting urethane adhesive containing no flammable solvents, with a service temperature range of minus 100 to plus 200 deg F.

C. Phenolic Adhesive: Solvent-based resin adhesive, with a service temperature range of minus 75 to plus 300 deg F.

D. Flexible Elastomeric and Polyolefin Adhesive: Comply with MIL-A-24179A, Type II, Class I.

2.5 MASTICS

A. Materials shall be compatible with insulation materials, jackets, and substrates; comply with MIL-PRF-19565C, Type II.

B. Vapor-Barrier Mastic: Water based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM E 96/E 96M, Procedure B, 0.013 perm at 43-mil dry film thickness.
2. Service Temperature Range: Minus 20 to plus 180 deg F.
3. Solids Content: ASTM D 1644, 58 percent by volume and 70 percent by weight.
4. Color: White.

C. Vapor-Barrier Mastic: Solvent based; suitable for indoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 35-mil dry film thickness.
2. Service Temperature Range: 0 to 180 deg F.
3. Solids Content: ASTM D 1644, 44 percent by volume and 62 percent by weight.
4. Color: White.

D. Vapor-Barrier Mastic: Solvent based; suitable for outdoor use on below-ambient services.

1. Water-Vapor Permeance: ASTM F 1249, 0.05 perm at 30-mil dry film thickness.
2. Service Temperature Range: Minus 50 to plus 220 deg F.
3. Solids Content: ASTM D 1644, 33 percent by volume and 46 percent by weight.
4. Color: White.

2.6 SEALANTS

A. Joint Sealants:

1. Joint Sealants for Cellular-Glass and Phenolic Products: Subject to compliance with requirements, provide one of the following:

a. Childers Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; CP-76.
b. Eagle Bridges - Marathon Industries; 405.
c. Foster Brand, Specialty Construction Brands, Inc., a business of H. B. Fuller Company; 30-45.
d. Mon-Eco Industries, Inc.; 44-05.
e. Pittsburgh Corning Corporation; Pittseal 444.

2.7 FIELD-APPLIED JACKETS

A. Field-applied jackets shall comply with ASTM C 921, Type I, unless otherwise indicated.

B. FSK Jacket: Aluminum-foil-face, fiberglass-reinforced scrim with kraft-paper backing.

C. PVC Jacket: High-impact-resistant, UV-resistant PVC complying with ASTM D 1784, Class 16354-C; thickness as scheduled; roll stock ready for shop or field cutting and forming. Thickness is indicated in field-applied jacket schedules.

1. Products: Subject to compliance with requirements, provide one of the following:

    a. Johns Manville; Zeston.
    b. P.I.C. Plastics, Inc.; FG Series.
    c. Proto Corporation; LoSmoke.
    d. Speedline Corporation; SmokeSafe.

2. Adhesive: As recommended by jacket material manufacturer.
3. Color: White.
4. Factory-fabricated fitting covers to match jacket if available; otherwise, field fabricate.

    a. Shapes: 45- and 90-degree, short- and long-radius elbows, tees, valves, flanges, unions, reducers, end caps, soil-pipe hubs, traps, mechanical joints, and P-trap and supply covers for lavatories.

D. Metal Jacket:

1. Aluminum Jacket: Comply with ASTM B 209, Alloy 3003, 3005, 3105, or 5005, Temper H-14.

    a. Sheet and roll stock ready for shop or field sizing.

2.8 TAPES

A. FSK Tape: Foil-face, vapor-retarder tape matching factory-applied jacket with acrylic adhesive; complying with ASTM C 1136.

1. Width: 3 inches.
2. Thickness: 6.5 mils.
3. Adhesion: 90 ounces force/inch in width.
4. Elongation: 2 percent.
5. Tensile Strength: 40 lbf/inch in width.
6. FSK Tape Disks and Squares: Precut disks or squares of FSK tape.

2.9 SECUREMENTS

A. Bands:

1. Aluminum: ASTM B 209, Alloy 3003, 3005, 3105, or 5005; Temper H-14, 0.020 inch thick, 1/2 inch wide with wing seal or closed seal.

B. Staples: Outward-clinching insulation staples, nominal 3/4-inch- wide, stainless steel or Monel.

C. Wire: 0.080-inch nickel-copper alloy.

PART 3 - EXECUTION

3.1 EXAMINATION

A. Examine substrates and conditions for compliance with requirements for installation tolerances and other conditions affecting performance of insulation application.

1. Verify that systems to be insulated have been tested and are free of defects.
2. Verify that surfaces to be insulated are clean and dry.
3. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 PREPARATION

A. Surface Preparation: Clean and dry surfaces to receive insulation. Remove materials that will adversely affect insulation application.

B. Surface Preparation: Clean and prepare surfaces to be insulated. Before insulating, apply a corrosion coating to insulated surfaces as follows:

1. Stainless Steel: Coat 300 series stainless steel with an epoxy primer 5 mils thick and an epoxy finish 5 mils thick if operating in a temperature range between 140 and 300 deg F. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.
2. Carbon Steel: Coat carbon steel operating at a service temperature between 32 and 300 deg F with an epoxy coating. Consult coating manufacturer for appropriate coating materials and application methods for operating temperature range.

C. Coordinate insulation installation with the trade installing heat tracing. Comply with requirements for heat tracing that apply to insulation.

D. Mix insulating cements with clean potable water; if insulating cements are to be in contact with stainless-steel surfaces, use demineralized water.

3.3 GENERAL INSTALLATION REQUIREMENTS

A. Install insulation materials, accessories, and finishes with smooth, straight, and even surfaces; free of voids throughout the length of piping including fittings, valves, and specialties.

B. Install insulation materials, forms, vapor barriers or retarders, jackets, and thicknesses required for each item of pipe system as specified in insulation system schedules.

C. Install accessories compatible with insulation materials and suitable for the service. Install accessories that do not corrode, soften, or otherwise attack insulation or jacket in either wet or dry state.

D. Install insulation with longitudinal seams at top and bottom of horizontal runs.

E. Install multiple layers of insulation with longitudinal and end seams staggered.

F. Do not weld brackets, clips, or other attachment devices to piping, fittings, and specialties.

G. Keep insulation materials dry during application and finishing.

H. Install insulation with tight longitudinal seams and end joints. Bond seams and joints with adhesive recommended by insulation material manufacturer.

I. Install insulation with least number of joints practical.

J. Where vapor barrier is indicated, seal joints, seams, and penetrations in insulation at hangers, supports, anchors, and other projections with vapor-barrier mastic.

1. Install insulation continuously through hangers and around anchor attachments.
2. For insulation application where vapor barriers are indicated, extend insulation on anchor legs from point of attachment to supported item to point of attachment to structure. Taper and seal ends at attachment to structure with vapor-barrier mastic.
3. Install insert materials and install insulation to tightly join the insert. Seal insulation to insulation inserts with adhesive or sealing compound recommended by insulation material manufacturer.
4. Cover inserts with jacket material matching adjacent pipe insulation. Install shields over jacket, arranged to protect jacket from tear or puncture by hanger, support, and shield.

K. Apply adhesives, mastics, and sealants at manufacturer's recommended coverage rate and wet and dry film thicknesses.

L. Install insulation with factory-applied jackets as follows:

1. Draw jacket tight and smooth.
2. Cover circumferential joints with 3-inch- wide strips, of same material as insulation jacket. Secure strips with adhesive and outward clinching staples along both edges of strip, spaced 4 inches o.c.
3. Overlap jacket longitudinal seams at least 1-1/2 inches. Install insulation with longitudinal seams at bottom of pipe. Clean and dry surface to receive self-sealing lap. Staple laps with outward clinching staples along edge at 2 inches o.c.
    a. For below-ambient services, apply vapor-barrier mastic over staples.
4. Cover joints and seams with tape, according to insulation material manufacturer's written instructions, to maintain vapor seal.
5. Where vapor barriers are indicated, apply vapor-barrier mastic on seams and joints and at ends adjacent to pipe flanges and fittings.

M. Cut insulation in a manner to avoid compressing insulation more than 75 percent of its nominal thickness.

N. Finish installation with systems at operating conditions. Repair joint separations and cracking due to thermal movement.

O. Repair damaged insulation facings by applying same facing material over damaged areas. Extend patches at least 4 inches beyond damaged areas. Adhere, staple, and seal patches similar to butt joints.

P. For above-ambient services, do not install insulation to the following:

1. Vibration-control devices.
2. Testing agency labels and stamps.
3. Nameplates and data plates.
4. Manholes.
5. Handholes.
6. Cleanouts.

3.4 PENETRATIONS

A. Insulation Installation at Roof Penetrations: Install insulation continuously through roof penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation above roof surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside roof flashing at least 2 inches below top of roof flashing.
4. Seal jacket to roof flashing with flashing sealant.

B. Insulation Installation at Underground Exterior Wall Penetrations: Terminate insulation flush with sleeve seal. Seal terminations with flashing sealant.

C. Insulation Installation at Aboveground Exterior Wall Penetrations: Install insulation continuously through wall penetrations.

1. Seal penetrations with flashing sealant.
2. For applications requiring only indoor insulation, terminate insulation inside wall surface and seal with joint sealant. For applications requiring indoor and outdoor insulation, install insulation for outdoor applications tightly joined to indoor insulation ends. Seal joint with joint sealant.
3. Extend jacket of outdoor insulation outside wall flashing and overlap wall flashing at least 2 inches.
4. Seal jacket to wall flashing with flashing sealant.

D. Insulation Installation at Interior Wall and Partition Penetrations (That Are Not Fire Rated): Install insulation continuously through walls and partitions.

E. Insulation Installation at Fire-Rated Wall and Partition Penetrations: Install insulation continuously through penetrations of fire-rated walls and partitions.

1. Comply with requirements in Section 078413 "Through-Penetration Firestop Systems" for firestopping and fire-resistive joint sealers.

F. Insulation Installation at Floor Penetrations:

1. Pipe: Install insulation continuously through floor penetrations.
2. Seal penetrations through fire-rated assemblies. Comply with requirements in Section 078413 "Through-Penetration Firestop Systems."

3.5 GENERAL PIPE INSULATION INSTALLATION

A. Requirements in this article generally apply to all insulation materials except where more specific requirements are specified in various pipe insulation material installation articles.

B. Insulation Installation on Fittings, Valves, Strainers, Flanges, and Unions:

1. Install insulation over fittings, valves, strainers, flanges, unions, and other specialties with continuous thermal and vapor-retarder integrity unless otherwise indicated.
2. Insulate pipe elbows using preformed fitting insulation or mitered fittings made from same material and density as adjacent pipe insulation. Each piece shall be butted tightly against adjoining piece and bonded with adhesive. Fill joints, seams, voids, and irregular surfaces with insulating cement finished to a smooth, hard, and uniform contour that is uniform with adjoining pipe insulation.
3. Insulate tee fittings with preformed fitting insulation or sectional pipe insulation of same material and thickness as used for adjacent pipe. Cut sectional pipe insulation to fit. Butt each section closely to the next and hold in place with tie wire. Bond pieces with adhesive.
4. Insulate valves using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. For valves, insulate up to and including the bonnets, valve stuffing-box studs, bolts, and nuts. Fill joints, seams, and irregular surfaces with insulating cement.
5. Insulate strainers using preformed fitting insulation or sectional pipe insulation of same material, density, and thickness as used for adjacent pipe. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker. Fill joints, seams, and irregular surfaces with insulating cement. Insulate strainers so strainer basket flange or plug can be easily removed and replaced without damaging the insulation and jacket. Provide a removable reusable insulation cover. For below-ambient services, provide a design that maintains vapor barrier.

6. Insulate flanges and unions using a section of oversized preformed pipe insulation. Overlap adjoining pipe insulation by not less than two times the thickness of pipe insulation, or one pipe diameter, whichever is thicker.
7. Cover segmented insulated surfaces with a layer of finishing cement and coat with a mastic. Install vapor-barrier mastic for below-ambient services and a breather mastic for above-ambient services. Reinforce the mastic with fabric-reinforcing mesh. Trowel the mastic to a smooth and well-shaped contour.
8. For services not specified to receive a field-applied jacket except for flexible elastomeric, install fitted PVC cover over elbows, tees, strainers, valves, flanges, and unions. Terminate ends with PVC end caps. Tape PVC covers to adjoining insulation facing using PVC tape.
9. Stencil or label the outside insulation jacket of each union with the word "union." Match size and color of pipe labels.

C. Insulate instrument connections for thermometers, pressure gages, pressure temperature taps, test connections, flow meters, sensors, switches, and transmitters on insulated pipes. Shape insulation at these connections by tapering it to and around the connection with insulating cement and finish with finishing cement, mastic, and flashing sealant.

D. Install removable insulation covers at locations indicated. Installation shall conform to the following:

1. Make removable flange and union insulation from sectional pipe insulation of same thickness as that on adjoining pipe. Install same insulation jacket as adjoining pipe insulation.
2. When flange and union covers are made from sectional pipe insulation, extend insulation from flanges or union long at least two times the insulation thickness over adjacent pipe insulation on each side of flange or union. Secure flange cover in place with stainless-steel or aluminum bands. Select band material compatible with insulation and jacket.
3. Construct removable valve insulation covers in same manner as for flanges, except divide the two-part section on the vertical center line of valve body.
4. When covers are made from block insulation, make two halves, each consisting of mitered blocks wired to stainless-steel fabric. Secure this wire frame, with its attached insulation, to flanges with tie wire. Extend insulation at least 2 inches over adjacent pipe insulation on each side of valve. Fill space between flange or union cover and pipe insulation with insulating cement. Finish cover assembly with insulating cement applied in two coats. After first coat is dry, apply and trowel second coat to a smooth finish.
5. Unless a PVC jacket is indicated in field-applied jacket schedules, finish exposed surfaces with a metal jacket.

3.6 INSTALLATION OF CELLULAR-GLASS INSULATION

A. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

B. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.

2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of cellular-glass block insulation of same thickness as pipe insulation.
4. Install jacket material with manufacturer's recommended adhesive, overlap seams at least 1 inch, and seal joints with flashing sealant.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed sections of same material as straight segments of pipe insulation when available. Secure according to manufacturer's written instructions.
2. When preformed sections of insulation are not available, install mitered sections of cellular-glass insulation. Secure insulation materials with wire or bands.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed sections of cellular-glass insulation to valve body.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.7 INSTALLATION OF FLEXIBLE ELASTOMERIC INSULATION

A. Seal longitudinal seams and end joints with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

B. Insulation Installation on Pipe Flanges:

1. Install pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of sheet insulation of same thickness as pipe insulation.
4. Secure insulation to flanges and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

C. Insulation Installation on Pipe Fittings and Elbows:

1. Install mitered sections of pipe insulation.
2. Secure insulation materials and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

D. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed valve covers manufactured of same material as pipe insulation when available.
2. When preformed valve covers are not available, install cut sections of pipe and sheet insulation to valve body. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.
4. Secure insulation to valves and specialties and seal seams with manufacturer's recommended adhesive to eliminate openings in insulation that allow passage of air to surface being insulated.

3.8 INSTALLATION OF PHENOLIC INSULATION

A. General Installation Requirements:

1. Secure single-layer insulation with stainless-steel bands at 12-inch intervals and tighten bands without deforming insulation materials.
2. Install 2-layer insulation with joints tightly butted and staggered at least 3 inches. Secure inner layer with 0.062-inch wire spaced at 12-inch intervals. Secure outer layer with stainless-steel bands at 12-inch intervals.

B. Insulation Installation on Straight Pipes and Tubes:

1. Secure each layer of insulation to pipe with wire or bands and tighten bands without deforming insulation materials.
2. Where vapor barriers are indicated, seal longitudinal seams, end joints, and protrusions with vapor-barrier mastic and joint sealant.
3. For insulation with factory-applied jackets on above-ambient services, secure laps with outward-clinched staples at 6 inches o.c.
4. For insulation with factory-applied jackets with vapor retarders on below-ambient services, do not staple longitudinal tabs. Instead, secure tabs with additional adhesive as recommended by insulation material manufacturer and seal with vapor-barrier mastic and flashing sealant.

C. Insulation Installation on Pipe Flanges:

1. Install preformed pipe insulation to outer diameter of pipe flange.
2. Make width of insulation section same as overall width of flange and bolts, plus twice the thickness of pipe insulation.
3. Fill voids between inner circumference of flange insulation and outer circumference of adjacent straight pipe segments with cut sections of block insulation of same material and thickness as pipe insulation.

D. Insulation Installation on Pipe Fittings and Elbows:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.

E. Insulation Installation on Valves and Pipe Specialties:

1. Install preformed insulation sections of same material as straight segments of pipe insulation. Secure according to manufacturer's written instructions.
2. Arrange insulation to permit access to packing and to allow valve operation without disturbing insulation.
3. Install insulation to flanges as specified for flange insulation application.

3.9 FINISHES

A. Pipe Insulation with ASJ, Glass-Cloth, or Other Paintable Jacket Material: Paint jacket with paint system identified below and as specified in Section 099113 "Exterior Painting" and Section 099123 "Interior Painting."

1. Flat Acrylic Finish: Two finish coats over a primer that is compatible with jacket material and finish coat paint. Add fungicidal agent to render fabric mildew proof.

a. Finish Coat Material: Interior, flat, latex-emulsion size.

B. Flexible Elastomeric Thermal Insulation: After adhesive has fully cured, apply two coats of insulation manufacturer's recommended protective coating.

C. Color: Final color as selected by Architect. Vary first and second coats to allow visual inspection of the completed Work.

D. Do not field paint aluminum jackets.

3.10 FIELD QUALITY CONTROL

A. Perform tests and inspections.

B. Tests and Inspections:

1. Inspect pipe, fittings, strainers, and valves, randomly selected by Architect, by removing field-applied jacket and insulation in layers in reverse order of their installation. Extent of inspection shall be limited to three locations of straight pipe, three locations of fittings, for each pipe service defined in the "Piping Insulation Schedule, General" Article.

C. All insulation applications will be considered defective Work if sample inspection reveals noncompliance with requirements.

3.11 PIPING INSULATION SCHEDULE, GENERAL

A. Acceptable preformed pipe and tubular insulation materials and thicknesses are identified for each piping system and pipe size range. If more than one material is listed for a piping system, selection from materials listed is Contractor's option.

B. Items Not Insulated: Unless otherwise indicated, do not install insulation on the following:

1. Underground piping.

3.12 INDOOR PIPING INSULATION SCHEDULE

A. Condensate Drain:

1. All Pipe Sizes: Insulation shall be the following:

a. Flexible Elastomeric: 1/2 inch thick.

B. Chilled Water:

1. NPS 3 and Smaller: Insulation shall be one of the following:

a. Cellular Glass: 2 inches thick.

2. NPS 4 and Larger: Insulation shall be one of the following:
a. Cellular Glass: 3 inches thick.

C. Hot Water:
1. Insulation shall be the following:

a. Fiber Glass: 2 inches thick.

D. Refrigerant Suction and Hot-Gas Piping:

a. Flexible Elastomeric: 3/4 inch thick.

3.13 OUTDOOR, ABOVEGROUND PIPING INSULATION SCHEDULE

A. Chilled Water Supply and Return:

1. All Pipe Sizes: Insulation shall be the following:

a. Cellular Glass: 3” inch thick. (Wrap all exposed exterior piping with aluminum jacket)

B. Hot Water:
   1. Insulation shall be the following:

      a. Cellular Glass: 2 inches thick. (Wrap all exposed exterior piping with aluminum jacket)

C. Refrigerant Suction and Hot-Gas Piping:

      a. Flexible Elastomeric: 3/4 inch thick. (Wrap all exposed exterior piping with aluminum jacket)

3.14 OUTDOOR, FIELD-APPLIED JACKET SCHEDULE

A. Install jacket over insulation material. For insulation with factory-applied jacket, install the field-applied jacket over the factory-applied jacket.
B. Piping, Exposed:

   1. Aluminum, Smooth with Z-Shaped Locking Seam: 0.024 inch thick.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 23 0923
DIRECT DIGITAL CONTROL (DDC) SYSTEM FOR HVAC

PART 1 - GENERAL

1.1 DESCRIPTION

A. General: The system shall be an DDC control system as indicated on the drawings and described in the specifications. Control functions within a building site shall be performed by localized direct digital controls linked through a peer-to-peer network of building controllers. The system shall provide a web-based user interface and be designed to integrate multiple BacNet based systems together, collect, store and display historical data and provide enterprise-wide or multiple building facilities management capabilities from a central storage and operational location.

B. An operator shall be able to logon to the system using a standard web browser, and without requiring system vendor-proprietary software installed on the user's PC to allow access to all appropriate data and control functions.

C. Direct Digital Control (DDC) technology shall be used to provide the functions necessary for control of systems defined for control on this project.

D. The control system shall accommodate simultaneous multiple user operation. Access to the control system data should be limited by operator password. An operator shall be able to log onto any workstation of the control system and have access to all designated data.

E. The control system shall be designed such that each mechanical system will operate under stand-alone control. As such, in the event of a network communication failure, or the loss of other controllers, the control system shall continue to independently operate the unaffected equipment.

F. Communication between the control panels and all workstations shall be over a high-speed network. All nodes on this network shall be peers. A network communications card shall be provided for each building control panel provided as part of the system installation.

1.2 APPROVED CONTROL SYSTEM CONTRACTORS AND MANUFACTURERS

A. Approved Control System Contractors and Manufacturers:

1. Trane Controls Only.

2. The above list of manufacturers applies to centralized server software, operator workstation configuration tool software, building controller software, the custom application programming language, Building Controllers, Custom Application Controllers, and Application Specific Controllers. All other products specified herein (i.e., sensors, valves, dampers, and actuators) need not be manufactured by the above manufacturers.

1.3 QUALITY ASSURANCE

A. System Installer Qualifications:

1. The Installer shall have an established working relationship with the Control System Manufacturer of not less than three years.

The Installer shall have successfully completed Control System Manufacturer's classes on the control system. The Installer shall present for review the certification of completed training, including the hours of instruction and course outlines upon request.
The installer shall have an office within 50 miles of the project site and provide 24-hour response in the event of a customer call.

1.4 CODES AND STANDARDS

A. Work, materials, and equipment shall comply with the rules and regulations of all codes and ordinances of local, state, and federal authorities. As a minimum, the installation shall comply with the current editions in effect 30 days prior to receipt of bids of the following codes:

National Electric Code (NEC)
International Building Code (2021 IBC)
International Mechanical Code (2021 IMC)
2013 ASHRAE 90.1 Standard
Underwriters Laboratories: Products shall be UL-916-PAZX listed.

1.5 SYSTEM PERFORMANCE

A. Data values displayed on web pages (that represent live data) shall automatically refresh at a minimum rate of every 10 seconds in the browser without refreshing the entire page.

B. Data on web pages must be returned and updated on a given web page within 5 seconds on average after the web page is initially delivered, subject to network loading.

C. Graphic Display. The system shall display a graphic with a minimum of 20 dynamic points with current data displayed within 20 seconds of the request.

D. Graphic Refresh. The system shall update all dynamic points with current data within 30 seconds.

E. Object Command. The maximum time between the command of a binary object by the operator and the reaction by the device shall be 10 seconds. Analog objects shall start to adjust within 10 seconds.

F. Object Scan. All changes of state and change of analog values shall be transmitted over the high-speed network such that any data used or displayed at a controller or workstation will be current, within the prior 60 seconds.

G. Alarm Response Time. The maximum time from when an object goes into alarm to when it is viewable on an operator workstation web page shall not exceed 45 seconds.

H. Program Execution Frequency. Custom and standard applications shall be capable of running as often as once every 5 seconds. The Contractor shall be responsible for selecting execution times consistent with the mechanical process under control.

I. Performance. Programmable Controllers shall be able to execute DDC PID control loops at a selectable frequency from at least once every 5 seconds. The controller shall scan and update the process value and output generated by this calculation at this same frequency.

J. Multiple Alarm Annunciation. Any authorized operator shall be able to view alarms through a web page interface, with up to 40 concurrent users accessing the system alarm data.

K. Reporting Accuracy. Table 1 lists minimum acceptable reporting accuracies for all values reported by the specified system.

Table 1
Reporting Accuracy

Measured Variable	Reported Accuracy
Space Temperature	±0.5°C [±1°F]
Ducted Air	±1.0°C [±2°F]
Outside Air	±1.0°C [±2°F]
Water Temperature	±0.5°C [±1°F]
Delta-T	±0.15°C[±0.25°F]
Relative Humidity	±5% RH
Water Flow	±5% of full scale
Air Flow (terminal)	±10% of reading *Note 1
Air Flow (measuring stations)	±5% of reading
Air Pressure (ducts)	±25 Pa [±0.1 "W.G.]
Air Pressure (space)	±3 Pa [±0.01 "W.G.]
Water Pressure	±2% of full scale *Note 2
Electrical Power	± 5% of reading *Note 3
Carbon Monoxide (CO)	± 5% of reading
Carbon Dioxide (CO2)	± 50 PPM

Note 1: (10%-100% of scale) (cannot read accurately below 10%)
Note 2: for both absolute and differential pressure.
Note 3: * not including utility supplied meters.

1.6 SUBMITTALS

A. Contractor shall provide shop drawings and manufacturers' standard specification data sheets on all hardware and software to be provided. No work may begin on any segment of this project until the Engineer and Owner have reviewed submittals for conformity with the plan and specifications. Digital (PDF) are required. All shop drawings shall be provided to the Owner electronically as .dwg or .dxf file formats.

B. Quantities of items submitted shall be reviewed by the Engineer and Owner. Such review shall not relieve the contractor from furnishing quantities required for completion.

C. Provide the Engineer and Owner, any additional information or data which is deemed necessary to determine compliance with these specifications or which is deemed valuable in documenting the system to be installed.

D. Submit the following within 30 days of contract award:

1. A complete bill of materials of equipment to be used indicating quantity, manufacturer and model number.
2. A schedule of all control valves including the valve size, model number (including pattern and connections), flow, CV, pressure rating, and location.
3. A schedule of all control dampers. This shall include the damper size, pressure drop, manufacturer and model number.
4. Provide manufacturers cut sheets for major system components. When manufacturer's cut sheets apply to a product series rather than a specific product, the data specifically applicable to the project shall be highlighted or clearly indicated by other means. Each submitted piece of literature and drawings shall clearly reference the specification and/or drawing that the submittal is being submitted to cover. Include:

a. Centralized server hardware and software
b. Building Controllers
c. Custom Application Controllers
d. Application Specific Controllers
e. Operator Interface Computer(s) as specified
f. Configuration and service software programs
g. Portable Operator Workstation(s) or Service software PCs as specified.
h. Auxiliary Control Devices
i. Proposed control system riser diagram showing system configuration, device locations, addresses, and cabling.
j. Detailed termination drawings showing all required field and factory terminations. Terminal numbers shall be clearly labeled.
k. Points list showing all system objects, and the proposed English language object names.
l. Sequence of operations for each system under control. This sequence shall be specific for the use of the Control System being provided for this project.
m. Color prints of proposed graphics with a list of points for display

E. Project Record Documents. Upon completion of installation submit three (3) copies of record (as-built) documents. The documents shall be submitted for approval prior to final completion and include:

1. Project Record Drawings. These shall be as-built versions of the submittal shop drawings. One set of electronic media including CAD .DWG or .DXF drawing files shall also be provided.
2. Testing and Commissioning Reports and Checklists.
3. Operating and Maintenance (O & M) Manual. These shall be as-built versions of the submittal product data. In addition to that required for the submittals, the O & M manual shall include:

a. Names, address and 24-hour telephone numbers of Contractors installing equipment, and the control systems and service representative of each.
b. Operators Manual with procedures of operating the control systems including logging on/off, alarm handling, producing point reports, trending data, overriding computer control, and changing set points and other variables.
c. Programming Manual with a description of the programming language including syntax, statement descriptions including algorithms and calculations used, point database creation and modification, program creation and modification, and use of the editor.
d. Engineering, Installation and Maintenance Manual(s) that explains how to design and install new points, panels, and other hardware; preventative maintenance and calibration procedures; how to debug hardware problems; and how to repair or replace hardware.
e. A listing and documentation of all custom software created using the programming language including the point database. One set of magnetic media containing files of the software and database shall also be provided.
f. One set of electronic media containing files of all color-graphic screens created for the project.
g. Complete original issue documentation, installation, and maintenance information for all third-party hardware provided including computer equipment and sensors.
h. Complete original issue media for all software provided including operating systems, programming language, operator workstation software, and graphics software.
i. Licenses and warranty documents for all equipment and systems.

j. Recommended preventive maintenance procedures for all system components including a schedule of tasks, time between tasks, and task descriptions.

F. Training Materials: The Contractor shall provide a course outline and training material for all training classes at least six weeks prior to the first class. The Owner reserves the right to modify any or all of the training course outline and training materials. Review and approval by Owner and Engineer shall be completed at least 3 weeks prior to first class.

1.7 WARRANTY

A. Warrant all work as follows:

1. Labor & materials for control system specified shall be warranted free from defects for a period of twenty-four (24) months after final completion acceptance by the Owner. Control System failures during the warranty period shall be adjusted, repaired, or replaced at no charge or reduction in service to the Owner. The Contractor shall respond to the Owner's request for warranty service within 24 hours during customary business hours.
2. At the end of the final start-up/testing, if equipment and systems are operating satisfactorily to the Owner and Engineer, the Owner shall sign certificates certifying that the control system's operation has been tested and accepted in accordance with the terms of this specification. The date of Owner's acceptance shall be the start of warranty.
3. Central server and configuration tool software, project specific software, graphics, database, and firmware updates shall be provided to the Owner at no charge during warranty period. Written authorization by Owner must, however, be granted prior to the installation of such changes.
4. The system provider shall provide a web-accessible on-line resource that provides the Owner access to a question/answer forum, graphics library, user tips, upgrades, and manufacturer training schedules.

1.8 OWNERSHIP OF PROPRIETARY MATERIAL

A. All project-developed hardware and software shall become the property of the Owner. These items include but are not limited to:

1. Project graphic images
2. Record drawings
3. Project database
4. Project-specific application programming code
5. All documentation

PART 2 - PRODUCTS

2.1 MATERIALS

A. All products used in this installation shall be new, currently under manufacture, and shall be applied in similar installations for a minimum of 2 years. The installation shall not be used as a test site for any new products unless explicitly approved by the Owner’s representative in writing. Spare parts shall be available for at least 5 years after completion of this contract.

2.2 COMMUNICATION

A. This project shall comprise of a network utilizing high-speed BACnet over IP communications between the Central Server, Building Controllers, and the Operator PC Workstations

B. The owner will provide all communication media, connectors, repeaters, hubs, and routers necessary for the internetwork. An active 10BaseT jack will be provided adjacent to each Building Control Panel and PC Workstation for connection to this network.

C. All Building Controllers shall have a communications port to allow for communications with other building controllers, service software PCs, and the centralized server. The connection shall be an Ethernet network interface node. Service software connections at a building controller may be optionally provided through an RS-232 port for Point-to-Point connection.

D. Remote service software access via the internet shall allow for communication with any and all controllers on the BAS network.

E. All database values (i.e., points, software variable, custom program variables) of anyone building controller shall be readable by any other building controller on the internetwork. An operator/installer shall not be required to set up any communications services to perform internetwork value passing.

2.3 OPERATOR INTERFACE

A. Provide a web browser user interface at Opp High School as shown on plans.
   a. The system shall provide summary tables by equipment type per site. Room or space summary tables shall provide names, space temperatures, setpoints, and variance from setpoint. Provide a means to sort columns of data viewed by ascending or descending value for any chosen data type.
   b. The system shall provide a user option to reformat summary tables and information for printing.
   c. The central server shall be capable of presenting selected data parameters such that they may be viewed and changed by the user. For example, adjustable data parameters may include space temperature setpoints, relative humidity setpoints, discharge air setpoints, static pressure setpoints.
   d. Provide the ability to reset diagnostic messages and perform control overrides.

B. System Software:

1. System Graphics. The operator interface shall provide graphically oriented web pages as designated.

   a. Provide a method for the operator to easily move between graphic displays on the screen.
   b. The system must dynamically generate and serve web pages based on standard or custom web page templates in combination with content derived from the database in any building control panel.
   c. Dynamic points shall include analog and binary values, dynamic text, static text, and animation files. Graphics shall have the ability to show animation of equipment.

2. Engineering Units. Allow for selection of the desired engineering units (i.e., Inch pound or SI) in the system. Unit selection shall be able to be customized by user to select the desired units for each measurement.
3. Site Management:

   a. The system must allow for grouping of the many sites in an enterprise in a logical manner.
   b. The system shall provide a search function to allow users to search for sites or groups of sites by name or partial names.

c. The system must provide the necessary means to add, remove, and manage sites.

C. System Applications. The central server shall serve operator interface web pages and provide off-line storage of system information. Provide the following applications within the system.

1. Automatic System Database Save and Restore. The central server shall store on the hard disk backup tables of data including trends, alarms, custom settings, and user profiles. This data shall be backed up once a day. This database shall be updated whenever a change is made in the system. The storage of this data shall be automatic and not require operator intervention.
2. Manual Database Save and Restore. A system operator with the proper password clearance shall be able to archive the database manually at any time.
3. System Configuration. The central server shall serve web pages as the interface for configuring the operator-level functions of the system. A user with proper security shall be able to configure the system to allow for future changes or additions.
4. On-Line Help and Training. Provide a context sensitive, on-line help system to assist the operator in operation and editing of the system. On-line help shall be available for all system functions and shall provide the relevant data for that particular screen. Additional help shall be available through the use of hypertext links onscreen.
5. Security. The system shall support state-of-the-art encryption between server and web browser. Web browser interface shall utilize Secure Socket Layer SSLv3 encryption technology. Web server shall utilize TLS encryption. Server security shall accommodate a minimum of 1000 individually password protected users. Each user shall be assigned a username and password and security level. Usernames and passwords shall be case sensitive and able to have up to 32 characters. User security shall be set up through the web browser as an administrative function. Each user will be assigned to a security level. Security levels shall be hierarchical in nature – the higher security levels have all rights of lower levels. There shall be at least four (4) user security levels corresponding to user roles. A System Administrator shall be able to define the data view and edit capabilities for each security level. Users shall be automatically logged off of the system after a specified period of inactivity.
6. System Diagnostics. The system shall automatically monitor the operation of all workstations, network connections, building management panels, and controllers. The failure of any device shall be annunciated to the operator.
7. Alarm Management - The central server shall provide the following alarm handling functions:

    a. Receiving alarms from each building panel.
    b. The central server shall store specified alarms in an alarm log database.
    c. Displaying an alarm log.
    d. Forward alarms via e-mail as specified by the user.
    e. Alarm sorting and/or filtering by alarm and/or site attribute.
    f. Store alarm data in a standard format accessible to a user-specified peer database/server.
    g. Storing and purging the alarm log.
    h. Provide a means of acknowledging and deleting alarms from the viewable alarm log(s).
    i. Provide a printer-friendly format for printing alarm logs.

8. Alarm and Event Log. The operator shall be able to view all logged system alarms and events from any location in the system. An operator with the proper security level may acknowledge and clear alarms. All that have not been cleared by the operator shall be archived to the hard disk on the central server.

9. Trend Logs. The operator shall be able to define a trend log for any data in the system. This definition shall include interval, start-time, and stop-time. Trend intervals of 1, 5, 15, 30, and 60 minutes as well as user-defined intervals shall be selectable. The system operator shall be able to determine how many samples are stored in each trend. Trend data shall be sampled and stored on the Building Controller panel, then harvested and be archived on the central server hard disk. Additionally, provide the capability to sample directly from the building controller database to the central server. Trend data shall be able to be viewed and printed from the operator interface web pages. Trends must be viewable in a text-based format or graphically. Trends shall also be storable in a tab delimited ASCII format for use by other industry standard word processing and spreadsheet packages and be exportable to a file for use in other software tools, available in a non-proprietary file format to be used by another database.
10. Dynamic Graphical Trending. The system shall have the ability to display collected data in a graphical chart. Trend viewing capabilities shall include the ability to show up to 5 points on a chart. Each data point trend line shall be an individual color. Trend data shall be able to be stored indefinitely on the central server, based on server storage capacity and data archiving practices.
11. Object and Property Status and Control. Provide a method for the operator to view, and edit if applicable, the status of any object and property in the system.
12. Reports and Logs. Provide a reporting function that presents the system operator stored data in either a table format, as a chart, or as a report that can be printed. Data in a table format shall list the data values as well as a date and time stamp. Allow the user to present data log pages of a collection from a single piece of equipment or a building panel summary. Provide the ability to view data points on a static graph or configured for a specified length of time. The system shall be capable of storing trend data in a database and providing an interface to allow for retrieval of data by network peer servers and databases.

D. Workstation Applications Editors. The system web user interface shall support dedicated screens for editing of control system applications. The application programs shall be executed at the appropriate controller panels.

Scheduling. An editor for an enterprise-wide scheduling application shall be provided. Provide a method by which a system operator can make permanent changes to one or many building schedules without the need to repeat any steps. The system shall provide temporary changes to one or more schedules at one or more building locations.

1. Manual Control and Override. Provide a means of manually controlling analog and binary output points.

2. Air System Equipment Coordination. Provide a control application and user interface pages that summarize the monitoring and control functions that group together and coordinates the operation of air handling equipment as specified in the sequence of operations. For each air system, status pages shall include:

   a. System mode of the air handling system
   b. Listing and assignment of the fan coil units.
   c. AHU supply air cooling and heating setpoints.

3. Chiller System. Provide a chiller plant control application and user interface pages that shall provide operating status for the chilled water system. For each chilled water system, status pages shall include:
   a. System mode of the chiller plant
   b. Chiller enable/disable status.
   c. System supply water setpoint

d. System supply and return water temperature.
e. System Chilled water pump status
f. System Chilled water flow
g. Bypass pipe flow rate (if applicable)
h. Messages as to when an additional chiller will be added or removed from operational sequence.
i. Chiller or system failure information
j. Chiller rotation information
k. Override capabilities to force an added chiller, subtract a chiller, or change of sequence.

2.4 APPLICATION AND CONTROL SOFTWARE

A. Furnish the following applications software for building and energy management. All software applications shall reside and run in the system controllers. Editing of applications shall occur at operator workstations served web-based user interface pages.

B. Scheduling. Provide the capability to schedule each object or group of objects in the system. Each of these schedules shall include the capability for start, stop, and optimal start actions. When a group of objects are scheduled together, provide the capability to define advances and delays for each member.

C. Optimal Start. The scheduling application shall support an optimal start algorithm. This shall calculate the thermal characteristics of a zone and start the equipment prior to occupancy to achieve the desired space temperature at the specified occupancy time. The algorithm shall calculate separate sets of heating and cooling rates for zones that have been unoccupied for less than and greater than 24 hours. Provide the ability to modify the start algorithm based on outdoor air temperature. Provide an early start limit in minutes to prevent the system from starting before an operator determined time limit.

D. Demand Limiting. The demand limiting program shall monitor building power consumption from signals generated by a pulse generator (provided by others) mounted at the building power meter, or from a watt transducer or current transformer attached to the building feeder lines.

1. The demand limiting program shall be based on a predictive sliding window algorithm. The sliding window duration and sampling interval shall be set equal to that of the local Electrical Utility.
2. Control system shall be capable of demand limiting by resetting HVAC system setpoints to reduce load while maintaining a widened band of comfort control in the space.
3. Input capability shall also be provided for an end-of-billing period indication.

E. Maintenance Management. The system shall monitor equipment status and generate maintenance messages based upon user designated run time, starts, and/or calendar date limits.

F. Chiller Sequencing. Provide applications software to properly sequence the chiller plant to minimize energy use. This application shall perform the following functions:
1. The chiller plant control application shall have the ability to control up to 25 chillers as detailed in the sequence of operations.
2. This application shall be able to control both constant and variable flow systems as well as parallel, series and decoupled piping configurations.
3. The chiller plant control application shall be able to control multiple chiller plants per site.
4. Diagnostics/Protection – The chiller plant application program shall be able to integrate individual chiller diagnostics into control action decisions.

5. Event Processing – All chiller plant control and status events shall be recorded, at the operator's selection, in the building management system event log to facilitate troubleshooting.
6. Alarm Indications – The chiller plant control status screens shall display chiller plant and individual chiller alarm messages.
7. Add/Subtract actions –The status screens shall provide information on when the next chiller add or subtract action will occur. The operation shall have the ability to manually force a chiller addition or a chiller subtraction.

G. PID Control. A PID (proportional-integral-derivative) algorithm with direct or reverse action and anti-wind-up shall be supplied. The algorithm shall calculate a time-varying analog value used to position an output or stage a series of outputs. The controlled variable, set-point, and PID gains shall be user-selectable. The setpoint shall optionally be chosen to be a reset schedule.

H. Timed Override. A standard application shall be utilized to enable/disable temperature control when a user selects on/cancel at the zone sensor, workstation, or the operator display. The amount of time that the override takes precedence will be selectable from the workstation.

I. Staggered Start. This application shall prevent all controlled equipment from simultaneously restarting after a power outage. The order in which equipment (or groups of equipment) is started, along with the time delay between starts shall be user selectable.

J. System Calculations. Provide software to allow instantaneous power (e.g., KW), flow rates (e.g., L/s [GPM]) to be accumulated and converted to energy usage data. Provide an algorithm that calculates a sliding-window KW demand value. Provide an algorithm that calculates energy usage and weather data (heating and cooling degree days). These items shall all be available for daily, previous day, monthly and the previous month.

K. Anti-Short Cycling. All binary output points shall be protected from short cycling. This feature shall allow minimum on-time and off-time to be selected.

2.5 BUILDING CONTROLLERS

A. General. Provide Building Controllers to provide the performance specified in section 1 of this division. Each of these panels shall meet the following requirements.

1. The Building Automation System shall be composed of one or more independent, standalone, micro-processor-based Building Controllers to manage the global strategies described in System software section.
2. The Building Controller shall have sufficient memory to support its operating system, database, and programming requirements.
3. The controller shall provide a communications port for connection of the Portable Operators Terminal.
4. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
5. Controllers that perform scheduling shall have a real time clock.
6. Data shall be shared between networked Building Controllers.
7. The Building Controller shall utilize industry recognized open standard protocols for communication to unit controllers.
8. The Building Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall:

    a. Assume a predetermined failure mode.
    b. Generate an alarm notification.

c. Create a retrievable file of the state of all applicable memory locations at the time of the failure.
d. Automatically reset the Building Controller to return to a normal operating mode.

B. Communications. Each Building Controller shall reside on the enterprise-wide network, which is same high-speed network as the central server and PC workstations. The enterprise-wide network will be provided by the owner and supports the Internet Protocol (IP). Local connections of the Building Controller shall be on ISO 8802-3 (Ethernet). Each Building Controller shall also perform routing to a network of Custom Application and Application Specific Controllers.

C. Environment. Controller hardware shall be suitable for the anticipated ambient conditions. Controller used in conditioned ambient shall be mounted in an enclosure and shall be rated for operation at 0° C to 50° C [32° F to 120° F].

D. Serviceability. Provide diagnostic LEDs for power, communications, and processor. The Building Controller shall have a display on the main board that indicates the current operating mode of the controller. All wiring connections shall be made to field removable, modular terminal strips or to a termination card connected by a ribbon cable. The primary logic board shall be removable without disconnecting field wiring.

E. Memory. The Building Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.

F. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shut-down below 80% nominal voltage.

2.6 CUSTOM APPLICATION CONTROLLERS

A. General. Provide Custom Application Controllers to provide the performance specified in Section 1 of this division. Each of these panels shall meet the following requirements.

1. The Controller shall have sufficient memory to support its operating system, database, and programming requirements.
2. Controllers that perform scheduling shall have a real time clock.
3. The operating system of the Controller shall manage the input and output communications signals to allow distributed controllers to share real and virtual point information and allow central monitoring and alarms.
4. The Controller shall continually check the status of its processor and memory circuits. If an abnormal operation is detected, the controller shall assume a predetermined failure mode, and generate an alarm notification.
5. Custom application controllers shall communicate using BacNet Controllers shall use FTT-10 transceivers. All communications shall be with the use of BacNet.

B. Environment. Controller hardware shall be suitable for the anticipated ambient conditions.

1. Controller used in conditioned ambient shall be mounted in NEMA 1 type enclosures and shall be rated for operation at 0° C to 50° C [32° F to 120° F].
2. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures and shall be rated for operation at -40° C to 70° C [-40° F to 158° F].

C. Serviceability. Provide diagnostic LEDs for power, communications, and processor. All low voltage wiring connections shall be made such that the controller electronics can be removed and/or replaced without disconnection of field termination wiring.

D. Memory. The Controller shall maintain all BIOS and programming information in the event of a power loss for at least 72 hours.

E. Immunity to power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80% nominal voltage.

2.7 APPLICATION SPECIFIC CONTROLLERS

A. General. Application specific controllers (ASC) are microprocessor based DDC controllers, which through hardware or firmware design are dedicated to control a specific piece of equipment. They are not fully user programmable but are customized for operation within the confines of the equipment they are designed to serve.

1. Each ASC shall be capable of stand-alone operation and shall continue to provide control functions without being connected to the network.
2. Each ASC will contain sufficient I/O capacity to control the target system.

B. Environment. The hardware shall be suitable for the anticipated ambient conditions.

1. Controller used in conditioned ambient spaces shall be mounted in NEMA 1 type rated enclosures. Controllers located where not to be disturbed by building activity (such as above ceiling grid), may be provided with plenum-rated enclosures and non-enclosed wiring connections for plenum cabling. All controllers shall be rated for operation at 0° C to 50° C [32° F to 120° F].
2. Controllers used outdoors and/or in wet ambient shall be mounted within NEMA 4 type waterproof enclosures and shall be rated for operation at -40° C to 65° C [-40° F to 150° F].

C. Serviceability. Provide diagnostic LEDs for power and communications. All wiring connections shall be clearly labeled and made to be field removable.

D. Memory. The Application Specific Controller shall maintain all BIOS and programming information in the event of a power loss for at least 90 days.

E. Immunity to Power and noise. Controller shall be able to operate at 90% to 110% of nominal voltage rating and shall perform an orderly shutdown below 80%.

F. Transformer. Power supply for the ASC must be rated at minimum of 125% of ASC power consumption and shall be fused or current limiting type.

G. Application Specific Controllers shall communicate using BacNet. Controllers shall use FTT-10 transceivers. All communications shall follow BacNet profiles. ASCs which do not have a profile that applies must comply with BacNet standards, utilize SNVTs for all listed points, and be provided with a XIF file for self-documentation.

2.8 INPUT/OUTPUT INTERFACE

A. Hard-wired inputs and outputs may tie into the system through Building, Custom, or Application Specific Controllers.

B. All input points and output points shall be protected such that shorting of the point to itself, another point, or ground will cause no damage to the controller. All input and output points shall be protected from voltage up to 24V of any duration, such that contact with this voltage will cause no damage to the controller.

C. Binary inputs shall allow the monitoring of on/off signals from remote devices. The binary inputs shall provide a wetting current of at least 12 mA to be compatible with commonly available control devices.

D. Pulse accumulation input points. This type of point shall conform to all the requirements of Binary Input points, and also accept up to 3 pulses per second for pulse accumulation and shall be protected against effects of contact bounce and noise.

E. Analog inputs shall allow the monitoring of low voltage (0-10 Vdc), current (4-20 mA), or resistance signals (thermistor, RTD). Analog inputs shall be compatible with, and field configurable to commonly available sensing devices.

F. Binary outputs shall provide for on/off operation. Terminal unit and zone control applications may use 2 outputs for drive-open, drive-close (tri-state) modulating control.

G. Analog outputs shall provide a modulating signal for the control of end devices. Outputs shall provide either a 0-10 Vdc or a 4-20 mA signal as required to provide proper control of the output device.

2.9 AUXILIARY CONTROL DEVICES

A. Motorized dampers, unless otherwise specified elsewhere, shall be as follows:

1. Damper frames shall be 16-gauge galvanized sheet metal or 1/8" extruded aluminum with reinforced corner bracing.
2. Damper blades shall not exceed 8" in width or 48" in length. Blades are to be suitable for medium velocity performance (2,000 fpm). Blades shall be not less than 16 gauge.
3. Damper shaft bearings shall be as recommended by manufacturer for application.
4. All blade edges and top and bottom of the frame shall be provided with compressible seals. Side seals shall be compressible stainless steel. The blade seals shall provide for a maximum leakage rate of 10 CFM per square foot at 2.5" w.c. differential pressure.
5. All leakage testing and pressure ratings will be based on AMCA Publication 500.
6. Individual damper sections shall not be larger than 48" x 60". Provide a minimum of one damper actuator per section.

B. Combination Fire/Smoke Dampers, unless otherwise specified elsewhere, shall be as follows:

1. Damper shall be factory furnished with auxiliary end switches and 120-volt Belimo actuators. Each Combination Fire/Smoke Damper end switch shall be monitored by the BAS.
2. The supply fan serving the Combination Fire/Smoke damper riser shall not be enabled until dampers are proven as open.
3. The 120-volt Belimo actuators shall be powered by via dedicated circuits provided and wired under the Electrical Section.
4. All activation relays shall be provided and installed by the Fire Alarm contractor.

C. Control dampers shall be parallel or opposed blade types as scheduled on drawings.

D. Electric damper/valve actuators.

1. The actuator shall be Belimo and have electronic overload or digital rotation sensing circuitry to prevent damage to the actuator throughout the rotation of the actuator.
2. Where shown, for power-failure/safety applications, an internal mechanical, spring return mechanism shall be built into the actuator housing.
3. All rotary spring return actuators shall be capable of both clockwise or counter clockwise spring return operation. Linear actuators shall spring return to the retracted position.

4. Proportional actuators shall accept a 0-10 VDC or 0-20 mA control signal and provide a 2-10 VDC or 4-20 mA operating range.
5. All non-spring return actuators shall have an external manual gear release to allow manual positioning of the damper when the actuator is not powered. Spring return actuators with more than 60 in-lb. torque capacity shall have a manual crank for this purpose.
6. Actuators shall be provided with a conduit fitting and a minimum 1m electrical cable and shall be pre-wired to eliminate the necessity of opening the actuator housing to make electrical connections.
7. Actuators shall be Underwriters Laboratories Standard 873 listed.
8. Actuators shall be designed for a minimum of 60,000 full stroke cycles at the actuator's rated torque.

D. Control Valves:

1. Control valves shall be two-way or three-way type for two-position or modulating service as scheduled or shown.
2. Close-off (differential) Pressure Rating: Valve actuator and trim shall be furnished to provide the following minimum close-off pressure ratings:

    a. Water Valves:

        1. Two-way: 150% of total system (pump) head.

        2. Three-way: 300% of pressure differential between ports A and B at design flow or 100% of total system (pump) head.

3. Water Valves:

    a. Body and trim style and materials shall be per manufacturer's recommendations for design conditions and service shown, with equal percentage ports for modulating service.
    b. Sizing Criteria:

        1. Two-position service: Line size.

        2. Two-way modulating service: Pressure drop shall be equal to twice the pressure drop through heat exchanger (load), 50% of the pressure difference between supply and return mains, or [5] psi, whichever is greater.

        3. Three-way Modulating Service: Pressure drop equal to twice the pressure drop through the coil exchanger (load), [5] psi maximum.

        4. Valves 1/2" through 2" shall be bronze body or cast brass ANSI Class 250, spring loaded, Teflon packing, quick opening for two-position service. Two-way valves to have replaceable or stainless-steel ball.

        5. 2-1/2" valves and larger shall be cast iron ANSI Class 125 with guided plug and Teflon packing.

    c. Water valves shall fail normally open or closed as scheduled on plans or as follows:

1. Heating coils in air handlers - normally open.

2. Chilled water control valves - normally closed.

3. Other applications - as scheduled or as required by sequence of operation.

d. Zone valves shall be sized to meet the control application and they shall maintain their last position in the event of a power failure.

E. Binary Temperature Devices

1. Low-Voltage Space Thermostats shall be 24 V, bimetal-operated, mercury-switch type, with either adjustable or fixed anticipation heater, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented cover.
2. Line-Voltage Space Thermostats shall be bimetal-actuated, open-contact type or bellows-actuated, enclosed, snap-switch type or equivalent solid-state type, with heat anticipator, UL listing for electrical rating, concealed setpoint adjustment, 13°C-30°C (55°F-85°F) setpoint range, 1°C (2°F) maximum differential, and vented cover.
3. Low-Limit airstream thermostats shall be UL listed, vapor pressure type. Element shall be at least 6 m (20 ft) long. Element shall sense temperature in each 30 cm (1 ft) section and shall respond to lowest sensed temperature. Low-limit thermostat shall be manual reset only.

F. Temperature Sensors

1. Temperature sensors shall be Resistance Temperature Device (RTD) or Thermistor.
2. Duct sensors shall be rigid or averaging as shown. Averaging sensors shall be a minimum of 1.5m [5 feet] in length.
3. Immersion sensors shall be provided with a separable stainless steel well. Pressure rating of well is to be consistent with the system pressure in which it is to be installed.
4. Space sensors shall be equipped with set-point adjustment, override switch, display, and/or communication port as shown on the drawings.
5. Provide matched temperature sensors for differential temperature measurement. Differential accuracy shall be within 0.1 C [0.2 F].

G. Humidity Sensors

1. Duct and room sensors shall have a sensing range of 20% to 80% with accuracy of ±5% R.H.
2. Duct sensors shall be provided with a sampling chamber.
3. Outdoor air humidity sensors shall have a sensing range of 20% to 95% R.H. It shall be suitable for ambient conditions of -40° C to 75° C [-40° F to 170° F].
4. Humidity sensor's drift shall not exceed 1% of full scale per year.

H. Static Pressure Sensors

1. Sensor shall have linear output signal. Zero and span shall be field-adjustable.
2. Sensor sensing elements shall withstand continuous operating conditions plus or minus 50% greater than calibrated span without damage.
3. Water pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Sensor shall be complete with 4-20 mA output, required mounting brackets, and block and bleed valves. Mount in location accessible for service.
4. Water differential pressure sensor shall have stainless steel diaphragm construction, proof pressure of 150 psi minimum. Over-range limit (DP) and maximum static pressure

shall be 3,000 psi. Transmitter shall be complete with 4-20 mA output, required mounting brackets, and five-valve manifold. Mount in a location accessible for service.

I. Low Limit Thermostats

1. Safety low limit thermostats shall be vapor pressure type with an element 6m [20 ft] minimum length. Element shall respond to the lowest temperature sensed by any one-foot section.
2. Low limit shall be manual reset only.

J. Flow Switches

1. Flow-proving switches shall be either paddle or differential pressure type, as shown.
2. Paddle type switches (water service only) shall be UL listed, SPDT snap-acting with pilot duty rating (125 VA minimum). Adjustable sensitivity with NEMA 1 Type enclosure unless otherwise specified.
3. Differential pressure type switches (air or water service) shall be UL listed, SPDT snap-acting, pilot duty rated (125 VA minimum), NEMA 1 Type enclosure, with scale range and differential suitable for intended application, or as specified.
4. Current sensing relays may be used for flow sensing or terminal devices.

K. Relays

1. Control relays shall be UL listed plug-in type with dust cover. Contact rating, configuration, and coil voltage suitable for application.
2. Time delay relays shall be UL listed solid-state plug-in type with adjustable time delay. Delay shall be adjustable plus or minus 200% (minimum) from set-point shown on plans. Contact rating, configuration, and coil voltage suitable for application. Provide NEMA 1 Type enclosure when not installed in local control panel.

L. Transformers and Power Supplies

1. Control transformers shall be UL listed, Class 2 current-limiting type, or shall be furnished with over-current protection in both primary and secondary circuits for Class 2 service.
2. Unit output shall match the required output current and voltage requirements. Current output shall allow for a 50% safety factor. Output ripple shall be 3.0 mV maximum Peak-to-Peak. Regulation shall be 0.10% line and load combined, with 50 microsecond response time for 50% load changes. Unit shall have built-in over-voltage protection.
3. Unit shall operate between 0° C and 50° C.
4. Unit shall be UL recognized.

M. Current Switches

1. Current-operated switches shall be self-powered, solid state with adjustable trip current. The switches shall be selected to match the current of the application and output requirements of the DDC system.

N. Local Control Panels

1. All indoor control cabinets shall be fully enclosed NEMA 1 Type construction with hinged door, and removable sub-panels or electrical sub-assemblies.
2. Interconnections between internal and face-mounted devices shall be pre-wired with color-coded stranded conductors neatly installed in plastic troughs and/or tie-wrapped. Terminals for field connections shall be UL listed for 600-volt service, individually

identified per control/interlock drawings, with adequate clearance for field wiring. Control terminations for field connection shall be individually identified per control drawings.

3. Provide on/off power switch with over-current protection for control power sources to each local panel.

O. Air Flow Measuring Stations (EBTRON, Inc. model GTx116-P+)

1. Airflow measurement devices (AMD) shall use the principle of thermal dispersion and provide one self-heated bead-in-glass thermistor and one zero power bead-in-glass thermistor at each sensing node.
2. The installed airflow accuracy shall be ±3% of reading when installed in accordance with the manufactures recommended placement guidelines in ducts.
3. The transmitter shall be provided with a 16-character, alpha-numeric, LCD display with Bluetooth low energy interface card to interface with Android or iOS devices. Provide free Android or iOS software that allows real-time airflow and temperature monitoring and airflow and temperature traverses. Software shall capture, save, or e-mail airflow and temperature data, transmitter settings and diagnostics information.
4. The transmitter shall be capable of determining the airflow rate and temperature average of all connected sensor nodes in an array for a single location with ability for high and/or low airflow alarm with user-defined set point and % of set point tolerance.
5. Upon request the manufacture shall submit for AMD approval a copy of the NIST report of calibration used for the reference standard used.
6. The AMD shall be UL/cUL 873 Listed as an assembly.
7. All network-capable AMD models supplied with RS-485 interface and BACnet protocol shall be BTL Listed.

PART 3 - EXECUTION

3.1 EXAMINATION

A. The project plans shall be thoroughly examined for control device and equipment locations, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

B. The contractor shall inspect the site to verify that equipment is installable as shown, and any discrepancies, conflicts, or omissions shall be reported to the Architect/Engineer for resolution before rough-in work is started.

C. Contractor shall provide a Site Assessment Report that provides information about the feasibility of the Customer's existing IT and Building Automation System infrastructure to support the enterprise-wide system capabilities.

3.2 PROTECTION

A. The Contractor shall protect all work and material from damage by his/her work or workers and shall be liable for all damage thus caused.

B. The Contractor shall be responsible for his/her work and equipment until finally inspected, tested, and accepted. The Contractor shall protect his/her work against theft or damage and shall carefully store material and equipment received on site that is not immediately installed. The Contractor shall close all open ends of work with temporary covers or plugs during storage and construction to prevent entry of foreign objects.

3.3 GENERAL WORKMANSHIP

A. Install equipment, piping, wiring/conduit parallel to building lines (i.e., horizontal, vertical, and parallel to walls) wherever possible.

B. Provide sufficient slack and flexible connections to allow for vibration of piping and equipment.

C. Install all equipment in readily accessible location as defined by chapter 1 article 100-part A of the NEC. Control panels shall be attached to structural walls unless mounted in equipment enclosure specifically designed for that purpose. Panels shall be mounted to allow for unobstructed access for service.

D. Verify integrity of all wiring to ensure continuity and freedom from shorts and grounds.

E. All equipment, installation, and wiring shall comply with acceptable industry specifications and standards for performance, reliability, and compatibility and be executed in strict adherence to local codes and standard practices.

3.4 FIELD QUALITY CONTROL

A. All work, materials and equipment shall comply with the rules and regulations of applicable local, state, and federal codes and ordinances as identified in Part 1 of this Section.

B. Contractor shall continually monitor the field installation for code compliance and quality of workmanship. All visible piping and or wiring runs shall be installed parallel to building lines and properly supported.

C. Contractor shall arrange for field inspections by local and/or state authorities having jurisdiction over the work.

3.5 CENTRAL SERVER INSTALLATION

A. The system installer shall perform complete installation and configuration of the following:

1. Server hardware
2. Server operating system
3. Server database software
4. Server application software

3.6 WIRING

A. All control and interlock wiring shall comply with the national and local electrical codes and Division 16 of these specifications. Where the requirements of this section differ with those in Division 16, the requirements of this section shall take precedence.

B. Where Class 2 wires are in concealed and accessible locations including ceiling return air plenums, approved cables not in raceway may be used provided that circuits meet NEC Class 2 (current-limited) requirements. (Low-voltage power circuits shall be sub-fused when required to meet Class 2 current-limit.)

C. All cables shall be UL listed for application, i.e., cables used in ceiling plenums shall be UL listed specifically for that purpose.

D. Do not install Class 2 wiring in conduit containing Class 1 wiring. Boxes and panels containing high voltage may not be used for low voltage wiring except for the purpose of interfacing the two (e.g., relays and transformers).

E. Where class 2 wiring is run exposed, wiring shall be run parallel along a surface or perpendicular to it, and bundled, using approved wire ties at no greater than 3 m [10 ft] intervals. Such bundled cable shall be fastened to the structure, using specified fasteners, at 1.5 m [5 ft] intervals or more often to achieve a neat and workmanlike result.

F. All wire-to-device connections shall be made at a terminal blocks or terminal strip. All wire-to wire connections shall be at a terminal block, or with a crimped connector. All wiring within enclosures shall be neatly bundled and anchored to permit access and prevent restriction to devices and terminals.

G. Maximum allowable voltage for control wiring shall be 120V. If only higher voltages are available, the Control System Contractor shall provide step down transformers.

H. All wiring shall be installed as continuous lengths, where possible. Any required splices shall be made only within an approved junction box or other approved protective device.

I. Install plenum wiring in sleeves where it passes through walls and floors. Maintain fire rating at all penetrations in accordance with other sections of this specification and local codes.

J. Size of conduit and size and type of wire shall be the design responsibility of the Control System Contractor, in keeping with the manufacturer's recommendation and NEC.

K. Control and status relays are to be located in designated enclosures only. These relays may also be located within packaged equipment control panel enclosures. These relays shall not be located within Class 1 starter enclosures.

L. Follow manufacturer's installation recommendations for all communication and network cabling. Network or communication cabling shall be run separately from other wiring.

M. Adhere to Division 16 requirements for installation of raceway.

N. This Contractor shall terminate all control and/or interlock wiring and shall maintain updated (as-built) wiring diagrams with terminations identified at the job site.

O. Flexible metal conduits and liquid-tight, flexible metal conduits shall not exceed 3' in length and shall be supported at each end. Flexible metal conduit less than 1/2" electrical trade size shall not be used. In areas exposed to moisture, including chiller and boiler rooms, liquid-tight, flexible metal conduits shall be used.

3.7 INSTALLATION OF SENSORS

A. Install sensors in accordance with the manufacturer's recommendations.

B. Mount sensors rigidly and adequate for the environment within which the sensor operates.

C. Room temperature sensors shall be installed on concealed junction boxes properly supported by the wall framing.

D. All wires attached to sensors shall be air sealed in their conduits or in the wall to stop air transmitted from other areas affecting sensor readings.

E. Install duct static pressure tap with tube end facing directly down-stream of air flow.

F. Sensors used in mixing plenums, and hot and cold decks shall be of the averaging type. Averaging sensors shall be installed in a serpentine manner horizontally across duct. Each bend shall be supported with a capillary clip.

G. All pipe mounted temperature sensors shall be installed in wells. Install all liquid temperature sensors with heat conducting fluid in thermal wells.

H. Wiring for space sensors shall be concealed in building walls. EMT conduit is acceptable within mechanical and service rooms.

I. Install outdoor air temperature sensors on north wall complete with sun shield at designated location.

3.8 FLOW SWITCH INSTALLATION

A. Use correct paddle for pipe diameter.

B. Install and adjust flow switch in accordance with manufacturers' instructions.

C. Assure correct flow direction and alignment.

D. Mount in horizontal piping - flow switch on top of the pipe.

3.9 ACTUATORS (BELIMO)

A. Mount and link control damper actuators per manufacturer's instructions.

1. To compress seals when spring return actuators are used on normally closed dampers, power actuator to approximately 5 degrees open position, manually close the damper, and then tighten the linkage.
2. Check operation of damper/actuator combination to confirm that actuator modulates damper smoothly throughout stroke to both open and closed positions.
3. Valves - Actuators shall be mounted on valves with adapters approved by the actuator manufacturer. Actuators and adapters shall be mounted following manufacturer's recommendations.

3.10 CONTROL VALVE INSTALLATION

A. Valve submittals shall be coordinated for type, quantity, size, and piping configuration to ensure compatibility with pipe design.

B. All control valves shall be installed so that the stem position is not more than 60° from the vertical up position.

C. Valves shall be installed in accordance with the manufacturer's recommendations.

D. Control valves shall be installed so that they are accessible and serviceable, and such that actuators may be serviced and removed without interference from structure or other pipes and/or equipment.

E. Isolation valves shall be installed such that control valve body may be serviced without draining the supply/return side piping system. Unions shall be installed at all connections to screwed type control valves.

F. Provide tags for all control valves indicating service and number. Tags shall be brass, 1-1/2" in diameter, with 1/4" high letters. Securely fasten with chain and hook. Match identification numbers as shown on approved controls shop drawings.

G. Provide 11”x17” framed schematic showing the location and identification of all valve tags.

3.11 DUCT SMOKE DETECTION

A. Controls contractor shall make final connections of the Fire Alarm shutdown relay as installed by the Fire Alarm Contractor within the interior of the air moving equipment being shut down.

3.12 WARNING LABELS

A. Affix labels on each starter and equipment automatically controlled through the DDC System. Warning label shall indicate the following:

> CAUTION
>
> This equipment is operating under automatic control and may start or stop at any time without warning. Switch disconnect to “Off” position before servicing.

B. Affix labels to motor starters and control panels that are connected to multiple power sources utilizing separate disconnects. Labels shall indicate the following:

> CAUTION
>
> This equipment is fed from more than one power source with separate disconnects. Disconnect all power sources before servicing.

3.13 IDENTIFICATION OF HARDWARE AND WIRING

A. All wiring and cabling, including that within factory-fabricated panels, shall be labeled at each end within 2" of termination with a cable identifier and other descriptive information.

B. Permanently label or code each point of field terminal strips to show the instrument or item served.

C. Identify control panels with minimum 1-cm (1/2”) letters on nameplates.

D. Identify all other control components with permanent labels. Identifiers shall match record documents. All plug-in components shall be labeled such that removal of the component does not remove the label.

E. Provide 11”x17” framed schematic showing the location and identification of all control devices (i.e. control panels, junction boxes, etc.)

3.14 CONTROLLERS

A. Provide a separate Controller for each major piece of HVAC equipment. A custom application controller may control more than one system provided that all points associated with that system

are assigned to the same controller. Points used for control loop reset such as outside air or space temperature are exempt from this requirement.

B. Building Controllers and Custom Application Controllers shall be selected to provide a minimum of 15% spare I/O point capacity for each point type found at each location. If input points are not universal, 15% of each type is required. If outputs are not universal, 15% of each type is required. A minimum of one spare is required for each type of point used.

1. Future use of spare capacity shall require providing the field device, field wiring, points database definition, and custom software. No additional Controller boards or point modules shall be required to implement use of these spare points.

3.15 PROGRAMMING

A. Provide sufficient internal memory for the specified control sequences and trend logging. There shall be a minimum of 25% of available memory in building controllers free for future use.

B. Point Naming: System point names shall be modular in design, allowing easy operator interface without the use of a written point index.

C. Software Programming:

1. Provide programming for the system as written in the specifications and adhere to the sequence strategies provided. All other system programming necessary for the operation of the system but not specified in this document shall also be provided by the Control System Contractor. Imbed into any custom-written control programs sufficient comment statements or inherent flow diagrams to clearly describe each section of the program. The comment statements shall reflect the language used in the sequence of operations.

D. Operators' Interface:

1. Standard Graphics. Provide graphics for each major piece of equipment and floor plan in the building. This includes each water system, air handling unit, fan coil unit and exhaust fan. These standard graphics shall show all points dynamically as specified in the points list.
2. The controls contractor shall provide all the labor necessary to install, initialize, start-up, and trouble-shoot all operator interface software and their functions as described in this section. This includes any operating system software, the operator interface database, and any third-party software installation and integration required for successful operation of the operator interface.
3. As part of this execution phase, the controls contractor will perform a complete test of the operator interface. Test duration shall be a minimum of 16 hours on-site. Tests shall be made in the presence of the Owner or Owner's representative.

E. Demonstration: A complete demonstration and readout of the capabilities of the monitoring and control system shall be performed. The contractor shall dedicate a minimum of 24 hours on-site with the Owner and his representatives for a complete functional demonstration of all the system requirements. This demonstration constitutes a joint acceptance inspection and permits acceptance of the delivered system for on-line operation.

3.16 CLEANING

A. This contractor shall clean up all debris resulting from his or her activities daily. The contractor shall remove all cartons, containers, crates, etc. under his control as soon as their contents have

been removed. Waste shall be collected and placed in a location designated by the Construction Manager or General Contractor.

B. At the completion of work in any area, the Contractor shall clean all of his/her work, equipment, etc., making it free from dust, dirt and debris, etc.

C. At the completion of work, all equipment furnished under this Section shall be checked for paint damage, and any factory finished paint that has been damaged shall be repaired to match the adjacent areas. Any metal cabinet or enclosure that has been deformed shall be replaced with new material and repainted to match the adjacent areas.

3.17 TRAINING

A. Provide a minimum of 4 classroom training sessions, 4 hours each, throughout the contract period for personnel designated by the Owner.

B. Train the designated staff of Owner's representative and Owner to enable them to proficiently operate the system; create, modify, and delete programming; add, remove, and modify physical points for the system, and perform routine diagnostic and troubleshooting procedures.

C. Additional training shall be available in courses designed to meet objectives as divided into three logical groupings; participants may attend one or more of these, depending on the level of knowledge required:

1. Day-to-day Operators
2. Advanced Operators
3. System Managers/Administrators

D. Provide course outline and materials as per Part 1 of this Section. The instructor(s) shall provide one copy of training material per student.

E. The instructor(s) shall be factory-trained instructors experienced in presenting this material.

F. Classroom training shall be done using a network of working controllers' representative of the installed hardware or at the customer's site.

3.18 ACCEPTANCE

A. The control systems will not be accepted as meeting the requirements of Completion until all tests described in this specification have been performed to the satisfaction of both the Engineer and Owner. Any tests that cannot be performed due to circumstances beyond the control of the Contractor may be exempt from the Completion requirements if stated as such in writing by the Owner's representative. Such tests shall then be performed as part of the warranty.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 23 2113
HYDRONIC PIPING

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes pipe and fitting materials, joining methods, special-duty valves, and specialties for the following:

1. Chilled-water piping.
2. Hot-water piping.
3. Condensate-drain piping.
4. Air-vent piping.
5. Safety-valve-inlet and -outlet piping.

B. See Division 15 Section 15185 "Hydronic Pumps" for pumps, motors, and accessories for hydronic piping.

1.2 PERFORMANCE REQUIREMENTS

A. Hydronic piping components and installation shall be capable of withstanding the following minimum working pressure and temperature:

1. Chilled-Water and Hot-Water Piping (steel or copper): 150 psig (kPa) at 200 deg F (93 deg C).
2. Condensate-Drain Piping: 150 deg F (66 deg C).
3. Air-Vent Piping: 200 deg F (93 deg C).
4. Safety-Valve-Inlet and -Outlet Piping: Equal to the pressure of the piping system to which it is attached.

1.3 SUBMITTALS

A. Submit Product Data: For each type of the following:

1. Pressure-seal fittings.
2. Valves. Include flow and pressure drop curves based on manufacturer's testing for calibrated-orifice balancing valves and automatic flow-control valves.
3. Air control devices.
4. Chemical treatment.
5. Hydronic specialties.

B. Submit Shop Drawings: Detail, at ¼” = 1’-0” scale, the piping layout, fabrication of pipe anchors, hangers, supports for multiple pipes, alignment guides, expansion joints and loops, and attachments of the same to the building structure. Detail location of anchors, alignment guides, and expansion joints and loops.

C. Submit Field quality-control test reports.

D. Submit Operation and maintenance data.

1.4 QUALITY ASSURANCE

A. ASME Compliance: Comply with ASME B31.9, "Building Services Piping," for materials, products, and installation. Safety valves and pressure vessels shall bear the appropriate ASME label. Fabricate and stamp air separators and expansion tanks to comply with

ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.

B. Steel piping and fittings shall be manufactured in the United States of America.

PART 2 - PRODUCTS

2.1 COPPER TUBE AND FITTINGS

A. Drawn-Temper Copper Tubing: ASTM B 88, Type L (ASTM B 88M, Type B).

B. Annealed-Temper Copper Tubing: ASTM B 88, Type K (ASTM B 88M, Type A).

C. DWV Copper Tubing: ASTM B 306, Type DWV.

D. Wrought-Copper Fittings: ASME B16.22.

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Nibco.
    b. Mueller Industries

E. Wrought-Copper Unions: ASME B16.22.

2.2 STEEL PIPE AND FITTINGS

A. Steel Pipe: ASTM A 53/A 53M, black steel with plain ends; type, grade, and wall thickness as indicated in Part 3 "Piping Applications" Article.

B. Cast-Iron Threaded Fittings: ASME B16.4; Classes 125 and 250 as indicated in Part 3 "Piping Applications" Article.

C. Malleable-Iron Threaded Fittings: ASME B16.3, Classes 150 and 300 as indicated in Part 3 "Piping Applications" Article.

D. Malleable-Iron Unions: ASME B16.39; Classes 150, 250, and 300 as indicated in Part 3 "Piping Applications" Article.

E. Cast-Iron Pipe Flanges and Flanged Fittings: ASME B16.1, Classes 25, 125, and 250; raised ground face, and bolt holes spot faced as indicated in Part 3 "Piping Applications" Article.

F. Wrought Cast- and Forged-Steel Flanges and Flanged Fittings: ASME B16.5, including bolts, nuts, and gaskets of the following material group, end connections, and facings:

1. Material Group: 1.1.
2. End Connections: Butt welding.
3. Facings: Raised face.

G. Steel fittings shall be manufactured in the United States of America.

2.3 JOINING MATERIALS

A. Pipe-Flange Gasket Materials: Suitable for chemical and thermal conditions of piping system contents.

1. ASME B16.21, nonmetallic, flat, asbestos free, 1/8-inch (3.2-mm) maximum thickness unless thickness or specific material is indicated.

a. Full-Face Type: For flat-face, Class 125, cast-iron and cast-bronze flanges.
b. Narrow-Face Type: For raised-face, Class 250, cast-iron and steel flanges.

B. Flange Bolts and Nuts: ASME B18.2.1, carbon steel, unless otherwise indicated.

C. Solder Filler Metals: ASTM B 32, lead-free alloys. Include water-flushable flux according to ASTM B 813.

D. Brazing Filler Metals: AWS A5.8, BCuP Series, copper-phosphorus alloys for joining copper with copper; or BAg-1, silver alloy for joining copper with bronze or steel.

E. Steel piping shall be manufactured in the United States of America.

2.4 DIELECTRIC CONNECTIONS

A. Insulating Material: Suitable for system fluid, pressure, and temperature.

B. Dielectric Nipples:

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. Matco-Norca, Inc.
b. Watts, Inc.

3. Galvanized Dielectric Nipples: ASTM A53, ANSI B1.20.1 & ASTEM F492-95.

C. Unions: (Submit for approval before use)

1. Available Manufacturers: Subject to compliance with requirements, manufactures 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. Matco-Norca, Inc.
b. Watts, Inc.
3. Standard Unions: ASTEM A105 & ASME SA 105, Unions to be of same metallurgy as the piping to be connected.

2.5 VALVES

A. Check, Ball, and Butterfly Valves: Comply with requirements specified in Division 23 Section 230523"General Duty Valves for HVAC Piping."

B. Automatic Temperature-Control Valves, Actuators, and Sensors: Comply with requirements specified in Division 23 Section 230923 “Direct Digital Control (DDC) System for HVAC.”

C. Diaphragm-Operated, Pressure-Reducing Valves:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Amtrol, Inc.
    b. Armstrong Pumps, Inc.
    c. Bell & Gossett Domestic Pump; a division of ITT Industries.
    d. Conbraco Industries, Inc.
    e. Spence Engineering Company, Inc.
    f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

4. Body: Bronze or brass.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: Brass.
7. Stem Seals: EPDM O-rings.
8. Diaphragm: EPT.
9. Low inlet-pressure check valve.
10. Inlet Strainer: Removable without system shutdown.
11. Valve Seat and Stem: Noncorrosive.
12. Valve Size, Capacity, and Operating Pressure: Selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

D. Diaphragm-Operated Safety Valves:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

    a. Amtrol, Inc.
    b. Armstrong Pumps, Inc.
    c. Bell & Gossett Domestic Pump; a division of ITT Industries.
    d. Conbraco Industries, Inc.
    e. Spence Engineering Company, Inc.
    f. Watts Regulator Co.; a division of Watts Water Technologies, Inc.

4. Body: Bronze or brass.
5. Disc: Glass and carbon-filled PTFE.
6. Seat: Brass.
7. Stem Seals: EPDM O-rings.
8. Diaphragm: EPT.
9. Wetted, Internal Work Parts: Brass and rubber.
10. Inlet Strainer: Removable without system shutdown.
11. Valve Seat and Stem: Noncorrosive.

12. Valve Size, Capacity, and Operating Pressure: Comply with ASME Boiler and Pressure Vessel Code: Section IV, and selected to suit system in which installed, with operating pressure and capacity factory set and field adjustable.

E. Automatic Flow-Control Valves:

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:
3. Basis-of-Design Product: Subject to compliance with requirements, provide the product indicated on Drawings or a comparable product by one of the following:

   a. Flow Design Inc.
   b. Griswold Controls.

4. Body: Brass or ferrous metal.
5. Piston and Spring Assembly: Stainless steel, Corrosion resistant, tamper proof, self cleaning, and removable.
6. Combination Assemblies: Include bonze or brass-alloy ball valve.
7. Identification Tag: Marked with zone identification, valve number, and flow rate.
8. Size: Same as pipe in which installed.
9. Performance: Maintain constant flow, plus or minus 5 percent over system pressure fluctuations.
10. Minimum CWP Rating: 175 psig (1207 kPa).
11. Maximum Operating Temperature: 200 deg F (93 deg C).

2.6 AIR CONTROL DEVICES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Amtrol, Inc.
2. Armstrong Pumps, Inc.
3. Bell & Gossett Domestic Pump; a division of ITT Industries.
4. Taco.

B. Manual Air Vents:

1. Body: Bronze.
2. Internal Parts: Nonferrous.
3. Operator: Screwdriver or thumbscrew.
4. Inlet Connection: NPS 1/2 (DN 15).
5. Discharge Connection: NPS 1/8 (DN 6).
6. CWP Rating: 150 psig (1035 kPa).
7. Maximum Operating Temperature: 225 deg F (107 deg C).

C. Bladder-Type Expansion Tanks:

1. Tank: Welded steel, rated for 125-psig (860-kPa) working pressure and 375 deg F (191 deg C) maximum operating temperature. Factory test with taps fabricated and supports installed and labeled according to ASME Boiler and Pressure Vessel Code: Section VIII, Division 1.
2. Bladder: Securely sealed into tank to separate air charge from system water to maintain required expansion capacity.
3. Air-Charge Fittings: Schrader valve, stainless steel with EPDM seats.

D. Tangential-Type Air Separators:

1. Tank: Welded steel; ASME constructed and labeled for 125-psig (860-kPa) minimum working pressure and 375 deg F (191 deg C) maximum operating temperature.
2. Air and dirt Collector Tube: Perforated stainless steel, constructed to direct released air into expansion tank and coalescing medium to remove floating debris.
3. Tangential Inlet and Outlet Connections: Threaded for NPS 2 (DN 50) and smaller; flanged connections for NPS 2-1/2 (DN 65) and larger.
4. Blowdown Connection: Threaded.
5. Size: Match system flow capacity.

2.7 CHEMICAL TREATMENT

A. Chemical Treatment by Nalco. See 232500 “HVAC Water Treatment”.

2.8 HYDRONIC PIPING SPECIALTIES

A. Y-Pattern Strainers:

1. Body: ASTM A 126, Class B, cast iron with bolted cover and bottom drain connection.
2. End Connections: Threaded ends for NPS 2 (DN 50) and smaller; flanged ends for NPS 2-1/2 (DN 65) and larger.
3. Strainer Screen: 40-mesh startup strainer and perforated stainless-steel basket with 50 percent free area.
4. CWP Rating: 125 psig (860 kPa).

B. Stainless-Steel Bellow, Flexible Connectors:

1. Body: Stainless-steel bellows with woven, 18” flexible, bronze, wire-reinforcing protective jacket.
2. End Connections: Threaded or flanged to match equipment connected.
3. Performance: Capable of 3/4-inch (20-mm) misalignment.
4. CWP Rating: 150 psig (1035 kPa).
5. Maximum Operating Temperature: 250 deg F (121 deg C).

PART 3 - EXECUTION

3.1 PIPING APPLICATIONS

A. Chilled-water and hot-water piping, aboveground, NPS 2” (DN 50) and smaller, shall be any of the following:

1. Type L, drawn-temper copper tubing, wrought-copper fittings, and soldered joints. Pro Press fittings are allowed.

B. Chilled-water piping and hot-water piping, aboveground, NPS 3” and larger, shall be any of the following:

1. Schedule 40 steel pipe, wrought-steel fittings and wrought-cast or forged-steel flanges and flange fittings, and welded and flanged joints.

C. Condensate-Drain Piping: Type L drawn-temper copper tubing, wrought-copper fittings, and soldered joints.

D. Air-Vent Piping:

1. Inlet: Same as service where installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.
2. Outlet: Type L, copper tubing with soldered or flared joints.

E. Safety-Valve-Inlet and -Outlet Piping for Hot-Water Piping: Same materials and joining methods as for piping specified for the service in which safety valve is installed with metal-to-plastic transition fittings for plastic piping systems according to the piping manufacturer's written instructions.

3.2 VALVE APPLICATIONS

A. Install shut off-duty valves at each branch connection to supply mains, and at supply connection to each piece of equipment.

B. Install throttling-duty or calibrated-orifice, balancing valves at each branch connection to return main.

C. Install calibrated-orifice, balancing valves in the return pipe of each heating or cooling terminal.

D. Install check valves at each pump discharge and elsewhere as required to control flow direction.

E. Install safety valves at hot-water generators and elsewhere as required by ASME Boiler and Pressure Vessel Code. Install drip-pan elbow on safety-valve outlet and pipe without valves to the outdoors; and pipe drain to nearest floor drain or as indicated on Drawings. Comply with ASME Boiler and Pressure Vessel Code: Section VIII, Division 1, for installation requirements.

F. Install pressure-reducing valves at makeup-water connection to regulate system fill pressure.

3.3 PIPING INSTALLATIONS

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of piping systems. Indicate piping locations and arrangements if such were used to size pipe and calculate friction loss, expansion, pump sizing, and other design considerations. Install piping as indicated unless deviations to layout are approved on Coordination Drawings.

B. Install piping in concealed locations, unless otherwise indicated and except in equipment rooms and service areas.

C. Install piping indicated to be exposed and piping in equipment rooms and service areas at right angles or parallel to building walls. Diagonal runs are prohibited unless specifically indicated otherwise.

D. Install piping above accessible ceilings to allow sufficient space for ceiling panel removal.

E. Install piping to permit valve servicing.

F. Install piping at indicated slopes.

G. Install piping free of sags and bends.

H. Install fittings for changes in direction and branch connections.

I. Install piping to allow application of insulation.

J. Select system components with pressure rating equal to or greater than system operating pressure.

K. Install groups of pipes parallel to each other, spaced to permit applying insulation and servicing of valves.

L. Install drains, consisting of a tee fitting, NPS 3/4 (DN 20) ball valve, and short NPS 3/4 (DN 20) threaded nipple with cap, at low points in piping system mains and elsewhere as required for system drainage.

M. Install piping at a uniform grade of 0.2 percent upward in direction of flow.

N. Reduce pipe sizes using eccentric reducer fitting installed with level side up.

O. Install branch connections to mains using mechanically formed tee fittings in main pipe, with the branch connected to the bottom of the main pipe. For up-feed risers, connect the branch to the top of the main pipe.

P. Install valves according to Division 23 Section "Valves."

Q. Install unions in piping, NPS 2 (DN 50) and smaller, adjacent to valves, at final connections of equipment, and elsewhere as indicated.

R. Install flanges in piping, NPS 2-1/2 (DN 65) and larger, at final connections of equipment and elsewhere as indicated.

S. Install strainers on inlet side of each control valve, pressure-reducing valve, solenoid valve, in-line pump, and elsewhere as indicated. Install NPS 3/4 (DN 20) nipple and ball valve in blowdown connection of strainers NPS 2 (DN 50) and larger. Match size of strainer blowoff connection for strainers smaller than NPS 2 (DN 50).

T. Identify piping as specified in Division 23 Section 230553 “Identification for HVAC Piping and Equipment.”

3.4 HANGERS AND SUPPORTS

A. Install the following pipe attachments:

1. Adjustable steel clevis hangers for individual horizontal piping less than 20 feet (6 m) long.
2. Adjustable roller hangers and spring hangers for individual horizontal piping 20 feet (6 m) or longer.
3. Pipe Roller: MSS SP-58, Type 44 for multiple horizontal piping 20 feet (6 m) or longer, supported on a trapeze.
4. Spring hangers to support vertical runs.
5. Provide copper-clad hangers and supports for hangers and supports in direct contact with copper pipe.
6. On plastic pipe, install pads or cushions on bearing surfaces to prevent hanger from scratching pipe.

B. Install hangers for steel piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 (DN 20): Maximum span, 7 feet (2.1 m); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 1 (DN 25): Maximum span, 7 feet (2.1 m); minimum rod size, 1/4 inch (6.4

mm).

3. NPS 1-1/2 (DN 40): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
4. NPS 2 (DN 50): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).
5. NPS 2-1/2 (DN 65): Maximum span, 11 feet (3.4 m); minimum rod size, 3/8 inch (10 mm).
6. NPS 3 (DN 80): Maximum span, 12 feet (3.7 m); minimum rod size, 3/8 inch (10 mm).
7. NPS 4 (DN 100): Maximum span, 14 feet (4.3 m); minimum rod size, 1/2 inch (13 mm).

C. Install hangers for drawn-temper copper piping with the following maximum spacing and minimum rod sizes:

1. NPS 3/4 (DN 20): Maximum span, 5 feet (1.5 m); minimum rod size, 1/4 inch (6.4 mm).
2. NPS 1 (DN 25): Maximum span, 6 feet (1.8 m); minimum rod size, 1/4 inch (6.4 mm).
3. NPS 1-1/2 (DN 40): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
4. NPS 2 (DN 50): Maximum span, 8 feet (2.4 m); minimum rod size, 3/8 inch (10 mm).
5. NPS 2-1/2 (DN 65): Maximum span, 9 feet (2.7 m); minimum rod size, 3/8 inch (10 mm).
6. NPS 3 (DN 80): Maximum span, 10 feet (3 m); minimum rod size, 3/8 inch (10 mm).

D. Support vertical runs at roof, at each floor, and at 10-foot (3-m) intervals between floors.

3.5 PIPE JOINT CONSTRUCTION

A. Join pipe and fittings according to the following requirements and Division 23 Sections specifying piping systems.

B. Ream ends of pipes and tubes and remove burrs. Bevel plain ends of steel pipe.

C. Remove scale, slag, dirt, and debris from inside and outside of pipe and fittings before assembly.

D. Soldered Joints: Apply ASTM B 813, water-flushable flux, unless otherwise indicated, to tube end. Construct joints according to ASTM B 828 or CDA's "Copper Tube Handbook," using lead-free solder alloy complying with ASTM B 32.

E. Brazed Joints: Construct joints according to AWS's "Brazing Handbook," "Pipe and Tube" Chapter, using copper-phosphorus brazing filler metal complying with AWS A5.8.

F. Threaded Joints: Thread pipe with tapered pipe threads according to ASME B1.20.1. Cut threads full and clean using sharp dies. Ream threaded pipe ends to remove burrs and restore full ID. Join pipe fittings and valves as follows:

1. Apply appropriate tape or thread compound to external pipe threads unless dry seal threading is specified.
2. Damaged Threads: Do not use pipe or pipe fittings with threads that are corroded or damaged. Do not use pipe sections that have cracked or open welds.

G. Flanged Joints: Select appropriate gasket material, size, type, and thickness for service application. Install gasket concentrically positioned. Use suitable lubricants on bolt threads.

H. Mechanically Formed, Copper-Tube-Outlet Joints: Use manufacturer-recommended tool and procedure, and brazed joints.

3.6 HYDRONIC SPECIALTIES INSTALLATION

A. Install manual air vents at high points in piping, at heat-transfer coils, and elsewhere as required for system air venting.

B. Install piping from, air separator, or air purge to expansion tank with a 2 percent upward slope toward tank.

C. Install in-line air separators in pump suction. Install drain valve on air separators NPS 2 (DN 50) and larger.

D. Install bypass chemical feeders in each hydronic system where indicated, in upright position with top of funnel not more than 48 inches (1200 mm) above the floor. Install feeder in minimum NPS 3/4 (DN 20) bypass line, from main with full-size, full-port, ball valve in the main between bypass connections. Install NPS 3/4 (DN 20) pipe from chemical feeder drain to nearest equipment drain and include a full-size, full-port, ball valve.

E. Install tank fitting in tank bottom and charge tank. Use manual vent for initial fill to establish proper water level in tank.

1. Install tank fittings that are shipped loose.
2. Support tank from floor or structure above with sufficient strength to carry weight of tank, piping connections, fittings, plus tank full of water. Do not overload building components and structural members.

F. Install tangential air separator with coalescing medium in pump suction. Install blowdown piping with gate or full-port ball valve; extend full size to nearest floor drain.

G. Install expansion tanks on the floor. Vent and purge air from hydronic system, and ensure tank is properly charged with air to suit system Project requirements.

3.7 TERMINAL EQUIPMENT CONNECTIONS

A. Sizes for supply and return piping connections shall be the same as or larger than equipment connections.

B. Install control valves in accessible locations close to connected equipment.

C. Install bypass piping with globe valve around control valve. If parallel control valves are installed, only one bypass is required.

D. Install ports for pressure gages and thermometers at coil inlet and outlet connections according to Division 15 Section 15121 "Meters and Gages for HVAC Piping."

3.8 FIELD QUALITY CONTROL

A. Prepare hydronic piping according to ASME B31.9 and as follows:

1. Leave joints, including welds, uninsulated and exposed for examination during test.
2. Provide temporary restraints for expansion joints that cannot sustain reactions due to test pressure. If temporary restraints are impractical, isolate expansion joints from testing.
3. Flush hydronic piping systems with clean water; then remove and clean or replace strainer screens.
4. Isolate equipment from piping. If a valve is used to isolate equipment, its closure shall be capable of sealing against test pressure without damage to valve. Install blinds in flanged joints to isolate equipment.
5. Install safety valve, set at a pressure no more than one-third higher than test pressure, to protect against damage by expanding liquid or other source of overpressure during test.

B. Perform the following tests on hydronic piping:

1. Use ambient temperature water as a testing medium unless there is risk of damage due to freezing. Another liquid that is safe for workers and compatible with piping may be used.
2. While filling system, use vents installed at high points of system to release air. Use drains installed at low points for complete draining of test liquid.
3. Isolate expansion tanks and determine that hydronic system is full of water.
4. Subject piping system to hydrostatic test pressure that is not less than 1.5 times the system's working pressure. Test pressure shall not exceed maximum pressure for any vessel, pump, valve, or other component in system under test. Verify that stress due to pressure at bottom of vertical runs does not exceed 90 percent of specified minimum yield strength or 1.7 times "SE" value in Appendix A in ASME B31.9, "Building Services Piping."
5. After hydrostatic test pressure has been applied for at least 10 minutes, examine piping, joints, and connections for leakage. Eliminate leaks by tightening, repairing, or replacing components, and repeat hydrostatic test until there are no leaks.
6. Prepare written report of testing.

C. Perform the following before operating the system:

1. Open manual valves fully.
2. Inspect pumps for proper rotation.
3. Set makeup pressure-reducing valves for required system pressure.
4. Inspect air vents at high points of system and determine if all are installed and operating freely (automatic type), or bleed air completely (manual type).
5. Set temperature controls so all coils are calling for full flow.
6. Inspect and set operating temperatures of hydronic equipment, such as boilers, chillers, cooling towers, to specified values.
7. Verify lubrication of motors and bearings.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 23 3113
METAL DUCTS

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Single-wall rectangular ducts and fittings.
2. Single-wall round and flat-oval ducts and fittings.
3. Sheet metal materials.
4. Duct liner.
5. Sealants and gaskets.
6. Hangers and supports.

B. Related Sections:

1. Division 23 Section 23 3300 "Duct Accessories" for dampers, sound-control devices, duct-mounting access doors and panels, turning vanes, and flexible ducts.
2. Division 23 Section 23 0593"Testing, Adjusting, and Balancing" for testing, adjusting, and balancing requirements for metal ducts.

1.2 PERFORMANCE REQUIREMENTS

A. Delegated Duct Design: Duct construction, including sheet metal thicknesses, seam and joint construction, reinforcements, and hangers and supports, shall comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" and performance requirements and design criteria indicated in "Duct Schedule" Article.

B. Structural Performance: Duct hangers and supports shall withstand the effects of gravity loads and stresses within limits and under conditions described in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible".

C. Airstream Surfaces: Surfaces in contact with the airstream shall comply with requirements in ASHRAE 62.1-2010.

1.3 SUBMITTALS

A. Submit Product Data: For each type of the following products:

1. Liners and adhesives.
2. Sealants and gaskets.

B. Submit Shop Drawings:

1. Fabrication, assembly, and installation, including plans, elevations, sections, components, and attachments to other work.
2. Factory- and shop-fabricated ducts and fittings.
3. Duct layout indicating sizes, configuration, liner material, and static-pressure classes.
4. Elevation of top of ducts.
5. Dimensions of main duct runs from building grid lines.
6. Fittings.
7. Reinforcement and spacing.
8. Seam and joint construction.
9. Penetrations through fire-rated and other partitions.
10. Equipment installation based on equipment being used on Project.
11. Locations for duct accessories, including dampers, turning vanes, and access doors and panels.
12. Hangers and supports, including methods for duct and building attachment and vibration

isolation.

C. Submit coordination Drawings: Plans drawn to scale, on which the following items are shown and coordinated with each other, using input from installers of the items involved:

1. Duct installation in congested spaces, indicating coordination with general construction, building components, and other building services. Indicate proposed changes to duct layout.
2. Suspended ceiling components.
3. Structural members to which duct will be attached.
4. Size and location of initial access modules for acoustical tile.
5. Penetrations of smoke barriers and fire-rated construction.
6. Items penetrating finished ceiling including the following:

   a. Lighting fixtures.
   b. Air outlets and inlets.
   c. Speakers.
   d. Sprinklers.
   e. Access panels.
   f. Perimeter moldings.

D. Submit welding certificates.

E. Submit field quality-control reports.

1.4 QUALITY ASSURANCE

A. Welding Qualifications: Qualify procedures and personnel according to the following:

1. AWS D1.1/D1.1M, "Structural Welding Code - Steel," for hangers and supports.
2. AWS D1.2/D1.2M, "Structural Welding Code - Aluminum," for aluminum supports.
3. AWS D9.1M/D9.1, "Sheet Metal Welding Code," for duct joint and seam welding.

B. ASHRAE Compliance: Applicable requirements in ASHRAE 62.1-2004, Section 5 - "Systems and Equipment" and Section 7 - "Construction and System Start-Up."

C. ASHRAE/IESNA Compliance: Applicable requirements in ASHRAE/IESNA 90.1-2004, Section 6.4.4 - "HVAC System Construction and Insulation."

PART 2 - PRODUCTS

2.1 SINGLE-WALL RECTANGULAR DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" based on indicated static-pressure class unless otherwise indicated.

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-4, "Transverse (Girth) Joints," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 1-5, "Longitudinal Seams - Rectangular Ducts," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

D. Elbows, Transitions, Offsets, Branch Connections, and Other Duct Construction: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 2, "Fittings and Other Construction," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.2 SINGLE-WALL ROUND AND FLAT-OVAL DUCTS AND FITTINGS

A. General Fabrication Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 3, "Round, Oval, and Flexible Duct," based on indicated static-pressure class unless otherwise indicated.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

    a. McGill AirFlow LLC.
    b. Sheet Metal Connectors, Inc.
    c. Spiral Manufacturing Co., Inc.
    d. Eastern SheetMetal

B. Transverse Joints: Select joint types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-2, "Transverse Joints - Round Duct," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Transverse Joints in Ducts Larger Than 60 Inches (1524 mm) in Diameter: Flanged.

C. Longitudinal Seams: Select seam types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-1, "Seams - Round Duct and Fittings," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

1. Fabricate round ducts larger than 90 inches (2286 mm) in diameter with butt-welded longitudinal seams.
2. Fabricate flat-oval ducts larger than 72 inches (1830 mm) in width (major dimension) with butt-welded longitudinal seams.

D. Tees and Laterals: Select types and fabricate according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees," for static-pressure class, applicable sealing requirements, materials involved, duct-support intervals, and other provisions in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

2.3 SHEET METAL MATERIALS

A. General Material Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G60 (Z180).
2. Finishes for Surfaces Exposed to View: Mill phosphatized.

C. Carbon-Steel Sheets: Comply with ASTM A 1008/A 1008M, with oiled, matte finish for exposed

ducts.

D. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304 or 316, as indicated in the "Duct Schedule" Article; cold rolled, annealed, sheet. Exposed surface finish shall be No. 2B, No. 2D, No. 3, or No. 4 as indicated in the "Duct Schedule" Article.

E. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M) Alloy 3003, H14 temper; with mill finish for concealed ducts, and standard, one-side bright finish for duct surfaces exposed to view.

F. Reinforcement Shapes and Plates: ASTM A 36/A 36M, steel plates, shapes, and bars; black and galvanized.

1. Where black- and galvanized-steel shapes and plates are used to reinforce aluminum ducts, isolate the different metals with butyl rubber, neoprene, or EPDM gasket materials.

G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.4 DUCT LINER

A. Flexible Elastomeric Duct Liner: Preformed, cellular, closed-cell, sheet materials complying with ASTM C 534, Type II, Grade 1; and with NFPA 90A or NFPA 90B.

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

a. Aeroflex USA Inc.
b. Armacell LLC.
c. Rubatex International, LLC

2. Surface-Burning Characteristics: Maximum flame-spread index of 25 and maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.
3. Liner Adhesive: As recommended by insulation manufacturer and complying with NFPA 90A or NFPA 90B.

a. For indoor applications, use adhesive that has a VOC content of 50 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

B. Insulation Pins and Washers:

1. Cupped-Head, Capacitor-Discharge-Weld Pins: Copper- or zinc-coated steel pin, fully annealed for capacitor-discharge welding, 0.106-inch- (2.6-mm-) diameter shank, length to suit depth of insulation indicated with integral 1-1/2-inch (38-mm) galvanized carbon-steel washer.
2. Insulation-Retaining Washers: Self-locking washers formed from 0.016-inch- (0.41-mm-) thick galvanized steel; with beveled edge sized as required to hold insulation securely in place but not less than 1-1/2 inches (38 mm) in diameter.

C. Shop Application of Duct Liner: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-19, "Flexible Duct Liner Installation."

1. Adhere a single layer of indicated thickness of duct liner with at least 90 percent adhesive coverage at liner contact surface area. Attaining indicated thickness with multiple layers of duct liner is prohibited.
2. Apply adhesive to transverse edges of liner facing upstream that do not receive metal nosing.
3. Butt transverse joints without gaps, and coat joint with adhesive.
4. Fold and compress liner in corners of rectangular ducts or cut and fit to ensure butted edge overlapping.

5. Do not apply liner in rectangular ducts with longitudinal joints, except at corners of ducts, unless duct size and dimensions of standard liner make longitudinal joints necessary.
6. Apply adhesive coating on longitudinal seams in ducts with air velocity of 2500 fpm (12.7 m/s).
7. Secure liner with mechanical fasteners 4 inches (100 mm) from corners and at intervals not exceeding 12 inches (300 mm) transversely; at 3 inches (75 mm) from transverse joints and at intervals not exceeding 18 inches (450 mm) longitudinally.
8. Secure transversely oriented liner edges facing the airstream with metal nosings that have either channel or "Z" profiles or are integrally formed from duct wall.
9. Secure insulation between perforated sheet metal inner duct of same thickness as specified for outer shell. Use mechanical fasteners that maintain inner duct at uniform distance from outer shell without compressing insulation.
10. Terminate inner ducts with buildouts attached to fire-damper sleeves, dampers, turning vane assemblies, or other devices. Fabricated buildouts (metal hat sections) or other buildout means are optional; when used, secure buildouts to duct walls with bolts, screws, rivets, or welds.

2.5 SEALANT AND GASKETS

A. General Sealant and Gasket Requirements: Surface-burning characteristics for sealants and gaskets shall be a maximum flame-spread index of 25 and a maximum smoke-developed index of 50 when tested according to UL 723; certified by an NRTL.

B. Two-Part Tape Sealing System:

1. Tape: Woven cotton fiber impregnated with mineral gypsum and modified acrylic/silicone activator to react exothermically with tape to form hard, durable, airtight seal.
2. Tape Width: 4 inches (102 mm).
3. Sealant: Modified styrene acrylic.
4. Water resistant.
5. Mold and mildew resistant.
6. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
7. Service: Indoor and outdoor.
8. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum.
10. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

C. Water-Based Joint and Seam Sealant:

1. Application Method: Brush on.
2. Solids Content: Minimum 65 percent.
3. Shore A Hardness: Minimum 20.
4. Water resistant.
5. Mold and mildew resistant.
6. VOC: Maximum 75 g/L (less water).
7. Maximum Static-Pressure Class: 10-inch wg (2500 Pa), positive and negative.
8. Service: Indoor or outdoor.
9. Substrate: Compatible with galvanized sheet steel (both PVC coated and bare), stainless steel, or aluminum sheets.

D. Flanged Joint Sealant: Comply with ASTM C 920.

1. General: Single-component, acid-curing, silicone, elastomeric.

2. Type: S.
3. Grade: NS.
4. Class: 25.
5. Use: O.
6. For indoor applications, use sealant that has a VOC content of 250 g/L or less when calculated according to 40 CFR 59, Subpart D (EPA Method 24).

E. Flange Gaskets: Butyl rubber, neoprene, or EPDM polymer with polyisobutylene plasticizer.

F. Round Duct Joint O-Ring Seals:

1. Seal shall provide maximum leakage class of 3 cfm/100 sq. ft. at 1-inch wg (0.14 L/s per sq. m at 250 Pa) and shall be rated for 10-inch wg (2500-Pa) static-pressure class, positive or negative.
2. EPDM O-ring to seal in concave bead in coupling or fitting spigot.
3. Double-lipped, EPDM O-ring seal, mechanically fastened to factory-fabricated couplings and fitting spigots.

2.6 HANGERS AND SUPPORTS

A. Hanger Rods for Noncorrosive Environments: Cadmium-plated steel rods and nuts.

B. Hanger Rods for Corrosive Environments: Electrogalvanized, all-thread rods or galvanized rods with threads painted with zinc-chromate primer after installation.

C. Strap and Rod Sizes: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct."

D. Steel Cables for Galvanized-Steel Ducts: Galvanized steel complying with ASTM A 603.

E. Steel Cables for Stainless-Steel Ducts: Stainless steel complying with ASTM A 492.

F. Steel Cable End Connections: Cadmium-plated steel assemblies with brackets, swivel, and bolts designed for duct hanger service; with an automatic-locking and clamping device.

G. Duct Attachments: Sheet metal screws, blind rivets, or self-tapping metal screws; compatible with duct materials.

H. Trapeze and Riser Supports:

1. Supports for Galvanized-Steel Ducts: Galvanized-steel shapes and plates.
2. Supports for Stainless-Steel Ducts: Stainless-steel shapes and plates.
3. Supports for Aluminum Ducts: Aluminum or galvanized steel coated with zinc chromate.

PART 3 - EXECUTION

3.1 DUCT INSTALLATION

A. Drawing plans, schematics, and diagrams indicate general location and arrangement of duct system. Indicated duct locations, configurations, and arrangements were used to size ducts and calculate friction loss for air-handling equipment sizing and for other design considerations. Install duct systems as indicated unless deviations to layout are approved on Shop Drawings and Coordination Drawings.

B. Install ducts according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" unless otherwise indicated.

C. Install round and flat-oval ducts in maximum practical lengths.

D. Install ducts with fewest possible joints.

E. Install factory- or shop-fabricated fittings for changes in direction, size, and shape and for branch connections.

F. Unless otherwise indicated, install ducts vertically and horizontally, and parallel and perpendicular to building lines.

G. Install ducts close to walls, overhead construction, columns, and other structural and permanent enclosure elements of building.

H. Install ducts with a clearance of 1 inch (25 mm), plus allowance for insulation thickness.

I. Route ducts to avoid passing through transformer vaults and electrical equipment rooms and enclosures.

J. Where ducts pass through non-fire-rated interior partitions and exterior walls and are exposed to view, cover the opening between the partition and duct or duct insulation with sheet metal flanges of same metal thickness as the duct. Overlap openings on four sides by at least 1-1/2 inches (38 mm).

K. Where ducts pass through fire/smoke-rated interior partitions and exterior walls, install combination fire/smoke dampers. Comply with requirements in Division 23 Section 233300 "Duct Accessories" for fire and smoke dampers.

L. Protect duct interiors from moisture, construction debris and dust, and other foreign materials. Comply with SMACNA's "Duct Cleanliness for New Construction Guidelines."

3.2 INSTALLATION OF EXPOSED DUCTWORK

A. Protect ducts exposed in finished spaces from being dented, scratched, or damaged.

B. Trim duct sealants flush with metal. Create a smooth and uniform exposed bead. Do not use two-part tape sealing system.

C. Grind welds to provide smooth surface free of burrs, sharp edges, and weld splatter. When welding stainless steel with a No. 3 or 4 finish, grind the welds flush, polish the exposed welds, and treat the welds to remove discoloration caused by welding.

D. Maintain consistency, symmetry, and uniformity in the arrangement and fabrication of fittings, hangers and supports, duct accessories, and air outlets.

E. Repair or replace damaged sections and finished work that does not comply with these requirements.

F. Support with sheet metal band and one all threaded rod up to support.

3.3 DUCT SEALING

A. Seal ducts for duct static-pressure, seal classes, and leakage classes specified in "Duct Schedule" Article according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."

B. Seal ducts to the following seal classes according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible":

1. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible."
2. Outdoor, Supply-Air Ducts: Seal Class A.
3. Outdoor, Exhaust Ducts: Seal Class C.
4. Outdoor, Return-Air Ducts: Seal Class C.
5. Unconditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and

Lower: Seal Class B.
6. Unconditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class A.
7. Unconditioned Space, Exhaust Ducts: Seal Class C.
8. Unconditioned Space, Return-Air Ducts: Seal Class B.
9. Conditioned Space, Supply-Air Ducts in Pressure Classes 2-Inch wg (500 Pa) and Lower: Seal Class C.
10. Conditioned Space, Supply-Air Ducts in Pressure Classes Higher Than 2-Inch wg (500 Pa): Seal Class B.
11. Conditioned Space, Exhaust Ducts: Seal Class B.
12. Conditioned Space, Return-Air Ducts: Seal Class C.

3.4 HANGER AND SUPPORT INSTALLATION

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Chapter 4, "Hangers and Supports."

B. Building Attachments: Concrete inserts, powder-actuated fasteners, or structural-steel fasteners appropriate for construction materials to which hangers are being attached.

1. Where practical, install concrete inserts before placing concrete.
2. Install powder-actuated concrete fasteners after concrete is placed and completely cured.
3. Use powder-actuated concrete fasteners for standard-weight aggregate concretes or for slabs more than 4 inches (100 mm) thick.
4. Do not use powder-actuated concrete fasteners for lightweight-aggregate concretes or for slabs less than 4 inches (100 mm) thick.
5. Do not use powder-actuated concrete fasteners for seismic restraints.

C. Hanger Spacing: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 4-1 (Table 4-1M), "Rectangular Duct Hangers Minimum Size," and Table 4-2, "Minimum Hanger Sizes for Round Duct," for maximum hanger spacing; install hangers and supports within 24 inches (610 mm) of each elbow and within 48 inches (1200 mm) of each branch intersection.

D. Hangers Exposed to View: Threaded rod and angle or channel supports.

E. Support vertical ducts with steel angles or channel secured to the sides of the duct with welds, bolts, sheet metal screws, or blind rivets; support at each floor and at a maximum interval of 16 feet (5 m).

F. Install upper attachments to structures. Select and size upper attachments with pull-out, tension, and shear capacities appropriate for supported loads and building materials where used.

3.5 CONNECTIONS

A. Make connections to equipment with flexible connectors complying with Division 23 Section "Duct Accessories."

B. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for branch, outlet and inlet, and terminal unit connections.

3.6 PAINTING

A. Paint interior of metal ducts that are visible through registers and grilles and that do not have duct liner. Apply one coat of flat, black, latex paint over a compatible galvanized-steel primer. Paint materials and application requirements are specified in Division 9 painting Sections.

3.7 DUCT CLEANING

A. Clean new duct system(s) before testing, adjusting, and balancing.

B. Particulate Collection and Odor Control:

1. When venting vacuuming system inside the building, use HEPA filtration with 99.97 percent collection efficiency for 0.3-micron-size (or larger) particles.
2. When venting vacuuming system to outdoors, use filter to collect debris removed from HVAC system, and locate exhaust downwind and away from air intakes and other points of entry into building.

C. Clean the following components by removing surface contaminants and deposits:

1. Air outlets and inlets (registers, grilles, and diffusers).
2. Supply, return, and exhaust fans including fan housings, plenums (except ceiling supply and return plenums), scrolls, blades or vanes, shafts, baffles, dampers, and drive assemblies.
3. Air-handling unit internal surfaces and components including mixing box, coil section, air wash systems, spray eliminators, condensate drain pans, humidifiers and dehumidifiers, filters and filter sections, and condensate collectors and drains.
4. Coils and related components.
5. Return-air ducts, dampers, actuators, and turning vanes except in ceiling plenums and mechanical equipment rooms.
6. Supply-air ducts, dampers, actuators, and turning vanes.
7. Dedicated exhaust and ventilation components and makeup air systems.

D. Mechanical Cleaning Methodology:

1. Clean metal duct systems using mechanical cleaning methods that extract contaminants from within duct systems and remove contaminants from building.
2. Use vacuum-collection devices that are operated continuously during cleaning. Connect vacuum device to downstream end of duct sections so areas being cleaned are under negative pressure.
3. Use mechanical agitation to dislodge debris adhered to interior duct surfaces without damaging integrity of metal ducts, duct liner, or duct accessories.
4. Clean fibrous-glass duct liner with HEPA vacuuming equipment; do not permit duct liner to get wet. Replace fibrous-glass duct liner that is damaged, deteriorated, or delaminated or that has friable material, mold, or fungus growth.
5. Clean coils and coils drain pans according to NADCA 1992. Keep drain pan operational. Rinse coils with clean water to remove latent residues and cleaning materials; comb and straighten fins.
6. Provide drainage and cleanup for wash-down procedures.
7. Antimicrobial Agents and Coatings: Apply EPA-registered antimicrobial agents if fungus is present. Apply antimicrobial agents according to manufacturer's written instructions after removal of surface deposits and debris.

3.8 START UP

A. Air Balance: Comply with requirements in Division 23 Section 230593 "Testing, Adjusting, and Balancing."

3.9 DUCT SCHEDULE

A. Fabricate ducts with galvanized sheet steel unless noted otherwise.

B. Supply Ducts:

1. Ducts Connected to Blower Coil Units:

a. Pressure Class: Positive 1-inch wg (250 Pa).

b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 24.

2. Ducts Connected to AHUs:

a. Pressure Class: Positive 4-inch wg (750 Pa).
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 24.

C. Return and Outdoor Air Ducts:

1. Ducts Connected to Fan Coil Units:

a. Pressure Class: Positive or negative 1-inch wg (250 Pa).
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 24.

2. Ducts (exhaust air) Connected to EF and AHUs:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 24.

3. Ducts Connected to Equipment Not Listed Above:

a. Pressure Class: Positive or negative 2-inch wg (500 Pa).
b. Minimum SMACNA Seal Class: C.
c. SMACNA Leakage Class for Rectangular: 24.
d. SMACNA Leakage Class for Round and Flat Oval: 24.

D. Intermediate Reinforcement:

1. Galvanized-Steel Ducts: Galvanized steel.

E. Liner:

1. Transfer Ducts: Fibrous-glass duct liner, 1 inch (25 mm) thick.
2. Supply Air Ducts: Flexible elastomeric, 2 inch thick (3” on roof, R-8 minimum).

a. 15’ downstream of AHUs

3. Return Air Ducts: Flexible elastomeric duct liner, 2 inch thick.
4.

a. 15’ upstream of AHUs

F. Elbow Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-2, "Rectangular Elbows."

a. Velocity 1000 fpm (5 m/s) or Lower:

1) Radius Type RE 1 with minimum 0.5 radius-to-diameter ratio.
2) Mitered Type RE 4 without vanes.

b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s):

1) Radius Type RE 1 with minimum 1.0 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 0.5 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

c. Velocity 1500 fpm (7.6 m/s) or Higher:

1) Radius Type RE 1 with minimum 1.5 radius-to-diameter ratio.
2) Radius Type RE 3 with minimum 1.0 radius-to-diameter ratio and two vanes.
3) Mitered Type RE 2 with vanes complying with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-3, "Vanes and Vane Runners," and Figure 2-4, "Vane Support in Elbows."

2. Round Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-3, "Round Duct Elbows."

a. Minimum Radius-to-Diameter Ratio and Elbow Segments: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Table 3-1, "Mitered Elbows." Elbows with less than 90-degree change of direction have proportionately fewer segments.

1) Radius-to Diameter Ratio: 1.5.

b. Round Elbows, 12 Inches (305 mm) and Smaller in Diameter: Stamped or pleated.
c. Round Elbows, 14 Inches (356 mm) and Larger in Diameter: Welded.

G. Branch Configuration:

1. Rectangular Duct: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 2-6, "Branch Connections."

a. Rectangular Main to Rectangular Branch: 45-degree entry.
b. Rectangular Main to Round Branch: Rectangular to round with standoff quadrant.

2. Round and Flat Oval: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible," Figure 3-4, "90 Degree Tees and Laterals," and Figure 3-5, "Conical Tees."

a. Velocity 1000 fpm (5 m/s) or Lower: 90-degree tap.
b. Velocity 1000 to 1500 fpm (5 to 7.6 m/s): Conical tap.
c. Velocity 1500 fpm (7.6 m/s) or Higher: 45-degree lateral.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 23 3300
DUCT ACCESSORIES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:

1. Backdraft and pressure relief dampers.
2. Manual volume dampers.
3. Control dampers.
4. Fire dampers.
5. Flange connectors.
6. Turning vanes.
7. Duct-mounted access doors.
8. Flexible connectors.
9. Flexible ducts.
10. Duct accessory hardware.

1.2 SUBMITTALS

A. Submit Product Data: For each type of product indicated.

B. Submit Shop Drawings: For duct accessories. Include plans, elevations, sections, details, and attachments to other work.

1. Detail duct accessories fabrication and installation in ducts and other construction. Include dimensions, weights, loads, and required clearances, and method of field assembly into duct systems and other construction. Include the following:

a. Special fittings.
b. Manual volume damper installations.
c. Control damper installations.
d. Fire-damper installations, including sleeves; and duct-mounted access doors.
e. Wiring Diagrams: For power, signal, and control wiring.

C. Submit operation and maintenance data.

1.3 QUALITY ASSURANCE

A. Comply with NFPA 90A, "Installation of Air Conditioning and Ventilating Systems," and with NFPA 90B, "Installation of Warm Air Heating and Air Conditioning Systems."

B. Comply with AMCA 500-D testing for damper rating.

PART 2 - PRODUCTS

2.1 MATERIALS

A. Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for acceptable materials, material thicknesses, and duct construction methods unless otherwise indicated. Sheet metal materials shall be free of pitting, seam marks, roller marks, stains, discolorations, and other imperfections.

B. Galvanized Sheet Steel: Comply with ASTM A 653/A 653M.

1. Galvanized Coating Designation: G90 (Z275).
2. Exposed-Surface Finish: Mill phosphatized.

C. Stainless-Steel Sheets: Comply with ASTM A 480/A 480M, Type 304, and having a No. 2 finish for concealed ducts and finish for exposed ducts.

D. Aluminum Sheets: Comply with ASTM B 209 (ASTM B 209M), Alloy 3003, Temper H14; with mill finish for concealed ducts and standard, 1-side bright finish for exposed ducts.

E. Extruded Aluminum: Comply with ASTM B 221 (ASTM B 221M), Alloy 6063, Temper T6.

F. Reinforcement Shapes and Plates: Galvanized-steel reinforcement where installed on galvanized sheet metal ducts; compatible materials for aluminum and stainless-steel ducts.

G. Tie Rods: Galvanized steel, 1/4-inch (6-mm) minimum diameter for lengths 36 inches (900 mm) or less; 3/8-inch (10-mm) minimum diameter for lengths longer than 36 inches (900 mm).

2.2 BACKDRAFT AND PRESSURE RELIEF DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.
4. Ruskin Company.
5. SEMCO Incorporated.

B. Description: Gravity balanced.

C. Maximum Air Velocity: 2000 fpm (10 m/s).

D. Maximum System Pressure: 1-inch wg (0.25 kPa).

E. Frame: 0.052-inch- (1.3-mm-) thick, galvanized sheet steel, with welded corners and mounting flange.

F. Blades: Multiple single-piece blades, center-pivoted, maximum 6-inch (150-mm) width, with sealed edges.

G. Blade Action: Parallel.

H. Blade Seals: Neoprene, mechanically locked.

I. Blade Axles:

1. Material: Galvanized steel.
2. Diameter: 0.20 inch (5 mm).

J. Tie Bars and Brackets: Aluminum.

K. Return Spring: Adjustable tension.

L. Bearings: Steel ball or synthetic pivot bushings.

M. Accessories:

1. Adjustment device to permit setting for varying differential static pressure.
2. Counterweights and spring-assist kits for vertical airflow installations.
3. Electric actuators.
4. Chain pulls.
5. Screen Mounting: Front mounted in sleeve.

a. Sleeve Thickness: 20-gage (1.0-mm) minimum.

b. Sleeve Length: 6 inches (152 mm) minimum.

6. Screen Mounting: Rear mounted.
7. Screen Material: Galvanized steel.
8. Screen Type: Insect.
9. 90-degree stops.

2.3 MANUAL VOLUME DAMPERS

A. Standard, Steel, Manual Volume Dampers:

1. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

   a. Greenheck Fan Corporation.
   b. METALAIRE, Inc.
   c. Ruskin Company.

2. Standard leakage rating.
3. Suitable for horizontal or vertical applications.
4. Frames:

   a. Hat-shaped, galvanized-steel channels, 0.064-inch (1.62-mm) minimum thickness.
   b. Mitered and welded corners.
   c. Flanges for attaching to walls and flangeless frames for installing in ducts.

5. Blades:

   a. Multiple or single blade.
   b. Parallel- or opposed-blade design.
   c. Stiffen damper blades for stability.
   d. Galvanized steel, 0.064 inch (1.62 mm) thick.

6. Blade Axles: Galvanized steel.
7. Bearings:

   a. Oil-impregnated bronze.
   b. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.

8. Tie Bars and Brackets: Galvanized steel.

2.4 CONTROL DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. American Warming and Ventilating; a division of Mestek, Inc.
2. Arrow United Industries; a division of Mestek, Inc.
3. Flexmaster U.S.A., Inc.
4. Greenheck Fan Corporation.
5. METALAIRE, Inc.
6. Nailor Industries Inc.
7. Ruskin Company.
8. Young Regulator Company.

B. Frames:

1. Hat shaped.
2. Galvanized-steel channels, 0.064 inch (1.62 mm) thick.
3. Mitered and welded corners.

C. Blades:

1. Multiple blades with maximum blade width of 8 inches (200 mm).
2. Parallel- and opposed-blade design.
3. Galvanized steel.
4. 0.064 inch (1.62 mm) thick.
5. Blade Edging: Closed-cell neoprene edging.
6. Blade Edging: Inflatable seal blade edging, or replaceable rubber seals.

D. Blade Axles: 1/2-inch- (13-mm-) diameter; galvanized steel; blade-linkage hardware of zinc-plated steel and brass; ends sealed against blade bearings.

1. Operating Temperature Range: From minus 40 to plus 200 deg F (minus 40 to plus 93 deg C).

E. Bearings:

1. Oil-impregnated bronze.
2. Dampers in ducts with pressure classes of 3-inch wg (750 Pa) or less shall have axles full length of damper blades and bearings at both ends of operating shaft.
3. Thrust bearings at each end of every blade.

2.5 FIRE DAMPERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Greenheck Fan Corporation.
2. METALAIRE, Inc.
3. Ruskin Company.

B. Type: Dynamic; rated and labeled according to UL 555 by an NRTL.

C. Closing rating in ducts up to 4-inch wg (1-kPa) static pressure class and minimum 4000-fpm (20-m/s) velocity.

D. Fire Rating: 1-1/2 and 3 hours.

E. Frame: Curtain type with blades outside airstream except when located behind grille where blades may be inside airstream; fabricated with roll-formed, 0.034-inch- (0.85-mm-) thick galvanized steel; with mitered and interlocking corners.

F. Mounting Sleeve: Factory- or field-installed, galvanized sheet steel.

1. Minimum Thickness: 0.052 or 0.138 inch (1.3 or 3.5 mm) thick, as indicated, and of length to suit application.
2. Exception: Omit sleeve where damper-frame width permits direct attachment of perimeter mounting angles on each side of wall or floor; thickness of damper frame must comply with sleeve requirements.

G. Mounting Orientation: Vertical or horizontal as indicated.

H. Blades: Roll-formed, interlocking, 0.034-inch- (0.85-mm-) thick, galvanized sheet steel. In place of interlocking blades, use full-length, 0.034-inch- (0.85-mm-) thick, galvanized-steel blade connectors.

I. Horizontal Dampers: Include blade lock and stainless-steel closure spring.

J. Heat-Responsive Device: Replaceable, 165 deg F (74 deg C) rated, fusible links.

2.6 FLANGE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Nexus PDQ; Division of Shilco Holdings Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Description: Add-on or roll-formed, factory-fabricated, slide-on transverse flange connectors, gaskets, and components.

C. Material: Galvanized steel.

D. Gage and Shape: Match connecting ductwork.

2.7 TURNING VANES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. METALAIRE, Inc.
4. SEMCO Incorporated.

B. Manufactured Turning Vanes for Metal Ducts: Curved blades of galvanized sheet steel; support with bars perpendicular to blades set; set into vane runners suitable for duct mounting.

C. General Requirements: Comply with SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-3, "Vanes and Vane Runners," and 2-4, "Vane Support in Elbows."

D. Vane Construction: Single wall for ducts up to 36 inches wide and double wall for larger dimensions.

2.8 DUCT-MOUNTED ACCESS DOORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:
1. Ductmate Industries, Inc.
2. Greenheck Fan Corporation.
3. Nailor Industries Inc.

B. Duct-Mounted Access Doors: Fabricate access panels according to SMACNA's "HVAC Duct Construction Standards - Metal and Flexible"; Figures 2-10, "Duct Access Doors and Panels," and 2-11, "Access Panels - Round Duct."

1. Door:

a. Double wall, rectangular.
b. Galvanized sheet metal with insulation fill and thickness as indicated for duct pressure class.
c. Hinges and Latches: 1-by-1-inch (25-by-25-mm) butt hinge and cam latches.
d. Fabricate doors airtight and suitable for duct pressure class.

2. Frame: 24” Galvanized. Conform to ASTM-A-591.

3. Seals: Door to Frame/Frame to Door-Neoprene gasket. Conform to ASTM-D 1056.68. Temperature range -20°F to 225°F .26 K Factor.

4. Latches: Dual camlock action on all doors 12” square and under. Two extra camlocks on larger sizes. Latches constructed of zinc plated cold rolled steel. Steel shall conform with ASTM-A A-366. Plating shall conform with ASTM-A 164.55.

5. Manufacture to the latest SMACNA standard or better. Designed for installation in duct having up to 3" W.C.

2.9 DUCT ACCESS PANEL ASSEMBLIES

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Flame Gard, Inc.
3. 3M.

B. Labeled according to UL 1978 by an NRTL.

C. Panel and Frame: Minimum thickness 0.0528-inch (1.3-mm) carbon steel.

D. Fasteners: Carbon steel. Panel fasteners shall not penetrate duct wall.

E. Gasket: Comply with NFPA 96; grease-tight, high-temperature ceramic fiber, rated for minimum 2000 deg F (1093 deg C).

F. Minimum Pressure Rating: 10-inch wg (2500 Pa), positive or negative.

2.10 FLEXIBLE CONNECTORS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Ductmate Industries, Inc.
2. Duro Dyne Inc.
3. Ward Industries, Inc.; a division of Hart & Cooley, Inc.

B. Materials: Flame-retardant or noncombustible fabrics.

C. Coatings and Adhesives: Comply with UL 181, Class 1.

D. Metal-Edged Connectors: Factory fabricated with a fabric strip 3-1/2 inches (89 mm) wide attached to 2 strips of 2-3/4-inch- (70-mm-) wide, 0.028-inch- (0.7-mm-) thick, galvanized sheet steel or 0.032-inch- (0.8-mm-) thick aluminum sheets. Provide metal compatible with connected ducts.

E. Indoor System, Flexible Connector Fabric: Glass fabric double coated with neoprene.

1. Minimum Weight: 26 oz./sq. yd. (880 g/sq. m).
2. Tensile Strength: 480 lbf/inch (84 N/mm) in the warp and 360 lbf/inch (63 N/mm) in the filling.
3. Service Temperature: Minus 40 to plus 200 deg F (Minus 40 to plus 93 deg C).

2.11 FLEXIBLE DUCTS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the following:

1. Flexmaster U.S.A., Inc.
2. McGill AirFlow LLC.

B. Insulated, Flexible Duct: UL 181, Class 1, black polymer film supported by helically wound, spring-steel wire; fibrous-glass insulation; polyethylene vapor-barrier film.

1. Pressure Rating: 4-inch wg (1000 Pa) positive and 0.5-inch wg (125 Pa) negative.
2. Maximum Air Velocity: 4000 fpm (20 m/s).
3. Temperature Range: Minus 20 to plus 175 deg F (Minus 29 to plus 79 deg C).

4. Insulation R-Value: Comply with ASHRAE 90.1-2013.

C. Flexible Duct Connectors:

1. Clamps: Stainless-steel band with cadmium-plated hex screw to tighten band with a worm-gear action in sizes 3 through 18 inches (75 through 460 mm), to suit duct size.
2. Non-Clamp Connectors: Adhesive plus sheet metal screws.

2.12 DUCT ACCESSORY HARDWARE

A. Instrument Test Holes: Cast iron or cast aluminum to suit duct material, including screw cap and gasket. Size to allow insertion of pitot tube and other testing instruments and of length to suit duct-insulation thickness.

B. Adhesives: High strength, quick setting, neoprene based, waterproof, and resistant to gasoline and grease.

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install duct accessories according to applicable details in SMACNA's "HVAC Duct Construction Standards - Metal and Flexible" for metal ducts and in NAIMA AH116, "Fibrous Glass Duct Construction Standards," for fibrous-glass ducts.

B. Install duct accessories of materials suited to duct materials; use galvanized-steel accessories in galvanized-steel and fibrous-glass ducts, stainless-steel accessories in stainless-steel ducts, and aluminum accessories in aluminum ducts.

C. Install backdraft dampers at inlet of exhaust fans or exhaust ducts as close as possible to exhaust fan unless otherwise indicated.

D. Install volume dampers at points on supply, return, and exhaust systems where branches extend from larger ducts. Where dampers are installed in ducts having duct liner, install dampers with hat channels of same depth as liner, and terminate liner with nosing at hat channel.

1. Install steel volume dampers in steel ducts.
2. Install aluminum volume dampers in aluminum ducts.

E. Set dampers to fully open position before testing, adjusting, and balancing.
F. Install test holes at fan inlets and outlets and elsewhere as indicated.
G. Install fire dampers and combination fire/smoke dampers according to UL listing.
H. Connect ducts to duct silencers rigidly.

I. Install duct access doors on sides of ducts to allow for inspecting, adjusting, and maintaining accessories and equipment at the following locations:

1. On both sides of duct coils.
2. Upstream from duct filters.
3. At outdoor-air intakes and mixed-air plenums.
4. At drain pans and seals.
5. Downstream from manual volume dampers, control dampers, backdraft dampers, and equipment.
6. Adjacent to and close enough to fire or smoke dampers, to reset or reinstall fusible links. Access doors for access to fire or smoke dampers having fusible links shall be pressure relief access doors; and shall be outward operation for access doors installed upstream from dampers and inward operation for access doors installed downstream from dampers.

7. At each change in direction and at maximum 50-foot (15-m) spacing.
8. Upstream from turning vanes.
9. Control devices requiring inspection.
10. Elsewhere as indicated.

J. Install access doors with swing against duct static pressure.

K. Access Door Sizes:

1. One-Hand or Inspection Access: 8 by 5 inches (200 by 125 mm).
2. Two-Hand Access: 12 by 6 inches (300 by 150 mm).
3. Head and Hand Access: 18 by 10 inches (460 by 250 mm).
4. Head and Shoulders Access: 21 by 14 inches (530 by 355 mm).
5. Body Access: 25 by 14 inches (635 by 355 mm).
6. Body plus Ladder Access: 25 by 17 inches (635 by 430 mm).

L. Label access doors according to Division 23 Section 230553 "Identification for HVAC Piping and Equipment" to indicate the purpose of access door.

M. Install flexible connectors to connect ducts to equipment.

N. For fans developing static pressures of 5-inch wg (1250 Pa) and more, cover flexible connectors with loaded vinyl sheet held in place with metal straps.

O. Connect diffusers to ducts with maximum 48-inch lengths of flexible duct clamped or strapped in place.

P. Connect flexible ducts to metal ducts with draw bands.

Q. Install duct test holes where required for testing and balancing purposes.

3.2 FIELD QUALITY CONTROL

A. Tests and Inspections:

1. Operate dampers to verify full range of movement.
2. Inspect locations of access doors and verify that purpose of access door can be performed.
3. Operate fire and smoke dampers to verify full range of movement and verify that proper heat-response device is installed.
4. Inspect turning vanes for proper and secure installation.

END OF SECTION

SECTION 23 3433
AIR CURTAINS

PART 1 - GENERAL

1.1 CONDITIONS AND REQUIREMENTS

A. The General Conditions, Supplementary Conditions, and Division 01 – General Requirements apply.

1.2 SECTION INCLUDES

A. Air curtains.

1.3 RELATED REQUIREMENTS

A. Section 05 40 00 - Cold-Formed Metal Framing: Reinforcing in wall as required for attachment of air curtain.
B. Section 08 11 00 - Metal Doors and Frames: Coordinate installation of switches.
C. Section 08 71 00 - Door Hardware: Coordinate with installation of hardware.
D. Division 26 - Electrical: Connection of electrical service and controls.

1.4 REFERENCE STANDARDS

A. American Society of Heating, Refrigerating and Air-Conditioning Engineers (ASHRAE):
   1. ASHRAE 135 - BACnet - A Data Communication Protocol for Building Automation and Control Networks.
   2. ASHRAE 135.1 - Method of Test for Conformance to BACnet

B. Air Movement & Control Association International, Inc. (AMCA):

   1. AMCA 211 - Certified Ratings Program - Product Rating Manual for Fan Air Performance.
   2. AMCA 220 - Laboratory Methods of Testing Air Curtain Units for Aerodynamic Performance Ratings.
   3. AMCA 222 - Application Manual for Air Curtain Units.

C. National Electrical Manufacturers Association (NEMA):

   1. NEMA 250 - Enclosures for Electrical Equipment (1000 Volts Maximum).

D. Underwriters Laboratories (UL):

   1. UL 507 - Electric Fans.
   2. UL 2021 - Fixed and Location-Dedicated Electric Room Heaters.
   3. UL 1995 - Heating and Cooling Equipment

1.5 SUBMITTALS

A. Submit under provisions of Section 01 33 00.

B. Product Data: Submit

   1. Rated capacities.
   2. Operating characteristics.
   3. Accessories.

   4. Options.

C. Shop Drawings: For air curtain components not adequately described by product data. Show configuration of non-standard units. Include plans, elevations, sections, details, and attachments to other work.

1. Indicate dimensions, weights, loads, clearances required, location and size of field connections.

2. Provide wiring diagrams for power, signal, and control wiring.

D. Operation and Maintenance Data: Manuals for air curtain operation and maintenance.

E. Warranties: Sample of special warranties.

1.6 QUALITY ASSURANCE

A. Manufacturers: Firms regularly engaged in manufacture of air curtains of the types and sizes required, whose products have been in satisfactory use in similar service for not less than 10 years. Provide air curtains produced by a manufacturer listed in this section.

B. Source Limitations: Obtain each type of air curtain through one (1) source from a single manufacturer.

C. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.

D. Aerodynamic Performance: Test units in accordance with AMCA 220, "Laboratory Methods of Testing Air Curtains for Aerodynamic Performance Ratings," for airflow rate, average outlet velocity, outlet velocity uniformity, velocity projection, and power rating.

E. Certification:
1. Provide units with AMCA Certified Ratings Seal.
2. UL and cUL listed to comply with applicable United States and Canadian standards.

1.7 DELIVERY, STORAGE AND HANDLING

A. Deliver air curtains in factory labeled packages.

B. Store and handle in strict compliance with manufacturer’s written instructions and recommendations.

C. Protect from damage due to weather, excessive temperature, and construction operations.

1.8 WARRANTY

A. Warranty: Manufacturer's standard form in which manufacturer agrees to repair or replace components of air curtains that fail in materials or workmanship within specified warranty period.

1. Five-year limited warranty for unheated (ambient) units.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Basis-of-Design Manufacturer: The design for air curtains is based on products manufactured by Berner International LLC, 111 Progress Avenue, New Castle; PA, Telephone: 724-658-3551;

Toll-Free Telephones: 800-245-4455 (U.S.), 800-242-4455 (Canada); Fax: 724-652-0682; email: airdoors@berner.com; Website: www.berner.com.

B. Substitutions will be considered under provisions of Section 01 60 00.

2.2 AIR CURTAINS

A. Acceptable Products: Berner Architectural Icon 08 Model AI08 Ambient.

B. Construction: Provide factory-assembled units of sufficient structural strength to be supported from ends without intermediate support. Ship units completely assembled.

C. Cabinet:

1. Material and Finish: Aluminum base frame with clear satin anodized aluminum cabinet.
2. Dimensions: Not to exceed 8.31 in. (21.1 cm) standard height with factory mounted disconnect by 16.13 in. (41.0 cm) standard depth.
3. Mounting: Provide for wall and suspended mounting.
4. Service Access: Removable screen and bottom access panel.

1/5-HP, 1800 RPM, single phase, variable speed, EC, direct driven, resilient mounted, continuous duty, with internal thermal-overload protection and permanently lubricated sealed ball bearings.

D. Fans: Balanced forward curved cross flow tangential type, made of aluminum with flexible hubs and mounted in matched fan scroll made of aluminized steel.

E. Discharge Nozzles:
1. Provide uniform velocity across width of air curtain.
2. Aperture: 2.25 in (5.715 cm) slot by width of air curtain.

F. Vanes: 1.50 in (3.8 cm) minimum height; articulating construction of airfoil-shaped aluminum extrusions; adjustable plus or minus 20 degrees to deflect airflow.

G. Inlet:
1. Location: Front.
2. Screen: Perforated pattern of the same material and finish used for the cabinet.
3. Inlet Filter: Flat faced fire-rated re-cleanable aluminum with integral bracket.

2.3 CONTROLS

A. Controller:

1. UL listed, industrial type, pre-wired, with solid-state control switch.

2. Factory-mounted and wired Intelliswitch™ digital programmable controller with the following features:

a. 5 volt DC output for external door and thermostat sensors.
b. Lock and Unlock tamperproof feature.
c. Motor control suitable for 10 fan speed settings.
d. Programmable fan start and fan stop time with provisions to set start and stop times for any day of the week.

e. Programmable settings for all user controlled options.
f. Adjustable time delay from 0 to 10 minutes.
g. Four (4) preset and three (3) customizable programs - On, Off, Automatic, Comfort Plus, Program 1, Program 2, and Program 3.
h. Built-in capillary style thermostat for heated units with temperature settings of 34 degrees F to 90 degrees F (1 degree C to 32 degrees C).
i. Comfort Plus heating mode calls for heat and fan.
j. Emergency stop.
k. Clock with lighted display.
l. Ability to be operated via Mobile App with Wi-Fi Controller option.

3. Unit mounted display.

4. Supply BACnet client connection: via CAT 5 cable connected to air curtain

B. Disconnect Switch: Provide lockable factory mounted non-fused toggle disconnects based on number of power supplies required.

2.4 MOUNTING ACCESSORIES

A. Provide brackets and other mounting accessories as required to permit installation and proper functioning of air curtain to meet project conditions of use.

1. Wall Mounting Hardware: Cabinet brackets, wall mounting plates and fasteners to assemble and allow flexible installation across the width of the unit on suitable load bearing wall component(s).

2. Transom Mounting Bracket: 1.0 in. (11.4 cm) to 3.75 in. (9.53 cm) mounting depth made of [stainless steel] [[insert color selection] powder coated aluminized steel].

PART 3 - EXECUTION

3.1 EXAMINATION

A. Verify that door frame and adjacent construction are installed correctly and are ready to receive work of this Section.

B. Verify that utilities are in correct location and are of correct capacities for specified products.

C. Proceed with installation only after unsatisfactory conditions have been corrected.

3.2 INSTALLATION

A. Install air curtains where indicated on Drawings and accordance with shop drawings and manufacturer’s instructions. Provide clearance to permit servicing and maintenance.

B. Securely install air curtains plumb, level, and as close as practical to top of opening and face of wall.

C. Install switches where indicated on Drawings.

3.3 CONNECTIONS

A. Connect air curtain to utilities as specified in Division 26 sections.

3.4 FIELD QUALITY CONTROL

A. Provide a factory-authorized service representative to inspect components, assemblies, and equipment installations, including connections, and to assist in testing.

B. Test and operate air curtain to be sure that it performs as intended.

3.5 ADJUSTING

A. Adjust fan speed to prepare installed products to perform properly.

B. Adjust discharge nozzles to deflect air outward unless otherwise required.

3.6 CLEANING

A. Clean air curtain prior to commissioning.

B. Repair or repaint damage to finishes on exposed-to-view surfaces.

3.7 SYSTEM STARTUP

A. Test and operate air curtains to ensure that they perform as intended. Adjust discharge nozzles to deflect air outward unless otherwise required.

3.8 DEMONSTRATION

A. Demonstrate for Owner’s maintenance personnel how to adjust, operate, and maintain air curtains.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

SECTION 23 3713
DIFFUSERS, REGISTERS, AND GRILLES

PART 1 - GENERAL

1.1 SUMMARY

A. Section Includes:
   1. Rectangular and square ceiling diffusers.
   2. Linear bar diffusers.
   3. Adjustable bar registers.
   4. Fixed face registers.

1.2 SUBMITTALS

A. Product Data: For each type of product indicated, include the following:

   1. Submit Data Sheet: Indicate materials of construction, finish, and mounting details; and performance data including throw and drop, static pressure drop, and noise ratings.
   2. Submit Diffuser, Register, and Grille Schedule: Indicate drawing designation, room location, quantity, model number, size, and accessories furnished.

B. Samples: For each exposed product and for each color and texture specified.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

A. Manufacturers: Subject to compliance with requirements, provide products by one of the manufacturers specified.

   1. Titus
   2. Price Industrial

2.2 SOURCE QUALITY CONTROL

A. Verification of Performance: Rate diffusers, registers, and grilles according to ASHRAE 70, "Method of Testing for Rating the Performance of Air Outlets and Inlets."

PART 3 - EXECUTION

3.1 INSTALLATION

A. Install diffusers, registers, and grilles level and plumb.

B. Ceiling-Mounted Outlets and Inlets: Drawings indicate general arrangement of ducts, fittings, and accessories. Air outlet and inlet locations have been indicated to achieve design requirements for air volume, noise criteria, airflow pattern, throw, and pressure drop. Make final locations where indicated, as much as practical. For units installed in lay-in ceiling panels, locate units in the center of panel. Where architectural features or other items conflict with installation, notify Architect for a determination of final location.

C. Install diffusers, registers, and grilles with airtight connections to ducts and to allow service and maintenance of dampers, air extractors, and fire dampers.

3.2 ADJUSTING

A. After installation, adjust diffusers, registers, and grilles to air patterns indicated, or as directed, before starting air balancing.

END OF SECTION

THIS PAGE INTENTIONALLY LEFT BLANK

COM*check* Software Version 4.1.5.5

Mechanical Compliance Certificate

Project Information

Energy Code:	90.1 (2013) Standard
Project Title:	Wallace Hall
Location:	Troy, Alabama
Climate Zone:	3a
Project Type:	Alteration

Construction Site: Owner/Agent: Designer/Contractor:

Mechanical Systems List

Quantity **System Type & Description**

3 FCU-1-1,2,5
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 20 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Hydronic Coil, Capacity = 12 kBtu/h
No minimum efficiency requirement applies
Fan System: FAN SYSTEM 1 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 1 Supply, Constant Volume, 436 CFM, 0.1 motor nameplate hp, 0.9 fan efficiency grade

SYSTEM VERIFICATION REQUIRED.

3 FCU-1-3,4,6
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 34 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Hydronic Coil, Capacity = 23 kBtu/h
No minimum efficiency requirement applies
Fan System: FAN SYSTEM 2 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 2 Supply, Constant Volume, 579 CFM, 0.2 motor nameplate hp, 0.9 fan efficiency grade

SYSTEM VERIFICATION REQUIRED.

1 FCU-1-7
Heating: 1 each - Hydronic or Steam Coil, Hot Water, Capacity = 51 kBtu/h
No minimum efficiency requirement applies
Cooling: 1 each - Hydronic Coil, Capacity = 34 kBtu/h
No minimum efficiency requirement applies
Fan System: FAN SYSTEM 3 -- Compliance (Motor nameplate HP method) : Passes

Fans:
FAN 3 Supply, Constant Volume, 694 CFM, 0.3 motor nameplate hp, 0.9 fan efficiency grade

SYSTEM VERIFICATION REQUIRED.

Mechanical Compliance Statement

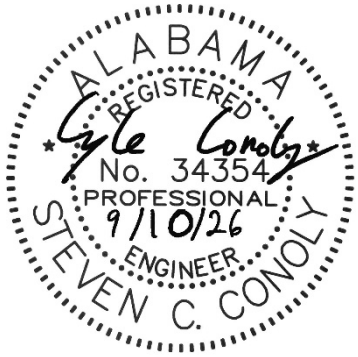
Compliance Statement: The proposed mechanical alteration project represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed mechanical systems have been designed to meet the 90.1 (2013) Standard requirements in COM*check* Version 4.1.5.5 and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Hunter Davis P.E.	Hunter Davis	09.11.2026
Name - Title	Signature	Date

SECTION 26 0000

ELECTRICAL

The following seal, signed and dated,
acknowledge that Cyle Conoly of Mills-Conoly
Engineering, P.C. prepared these specifications:



1 GENERAL PROVISIONS

1.1 General Requirements: Division One is applicable in full hereto.

1.1.1 Qualification of Bidders: Subcontractor for this section must have installed at least 3 similar type and size jobs, and electrical contracting shall be his primary business.

1.2 Work Under Other Sections: Painting of conduits, equipment, etc. (except wood backboards). Refer to Par. "Equipment Connections" regarding controls, control circuits, starters, etc.

1.3 Codes, Permits and Inspections: Comply with applicable laws of the community, with latest edition of NEC where not in conflict with those laws, and with the service rules of the local utility company. Obtain and pay for all permits and fees as required. After completion of the work, submit certificates of final inspection and approval from the local electrical inspector, certifying that the installation complies with all regulations governing same.

1.3.1 In existing areas where renovation work takes place, bring the existing electrical work that is to remain up to the latest codes. This includes conduits anchored, open knockouts in boxes filled, etc.

1.4 Materials and Workmanship: All materials shall be new, UL listed where a standard has been established. Execute all work so as to present a neat and professional appearance when completed.

1.5 Drawings and Specifications: Consider as complementary each to the other. What is called for by one shall be as binding as if called for by both. Where conflicts occur, secure clarification from Architect in advance of bidding; otherwise provide the more expensive quality or quantity. Follow figures in preference to scale dimensions, verify all dimensions and existing conditions.

1.6 Conflicts, Coordination and Changes: In the event that interferences or conflicts develop, contact the Architect at once. Whether conflicts develop due to field conditions or between different contractors, the Architect shall decide what action to take or equipment to be relocated regardless of which was installed. In the interest of avoiding such conflicts, the electrical sub-contractor who is using common space such as mechanical rooms, chases, ceiling space, etc., shall coordinate his work with other trades and other parts of his own work. If, during this construction, it is discovered that necessary or desirable changes should be made, advise the Architect and secure his decision in writing.

1.7 Definitions: The definitions in the National Electrical Code (NEC) shall apply where referenced in the NEC. When the word “concealed” is referenced in these specifications and on the drawings, it shall mean to be out of sight. A conduit referenced to be concealed overhead would allow it to run above an accessible ceiling. The word “exposed” when referenced in these specifications and on the drawings, means to be within sight. Items “To Be Removed” shall be removed by the contractor unless followed with “by others”. Removed items shall be disposed of as directed in other sections of these specifications and to comply with all codes and ordinances.

1.8 Cutting, Chasing and Patching: Where possible all work shall be built in as the job progresses. Where this is not possible, secure approval and do necessary cutting, chasing, etc. required. Patching shall restore disturbed surfaces to original condition.

1.9 Visit to Site: Before submitting a bid, visit the site and ascertain all existing conditions. Make sure adjustments in work as are required by actual conditions encountered.

1.10 Demolition: Remove items in renovated areas as shown or noted. Where existing electrical work is interrupted by removal of other electrical work, provide all wiring, conduit, etc. required to maintain these items in operation. The exact extent of demolition shall be as directed by architect. Removed items shall be offered to the owner. If the owner does not accept the items, then dispose of in manner that complies with ordinances, laws and codes.

1.11 Manufacturer's Drawings and Data: Follow procedure outlined in Section 1. Submit for approval within 20 days of award all items as indicated below. Because items must be coordinated one with another, partial submittals will not be considered. Where one manufacturer is named, a pre-bid submittal is recommended (and an addendum will be issued if enough time was provided) or equal products will be considered for approval unless stated otherwise. Similar products shall be produced by the same manufacturer. Only manufacturers with local, active, ethical and reliable representation in specifier's area will be considered.

1.11.1 Submit a complete list of materials proposed; include all items, even if exactly as specified. Submit manufacturer's data (and samples upon request) for all items where substitutions are desired. All substituted items shall indicate the differences in that specified from that submitted.

1.11.2 Submit shop drawings for the lighting fixtures, lighting controls, wiring devices, floor outlets, fire alarm system and power distribution equipment (including those exactly as specified). Before the submittals are reviewed by the engineer, there shall be a stamp or letter attached indicating the submittals were reviewed and in compliance with plans and specifications, signed by the electrical contractor. Faxed copies of submittal data will not be accepted. All data shall be readable and complete with catalog numbers, highlighted accessories and options, and detailed information to describe portions of catalog numbers.

1.12 C.A.D. Drawings Requests: Electrical drawings produced by Computer Aided Design are available on disk or e-mail at a minimal fee to compensate for time, materials, shipping, etc. incurred to provide the amount of detail requested. The electronic files are available in AutoCAD Release 2014 format. The accuracy of the electronic files shall be the responsibility of the person placing the request due to addenda items, change orders, etc. that may not be incorporated in the files. The files are only available for shop drawing and as-built document preparation. Written permission by the Engineer is required for uses other than that stated.

1.13 Testing: Upon completion of the work, conduct a thorough test in the Architect's presence, and demonstrate that all systems are in perfect working condition.

1.14 Demonstration: By on-off, start-stop operation, demonstrate to the owner or his representative, the use, working, resetting and adjusting of each and every system. Include hands-on instructions to the Owner for the testing of exit lights, emergency battery lighting systems, smoke detectors, etc. that must be performed periodically per codes. Submit statement initialed by the owner that such demonstration has been made.

1.15 Warranty: Warrant the electrical work performed in this project in proper working order. Replace, without additional charge, all work or material which may develop defects from ordinary wear and tear (damage resulting from improper handling excepted) within a period of one year from date of final acceptance.

1.16 Conduit Routing: Exact routing of all conduits shall be as indicated and shall be approved by Architect. No penetrations of four hour rated partitions will be allowed unless a written letter from local authority having jurisdiction is provided.

1.17 Fire Stops: Where conduits and electrical equipment raceways pass through partitions (walls, floors, ceilings, etc.) rated less than four hours, install a fire stop that provides an effective barrier against the spread of fire, smoke and gases. NFPA 221 prohibits conduits, pipes and wiring from passing through four hour rated partitions. Fire stop material shall be packed tight and completely fill clearance between raceways and openings fire stop material shall be 3M, Crouse-Hinds, Dow Corning, Hilti or approved equal installed in accordance with ASTM E-814. Where conduit nipples pass thru walls, provide removable pillow type firestop.

1.18 Operating Manuals: Provide a type written operating manual and maintenance manual to the building owner. These manuals shall include:

1.18.1 Data stating equipment rating, selected options, manufacturer and catalog numbers for each piece of equipment requiring maintenance.

1.18.2 Operation manuals and maintenance manuals for each piece of equipment requiring maintenance. The required routine maintenance actions shall be clearly identified.

1.18.3 Names and addresses of at least one qualified service agency.

1.18.4 Submittal data indicating all selected options for each piece of lighting equipment and lighting controls. Include a schedule for inspecting and recalibrating all lighting controls.

1.18.5 A complete narrative of how each system is intended to operate, including recommended set points and the programmed entry data for systems on this project.

2 SERVICE (existing)

2.1 General: Existing service to remain.

2.2 Characteristics of Power: 277/480 volt, 60 cycle, 3 phase, 4 wire, wye connected with a grounded solid neutral.

3 GROUNDING

3.1 General: Ground the neutral conductor and various conductive materials in the building per NEC Article 250.

3.2 Electric System (Neutral) Ground: The current carrying neutral leg of the wiring system shall be of insulated conductor and shall be connected to the grounding electrode conductor only via the neutral connection at the service equipment.

3.3 Building Equipment Ground: All non-current-carrying metal parts of the wiring system (including conduit, outlet boxes, cabinets, motor frames, etc.) shall be connected to ground via equipment grounding system. A grounding conductor (copper with green insulation except where bare copper is used) shall be installed. Conduit ground is not acceptable. Provide bonding jumpers at flexible conduit connections, expansion joints, service equipment enclosure, and all other places where required for electrical continuity.

4 POWER DISTRIBUTION SYSTEM

4.1 Type of Wiring: Install wiring in approved raceways with conductors of the types and sizes as shown and specified herein; where no types or sizes are shown, meet NEC requirements.

4.2 Feeder Circuits: Provide a complete system of wiring from main service equipment to the various load centers, panels and other locations, as indicated.

4.3 Branch Circuits: From panels and load centers extend a complete system of wiring to all fixtures, motors, devices and other equipment. Lighting circuits shall supply lighting outlets only, except as shown otherwise. Secure approval of any departure from the circuit arrangement as shown.

4.4 Indication on Drawings: Numerals shown on "home runs" and by the outlet indicate the circuit arrangement in the panelboard. Crossmarks on branch circuit runs indicate the number of conductors required. No runs shall contain more than three circuits unless shown. Connect circuits to panelboards to give an evenly balanced load to the supplying feeder, based on normal usage of the connected equipment.

5 RACEWAYS

5.1 Applications: Raceways shall be as follows:

5.1.1 Where subject to moisture or mechanical injury - rigid conduit.

5.1.2 In concrete or solid masonry - rigid conduit.

5.1.3 Above furred space or in cells of hollow masonry - EMT.

5.1.4 Buried in earth or porous fill - rigid conduit painted with two coats of asphaltum paint (1" and larger may be plastic with ground wire except elbows and vertical runs).

5.1.5 Exposed in unfinished areas (Boiler, Electrical, Mechanical Rooms) - rigid conduit, IMC or EMT.

5.1.6 Motor and vibrating equipment connections - flexible conduit.

NOTE: The use of MC cable is not allowed on this project.

5.2 Rigid Conduit Material: Rigid, thickwall, zinc coated conduit by Allied, Republic, Wheatland or approved equal. Fittings shall be threaded type by Thomas & Betts, Bridgeport, or Appleton. Right and left couplings shall not be used; conduit couplings of the Erikson type shall be used at location requiring such joints.

5.3 Electrical Metallic Tubing (EMT) Material: Tubing shall be zinc coated by one of manufacturers named for rigid conduit. Fittings shall be steel (not cast), raintight, set screw type as manufactured by Thomas & Betts, Steel City, Bridgeport, Appleton or approved equal.

5.4 Flexible Conduit at Motor or Equipment Connections: Provide neoprene jacketed liquid-tight flexible conduit (with ground conductor) equal to Anaconda Sealtite. At fixture connections provide flexible steel conduit by one of manufacturers named for rigid conduit.

5.5 Flexible Conduit: Where existing conditions will not allow or will make very difficult the installation of rigid or EMT conduit, it will be permissible to run zinc-coated steel flexible metal conduit. This condition will not allow MC cable use. Provide with ground conductor.

5.6 Plastic Conduit Material: Carlon type 40 heavy wall rigid PV-Duit (Polyvinyl-chloride), or approved equal by Kraley or Southwestern with matching elbows, fittings, etc. Provide ground conductor. Change to rigid conduit for elbows up through slab or above grade.

5.7 Conduit Sizes: Comply with NEC, Chapter 9. Minimum size 1/2 inch.

5.8 Cast Metal Conduit Fittings: As manufactured by Appleton, Crouse-Hinds, Killark or approved equal, and of the form and type applicable to the installation. Not to be used where other types are specified.

5.9 Layout: Install all conduit concealed except in equipment rooms and where exposed runs are specifically indicated. Keep runs at least 6 inches from flues, hot water pipes and other heat sources. Eliminate trapped runs insofar as possible. Do not run conduit in cavity of exterior walls.

5.9.1 Generally follow the conduit layout shown on the drawings. However, the layout is diagrammatic only and must be adjusted for structural conditions, built-in equipment and other causes. Off- sets are not indicated and must be furnished as required.

5.9.2 Run concealed conduits in direct line with long sweep bends and offsets where practicable. Install exposed conduit with runs parallel or perpendicular to walls, structural members, or intersections of vertical planes and ceilings, with right-angle turns consisting of cast metal fittings or symmetrical bends. Where conduits are indicated exposed overhead, runs down to wall outlets shall be concealed to wall.

5.10 Installation: Securely fasten conduits to all sheet metal outlets, cabinets, junction and pull boxes with locknuts and bushings taking care to see that stout mechanical and solid electrical connections are obtained. Thread rigid conduit so that ends meet in couplings; cut ends square, ream smooth and drawn up tight. Cap conduit ends to keep out water and trash during construction.

5.10.1 Avoid field made bends where possible, but where necessary, use a proper hickey or conduit-bending machine. Make no bends with radius less than six times the conduit diameter, nor more than 90 degrees. Make changes in direction with pull boxes, symmetrical bends and cast-metal fittings. Replace crushed and deformed conduits.

5.11 Support and Anchoring: All conduits, concealed or exposed, shall be supported and substantially fastened to not more than eight feet. Support with approved types of galvanized wall brackets, ceilings trapeze, clamps, or other approved devices. Attach supporting devices with screws, bolts, expansion sleeves or other workmanlike means appropriate to the surface. In stud walls, secure to studs as required so that conduit is immovable.

5.12 Empty Conduit: Provide #14 galvanized fish wire with 14 inch free ends.

5.13 Terminated Conduit: Provide bushings on ends where auxiliary system conduit raceway is stubbed out into an attic space, adjacent to back board, etc.

5.14 Pull Boxes: Galvanized sheet metal screw-cover type as produced by B & C Metal Stamping Company. Provide as required to avoid excessive runs or bends between outlets (generally not over three 90 degree bends per run between boxes).

5.14.1 Label all junction box and pull box covers to indicate contents (F.A., Panel & Circuit Number, I.C., Etc.).

5.15 Installation in Concrete: At slabs on grade, elevated slabs and/or any structural slab, conduit 3/4” and smaller may run in slab if approved by Structural Engineer or Architect. Run larger conduits below slab. No conduit shall be run in or through any structural member unless approved by the structural engineer. Where adequate support cannot be obtained by wiring to reinforced steel, obtain support with solid iron stakes (which may be driven through membrane) cut off flush with slab after pouring. At turn-ups of adjacent runs of exposed conduit, obtain alignment by wiring members to a temporary horizontal member.

5.16 Expansion Joints: Where conduits pass through or across building expansion joints, provide hot-dipped galv. expansion fittings with bonding jumpers.

6 OUTLET BOXES

6.1 General: Except as noted, boxes shall be standard cold rolled steel galvanized or sherardized at least 1-1/2" deep, of metal at least 1/16" thick; sized to accommodate devices and conductors per NEC Article 370; product of Crouse-Hinds, O-Z/Gedney, Thomas & Betts or approved equal.

6.2 Ceiling and Wall Bracket Outlets: 4" octagonal boxes with plaster rings appropriate for finish surface.

6.3 Typical Boxes (For Switches, Receptacles & Auxiliary Systems): 4" square boxes ganged as required. Furnish with 3/4" plaster rings where employed in plaster, 1" tile covers where used in ceramic tile, 1" plaster rings where set in exposed concrete, and as otherwise appropriate for surface and construction.

6.4 Boxes in Exposed (Or Thin Coated Plastered) Masonry: Where conduit connections permit, employ solid flush-type, square cornered, masonry boxes with turned-in device holders; otherwise employ typical box with 1-1/2" square cut tile cover.

6.5 Boxes Used With Exposed Conduit: 4" square utility boxes. Label covers with permanent marker indicating contents (Fire Alarm, Intercom, Panel/Circuit Number, etc.).

6.6 Boxes Used with Recessed Lighting Fixtures: Provide a 4" square box with blank cover adjacent to each fixture group. Generally attach to underside of structure above, in accessible location, to accommodate a 4' to 6' flexible conduit connection to each fixture or fixture run.

6.7 Boxes in Dry-Wall Construction: Sectional type switch boxes at least 2-1/2" deep may be used instead of typical box (but not where dry wall finish is applied over masonry back-up and not where multi-gang devices occur).

6.8 Mounting and Supports: Boxes which are not imbedded in masonry or concrete shall be fastened to the structure in a manner specified for conduits. Each flush wall box shall be anchored to a steel back strap that spans the studs.

6.9 Locations: The drawings indicate approximate locations only; determine the exact location at the building in view of all structural and architectural conditions. Obtain Architect's verification of final locations. No outlets shall be mounted back-to-back in rated walls. Stagger boxes as required on opposite sides of studs, on separate studs, separate CMU blocks, etc. as required.

6.9.1 Where outlets at different levels are shown adjacent, install in one vertical line where possible. At counters adjust heights to avoid conflicts with splash backs, upper cabinets and other equipment.

6.9.2 No lighting controls shall be located behind an open door unless where double doors occur. Unless shown near a podium or entry into a room, locate controller outlets on the lock side of door and so that first controller in a single or gang installation is approximately 6" to 10" from the door jamb. If this section is contradictory with the plans, then contact the architect or engineer for clarification prior to rough-in. Avoid conflict with wainscot caps by adjusting height slightly up or down as directed.

6.10 Mounting Heights: Unless noted or directed otherwise, locate outlet centers above the finished floor as follows:

Lighting Controllers, generally	3' - 10"
Receptacles, generally	1' - 6"
Thermostats	3' - 10" (A.D.A. Requirement)
Television Outlets	12" below ceiling (9' max)
Telephone/Data Outlets	1' - 6"
Fire Alarm Manual Station	Operable handle at 44”
Fire Alarm Horn/Light	Light lens at 82”

7 CONDUCTORS

7.1 Material: Copper with not less than 98% conductivity; solid type THHN for No. 10 and smaller and stranded type THWN for No. 8 and larger; 600 volt insulation. Product of Triangle, Southwire, American Wire or approved equal, with manufacturer's name, type insulation, and conductor size imprinted on jacket at regular intervals.

7.2 Sizes: AWG sizes as noted. Phase and ground conductors shall not be smaller than #12. Multi-circuit runs shall contain a neutral conductor (color coded as indicated below) for each phase conductor in the run. Where branch circuit runs exceed 100 feet in length, increase to next larger size.

7.3 Installation: Do not pull conductors until conduit run is complete and the building has been closed to the weather. Use only U/L approved lubricant to facilitate pulling of conductors. No multi-wire branch circuits shall be run on this project. Provide a neutral conductor for each phase conductor per color coding scheme stated in these specifications. No more than three circuits shall be installed in a raceway unless shown otherwise.

7.4 Joints: For solid conductors, make joints with solderless type connectors (Ideal, "Wing-Nut", Buchanan "B-Cap" or approved equal). Make taps or splices of stranded conductors with T & B compression "C" or "Lock-tite" connectors, and cover with Okoweld or Scotch #33 Electrical Tape so that the insulation is equal to the conductor insulation. Fixture outlets shall have a loop or end not less than eight inches long left for connection to fixture. Conductors in capped outlets shall have taped ends. Make splices and taps only in junction boxes and wireways. Connections and splices within in-grade pullboxes or where considered wet locations shall be made with devices rated for wet locations for the number and size of the conductors (NSI Polaris Blue Insulated Connector series or approved equal U/L rated for direct burial or submersible applications).

7.5 Color Coding: Follow NEC Section 210-5. Equipment grounds shall be green. Conductors shall be identified by colored insulation throughout if wires are No. 10 AWG or smaller. For wires larger than No. 10, use colored tape band on black insulation.

Color coding for 120/208 volt system shall be:

Phase A: Black
Phase B: Red
Phase C: Blue
Neutral for Phase A: White with Black Stripe
Neutral for Phase B: White with Red Stripe
Neutral for Phase C: White with Blue Stripe
Ground: Green

Color coding for 277/480 volt system shall be:

Phase A: Brown
Phase B: Orange
Phase C: Yellow
Neutral for Phase A: White or Gray with Brown Stripe
Neutral for Phase B: White or Gray with Orange Stripe
Neutral for Phase C: White or Gray with Yellow Stripe
Ground: Green

8 PANELS AND SAFETY SWITCHES

8.1 Panels: Deadfront, UL labeled, single door type with flush combination pull, catch and lock. All locks keyed alike. Interiors factory assembled. Back boxes shall be galvanized and have a 20" minimum width. Fronts shall have standard gray factory finish. Panels used for service equipment shall be UL labeled for that use. Type, catalog and style numbers shown on the drawings refer to Square D. Equal equipment manufactured by Siemens, GE, Eaton or approved equal will be accepted; all panels and cabinets shall be by the same manufacturer. Panels shall have metal directory holders welded to door, flush metal latches and concealed trim clamps. Surface mounted panels shall have door-in-a-door construction (hinged door for easy access). No back-fed main breakers or sub-feed breakers are allowed except where approved prior to bid or noted on schedule. The main breakers shall be located at top or bottom of busbars depending on direction of feed.

8.1.1 The number and rating of circuit breakers and future spaces shall be as scheduled. Branch breakers in panels shall be numbered. All breakers shall have labels or be referenced to a directory indicating the load they serve. Provide a label on cover stating panel name, voltage and phase, and where it is fed from.

8.1.2 Circuit breakers shall be series rated so that a breaker at any point in system shall be capable of interrupting available short circuit at that point. Provide nameplate on interior trim of each panel to read "SERIES RATED FOR SHORT CIRCUIT CURRENT, NEW BREAKERS SHALL COORDINATE WITH SYSTEM". The panel used for service entrance equipment shall be UL labeled for that use. Breakers in service and/or distribution panels shall have breakers that can protect all breakers that are specified or that can be mounted into the branch panel being served. This means the feeder breaker shall protect the lowest interrupting rated breaker of any size that can be mounted into the branch panel.

8.2 Future Panel Circuits: Stub out six empty 1" conduits for each flush mounted panelboard to an accessible location above lay-in ceiling (or attic) and to crawl space if available. Where "space only" is indicated, provided all copper work and make provisions for mounting circuit breakers are added, no additional parts or changes to the structure or bus work are required.

8.3 Fuses: Provide complete set of fuses for all switches and panels. Furnish rated as shown; for motor loads size as recommended by motor supplier.

8.3.1 Provide Bussmann Class RK1, dual element fuses for sizes up to 600 amps and Class L, time delay for sizes 601 to 6000 amps. Equal fuses by Gould, Littelfuse or approved equal may be used.

8.4 Circuit Breakers: Circuit breakers shall be bolted-in-place molded case breakers. Two and three pole breakers shall have common trip action and be interchangeable with single pole breakers. Breakers indicated GFI shall have integral ground fault protection with test switch.

8.5 Identification: Provide identification as required in NEC 408.4. On the door provide the panel name, voltage/phase and the source of supply. All panels shall have permanent circuit markers. A typewritten directory card showing equipment and areas controlled shall be provided in holder on inside door. Panels without covers shall have nameplates mounted beside each breaker. Provide arc-flash hazard warning labels in new panels and in the existing panels where new work is performed if not existing in those panels per NEC 110.16 and 110.21.

8.6 Mounting: Mount panels with center of top switch or circuit 6'-0" above the floor maximum. Carefully align covers which occur side by side in finished areas.

8.6.1 Protect from plastering and masonry operations with temporary cardboard covers.

8.7 Coordination and Size Requirements: If the power distribution equipment is larger than that shown, then it is the responsibility of the contractor to modify the electrical space to incorporate the equipment and the modified layout must be acceptable to the engineer. Otherwise, another manufacturer of the equipment shall be used.

9 DRY TYPE TRANSFORMER

9.1 Indoor Transformers: Provide Square D NLP Series dry type transformers for non-linear loads for conversion of 480 volts Delta, 3Ø, 3W to 208Y/120 volts, 3Ø, 4W. Size shall be as noted on Riser Diagram. Transformers shall have aluminum windings, class 220 insulation, UL K-13 rated, double size neutral terminals, 115º C rise and 4-2B% taps in high voltage winding (two above and two below rated voltage). All terminals shall be completely enclosed. Internal vibration isolators shall be provided for noise control. Noise levels shall be less than NEMA standards. Equivalent transformers by Sorgel, Acme, or approved equal may be used. Provide all mounting brackets and accessories.

10 LIGHTING FIXTURES

10.1 General: All units UL labeled. Drivers and internal wiring to be factory installed. Catalog numbers shown are for basic units; furnish complete with flexible connections, trim and other appurtenances necessary to the installation. Coordinate frames and fixtures with ceiling construction in each room before ordering.

10.2 Substitutions: Reference to a specific manufacturer's product is made only to establish a standard of quality and design, and to give a general description of the basic type desired. Substitutions will be subject to the approval of the Architect.

10.3 LED Fixtures: All LED fixtures shall have at least the initial delivered lumen output and the color temperature stated in the lighting fixture schedule. The CRI shall be 80 or better, a life expectancy of at least 50,000 hours at 70% lumen maintenance, minimum of 5 year warranty (including driver) and shall be tested in accordance with LM-79 and LM-80.

10.4 LED Driver: The LED driver shall be installed in an electrical enclosure. Driver shall be provided and warranted by the lighting fixture manufacturer. Driver shall have a Class A sound rating. It shall have a life expectancy of at least 50,000 hours. It shall comply with FCC rules and regulations. Coordinate voltage of driver with the circuit connected. Coordinate 0-10 volt dimming or other method so that it will be compatible with the controls specified.

10.5 Coordination: Contractor shall verify voltage of fixtures with the circuits to be connected to and coordinate fixture trims with ceilings in each area prior to placing an order.

10.6 Installation: Lay out work as shown, and to provide attractive and efficient arrangement; coordinate with work of other trades. Provide adequate and substantial supports for fixtures. Prior to final inspection clean fixtures and lamps with a soft cloth or sponge and detergent (not soap) solution. Each fixture shall be anchored to or in ceiling, wall, etc. as approved by the architect. Adjustable fixtures (track mounted, floodlights, etc.) shall be aimed as stated or as directed by the Owner or Architect.

10.6.1 Securely fasten troffers in exposed grid ceiling with integral or factory furnished grid clips and to structure (separate from ceiling supports) by means of cables or wires. Cable or wire fixture supports shall comply with specifications for anchoring a lay-in ceiling system with at least a wire or cable attached at two opposite corners of each fixture. Support wires shall be independent of each other and from supporting other trades. Provide color or tagging of the fixture support wires to distinguish them from the other trades support wires.

10.6.2 Suspended lighting fixtures shall be complete with stems and swivel hangers. Anchor stems to support 60 pounds each. Stem swivels shall match ceiling slope. Provide swivel stems for suspended high bay type fixtures to allow fixture movement.

11 WIRING DEVICES

11.1 General: Manufacturers and catalog numbers listed are used to establish style, type and quality. Equal devices by Hubbell, Leviton, Legrand and Eaton will be accepted. All devices shall have plaster ears.

11.2 Installation: Unless otherwise noted install wall devices vertically, so that all devices of any given height will align exactly. Plates must be plumb and true with all four edges contacting wall surface. Mount receptacles with grounding terminals down. Do not install devices until plastering or other type wall covering has been completed; install ahead of painting work, but protect from paint spatter.

11.3 Duplex Receptacles: 125v/15a, flush duplex receptacles with side and back wiring, grounding terminal and breakoff fins for converting to 2-circuit use, Hubbell BR15. Color to be selected by the architect. Where a 20 amp circuit feeds only one receptacle, that receptacle shall be rated 20 amps (Hubbell BR20). Where indicated GFI, provide duplex receptacle with integral ground fault protection and test switch (Hubbell GFRST20). Where indicated WP, provide GFI protected weather resistant type duplex receptacle (Hubbell GFWRST20) in cast box with cast plates and lift cover.

11.4 Device Plates: Type appropriate for device of 302 stainless steel alloy. Provide single plate or proper gang where more than one device occurs. Furnish blank plates on outlets for future use.

11.5 Floor Outlet (Power & Auxiliary Systems) in Concrete Construction: Floor outlets shall be a multi-service cast iron recessed in floor type box. Wiremold Walkerbox Resource RFB series or approved equal. Provide brackets, plates, compartment separators, flush access covers, etc. as required for complete assembly. The floor box shall have two duplex receptacles and two compartments for auxiliary systems use. Wiremold # RFB4-CI-1/S36CCTCAL with two CIH/LT-B blank brackets for auxiliary systems use. See detail on plans for conduit entry and wiring instructions. Mount at exact location as directed by Architect.

12 LIGHTING CONTROLS

12.1 General: Provide type controller described herein and all accessories required for a complete installation. Locate occupancy sensors to monitor room or area installed as directed by the manufacturer. If a directional type, mount on ceiling in corner of room so that sensor will not detect motion outside of room. In toilets mount to cover entrance doorway and individual stalls. Low voltage units require a power supply/relay unit and shall be located above an accessible ceiling in same space. All low voltage wiring shall be in conduit unless noted. All wiring (quantity and type) shall be as recommended by the manufacturer.

12.2 Wall Switches: 120/277v, 20a, flush enclosed, quiet type switches. Color to be selected by Architect. Hubbell Specification Grade, 1221, 1222, 1223, 1224 series as required. Provide similar 20a and 30a switches as indicated.

12.3 PIR & Ultrasonic Wall Switch Sensor: Shall use PIR and ultrasonic detection and can operate on 120/277 volts. Dip switches shall be available to change operation settings. Switch shall be Hubbell LHMTS (single pole) or LHDCMTD (where indicated two pole) with cover plate or approved equal. Unit shall have at least a 5 year warranty. Color choices of device shall be white, gray, black, light almond, ivory and submitted to the architect for selection. Program for occupancy sensing (auto on) or vacancy sensing (manual on) as stated in the description. Inform the user of the space the adjustable settings available and program the switch for their preferences. Instruct the user how to operate the switch.

12.4 PIR & Ultrasonic Wall Dimmer Sensor: Shall use PIR and ultrasonic detection and can operate on 120/277 volts. Dimming method is 0-10 volt. Dip switches shall be available to change operation settings. Switch shall be Hubbell LHDMMTS with cover plate or approved equal. Unit shall have at least a 5 year warranty. Color choices of device shall be white, gray, black, light almond, ivory and submitted to the architect for selection. Program for occupancy sensing (auto on to 50% light output) or vacancy sensing (manual on) as stated in the description. Inform the user of the space the adjustable settings available and program the switch for their preferences. Instruct the user how to operate the switch.

12.5 Digital Load Control System: Provide a system of compatible products that controls the lighting and receptacles in the same room and can operate on 120/277 volts. The ceiling mounted occupancy sensors and wall switches connect to the controllers with Cat 5e cables. The components shall have at least a 5 year warranty. Connect the components as recommended by manufacturer. Many of the components specified have the same model number, but can be programed to perform different functions. Program the components to perform the function stated on the drawings. The individual components are as follows:

- Non-Dim Room Controller: Single relay room controller for one circuit of lighting control. Hubbell NXRCFX-1RD-UNV or equal.
- One Zone Dimming Room Controller: One relay room controller with 0-10 volt dimming capable of on/off and/or raise/lower one zone of lighting. This device shall also have an integral time clock that can be used for programming a schedule of operation. Hubbell NXRCFX-1RD-UNV or equal.
- Wall Controller (Non-Dimming): Two buttons to turn lighting on and off. Hubbell NXSW-OO or equal. Color to be selected by the architect.
- Dimming Wall Controllers: Four buttons to turn lighting on and off and raise/lower the light level. Provide a dimming wall switch for each zone of lighting controlled. Hubbell NXSW-ORLO or equal. Color to be selected by the architect.
- Dual Technology Occupancy Sensor on Ceiling: Ceiling mounted sensor with PIR and ultrasonic detection. Hubbell NXOS-OM with range model to cover area installed or equal.
- Interconnection Cable: Provide pre-made or field cut Cat 5e plenum rated cables terminated with RJ45 style plugs.

12.6 Spare: Provide 10% of each component with a minimum of one per type. Deliver to owner at end of project.

12.7 Settings: Install with factory recommended settings for space located. Dip switches shall be available to change operation settings. Electrical contractor shall expect to make up to three (3) trips to the site during the one year building warranty to fine tune and adjust any occupancy sensors the owner desires.

12.8 Installation: All sensors shall be mounted on ceiling unless noted. Provide brackets as required for installation. Refer to wiring diagrams on the plans for multiple sensor and power supply/relay requirements, adding wall switches and loads. Provide quantity of sensors and relays as recommended by manufacturer to cover area and operate all circuits and lighting. Actual connections, conductor type and quantity required shall be as instructed by the manufacturer. Provide plenum rated cables where required. Those that require aiming shall be positioned to cover area installed. The low voltage cables and/or wiring shall be installed in conduit separate from the power conductors or run exposed in a neat and orderly manner and attached to the lighting circuit conduits within 12” from luminaire and box and at least 24” maximum intervals throughout run. Control wiring shall be run in conduit where access or replacement is not possible (in walls, above hard ceilings, etc.).

12.9 Submittal: Substitutions to the sensors above shall be submitted for review. Substituted products shall bring to engineer’s attention all differences if their product verses that specified. Variations in the design for better operation are welcomed. Those by Watt Stopper are listed by catalog number in order to establish a standard and state features and operation desired.

13 TELEPHONE/DATA/TV SYSTEMS

13.1 Scope: Provide a complete system of outlets, conduit raceways and terminal backboards and/or terminal cabinets for systems as shown. Coordinate with Owner and modify layout shown as required to meet Owner’s vendor or existing equipment standards.

13.2 Raceway System: Conduit raceway (3/4" minimum size) same as specified for power wiring. Generally outlets shall be wall outlet boxes. Provide blank plates (same specification as those in wiring device section) for one-half the outlets shown. The remainder outlets shall have plates furnished by Owner’s telephone installation contractor. Install plates on outlets directed by Owner or by Architect. Provide #14 galv. pull wire in all runs, and bushings on conduit ends. At backboard terminate conduits neatly and uniformly at edge of backboard.

13.3 Cable Management System: Provide a suspended cable tray system or wall mounted hook system as required for conditions at site. Systems shall be complete with all bends, offsets, elbows, couplings, supports, etc. All components shall be free of burrs or sharp edges. The manufacturer of systems shall be Cable Management Solutions (Snake Tray models) or approved equal. Tray system shall be Snake Tray CM-201-6-8 or approved equal. Wall hook system shall be Snake Tray CM-501-5-8 or approved equal. Both systems shall have 4" rung spacing and be mounted every 4'. Coordinate layout with other trades. Provide level changes as required and as directed by architect.

13.4 Cable Hooks: Provide a system of hooks mounted to wall above accessible ceilings for support of cables. All components shall be free of burrs or sharp edges. Shall be Mono-Systems, Inc. "The Hook" system or approved equal. Hooks shall be aluminum construction, each to be 6" deep by 6" wide and spaced 36" on center. Coordinate layout with other trades. Mount on corridor wall and provide supports for spans to continue at intersections. Coordinate with ducts, piping, structure, etc. Provide level changes as required and as directed by architect. The hooks may be used for telephone, data and television systems. The fire alarm and intercom systems shall be in dedicated raceways.

13.5 Sleeves in Walls: Where sleeves are shown in non-rated walls, provide a 4" EMT conduit nipple through wall with plastic bushings on each end. Where sleeves are shown in rated walls, provide one of the following systems that allow cables to the installed and/or removed without disruption of sealant system:

13.5.1 FlameStopper Thru-Wall Fitting by Wiremold Company. Where 2" nipples are shown, provide the 2" thru-wall fitting (#FS2R-GA) with 2" EMT conduit sized per wall thickness and number indicated. Where 4" nipples are shown, provide the 4" thru-wall fitting (#FS4R-GA) with 4" EMT conduit sized per wall thickness and number indicated. Install system as directed by manufacturer's installation instructions.

13.5.2 EZ-Path fire rated pathway by Specified Technologies, Inc. The fire rated pathways shall be U/L listed for rating of wall penetrated. Each sleeve shall have a 3"x3"x10.5" opening with an internal sealing system. Provide number of sleeves as required to match area of conduit nipples shown. Provide all pathways, trim kits, sealant around sleeves, etc. as required for a complete installation. The above product can be found at web site www.stifirestop.com.

14 EQUIPMENT CONNECTIONS AND CONTROLS

14.1 General: Provide electrical connections to all equipment as shown and as described in other sections and as outlined below. For equipment supplied with portable cords provide receptacles to match plugs on cords. Connect all equipment ready for operation, in accordance with detail wiring diagrams furnished by the equipment manufacturer and in cooperation with the respective subcontractor.

14.2 Connections: Provide safety switches for all motors and equipment as indicated or required by NEC. Connect all motors and equipment to equipment terminal boxes with flexible conduit with ground conductor. Where terminal boxes are not provided, terminate flexible conduit in suitable condulet and make connections.

14.3 Disconnecting Means: All equipment required by Code to have a disconnecting means and is not furnished with the equipment, shall be provided whether shown or not. If not shown on the plans and the panel is not within sight, then provide a safety switch with fusing to meet these specifications and the codes. Where breakers in panels are serving as disconnects, then the breaker shall be HACR rated and be sized per the maximum allowable by the nameplate (coordinate sizing with equipment supplier).

14.4 Miscellaneous Equipment: Electric water coolers will be furnished and installed by under other sections or by Owner. Roughing in and connections for equipment shall be as directed by Suppliers. Outlet for electric water cooler shall be GFI type and mounted at an accessible location below the unit.

15 MISCELLANEOUS ITEMS

15.1 Nameplates: Provide 1" x 3" laminated phenolic nameplates (with 1/4" high black letters on white) on disconnect switches, panels, terminal cabinets, controllers, pullboxes, and on other equipment as required by code. Nameplates shall identify the equipment as referenced on the drawings and provide available short circuit current values where required by code. Furnish list for approval. Apply with contact bond adhesive.

END OF SECTION 26 0000

Compliance Certificate

Project Information

Energy Code:	90.1 (2013) Standard
Project Title:	Troy Wallace Hall Renovation
Location:	Troy, Alabama
Climate Zone:	3a
Project Type:	New Construction
Project No:	165877
Performance Sim. Specs:	EnergyPlus 24.1.0 (EPW: TBD)
All Electric:	false
Is Renewable:	false
Has Battery:	false
Has Charger:	false
Has Heat Pump	false

Construction Site: **Owner/Agent:** **Designer/Contractor:**

Notes:

Building Area

Description	Floor Area
1-School/University (School/University) : Nonresidential	28000

Interior Lighting Compliance Certificate

Project Information

Energy Code:	90.1 (2013) Standard
Project Title:	Troy Wallace Hall Renovation
Location:	Troy, Alabama
Climate Zone:	3a
Project Type:	New Construction

Construction Site: **Owner/Agent:** **Designer/Contractor:**

Allowed Interior Lighting Power

A Area Category	B Floor Area (ft2)	C Allowed Watts / ft2	D Allowed Watts
1-Office 177 (Common Space Types:Office - Enclosed)	98	1.11	109
2-Studio 2 176 (Common Space Types:Conference/Meeting/Multipurpose)	82	1.23	101
3-Control 2 178 (Common Space Types:Conference/Meeting/Multipurpose)	95	1.23	117
4-Office 180 (Common Space Types:Office - Enclosed)	93	1.11	103
5-Work Space 182 (Common Space Types:Conference/Meeting/Multipurpose)	275	1.23	338
6-Studio 1 179 (Common Space Types:Conference/Meeting/Multipurpose)	125	1.23	154
7-Control 1 181 (Common Space Types:Conference/Meeting/Multipurpose)	102	1.23	125
8-Meeting 175 (Common Space Types:Conference/Meeting/Multipurpose)	190	1.23	234
9-Corridor 201 (Common Space Types:Corridor/Transition <8 ft wide)	162	0.66	107
10-Dressing Room 171 & 172 (Common Space Types:Restrooms)	221	0.98	217
11-Lobby 101 (Common Space Types:Lobby - General)	842	0.9	758
12-Student Lounge 102 (Common Space Types:Lounge/Breakroom)	592	0.73	432
13-Reception 101A (Common Space Types:Office - Open Plan)	281	0.98	275
14-Meeting Room 105 (Common Space Types:Conference/Meeting/Multipurpose)	339	1.23	417
15-Newsroom 103 (Common Space Types:Office - Open Plan)	553	0.98	542
16-Classroom 114 (Common Space Types:Classroom/Lecture/Training)	454	1.24	563
Total Allowed Watts:			**24360**

Proposed Interior Lighting Power

A Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	B # of Fixture	C Fixture Watt.	D (B X C)
1-Office 177 (Common Space Types:Office - Enclosed)			
L4: L4: LED:	2	35	70
2-Studio 2 176 (Common Space Types:Conference/Meeting/Multipurpose)			

A	B	C	D
Fixture ID : Description / Lamp / Wattage Per Lamp / Ballast	**# of Fixture**	**Fixture Watt.**	**(B X C)**
L4: L4: LED:	2	35	70
3-Control 2 178 (Common Space Types:Conference/Meeting/Multipurpose)			
L4: L4: LED:	2	35	70
4-Office 180 (Common Space Types:Office - Enclosed)			
L4: L4: LED:	2	35	70
5-Work Space 182 (Common Space Types:Conference/Meeting/Multipurpose)			
L1: L1: LED:	8	20	160
6-Studio 1 179 (Common Space Types:Conference/Meeting/Multipurpose)			
L4: L4: LED:	2	35	70
7-Control 1 181 (Common Space Types:Conference/Meeting/Multipurpose)			
L4: L4: LED:	2	35	70
8-Meeting 175 (Common Space Types:Conference/Meeting/Multipurpose)			
L1: L1: LED:	8	20	160
9-Corridor 201 (Common Space Types:Corridor/Transition <8 ft wide)			
L1: L1: LED:	5	20	100
10-Dressing Room 171 & 172 (Common Space Types:Restrooms)			
L2: L2: LED:	4	26	104
11-Lobby 101 (Common Space Types:Lobby - General)			
L1: L1: LED:	8	20	160
P: P: LED:	11	26	286
12-Student Lounge 102 (Common Space Types:Lounge/Breakroom)			
L1: L1: LED:	4	20	80
EX: EX: LED:	12	36	432
13-Reception 101A (Common Space Types:Office - Open Plan)			
L1: L1: LED:	6	20	120
14-Meeting Room 105 (Common Space Types:Conference/Meeting/Multipurpose)			
L3: L3: LED:	6	30	180
15-Newsroom 103 (Common Space Types:Office - Open Plan)			
L3: L3: LED:	8	30	240
16-Classroom 114 (Common Space Types:Classroom/Lecture/Training)			
L5: L5: LED:	6	43	258
Total Proposed Watts:			**2700**

Proposed Interior Lighting Controls

Fixture	Lighting Control
1-Office 177 (Common Space Types:Office - Enclosed)	
L4: L4: LED:	Occupancy Sensor, Manual Control, Bi-level
2-Studio 2 176 (Common Space Types:Conference/Meeting/Multipurpose)	
L4: L4: LED:	Occupancy Sensor, Manual Control, Bi-level
3-Control 2 178 (Common Space Types:Conference/Meeting/Multipurpose)	
L4: L4: LED:	Occupancy Sensor, Manual Control, Bi-level
4-Office 180 (Common Space Types:Office - Enclosed)	

Fixture	Lighting Control
L4: L4: LED:	Occupancy Sensor, Manual Control, Bi-level
5-Work Space 182 (Common Space Types:Conference/Meeting/Multipurpose)	
L1: L1: LED:	Occupancy Sensor, Manual Control, Bi-level
6-Studio 1 179 (Common Space Types:Conference/Meeting/Multipurpose)	
L4: L4: LED:	Occupancy Sensor, Manual Control, Bi-level
7-Control 1 181 (Common Space Types:Conference/Meeting/Multipurpose)	
L4: L4: LED:	Occupancy Sensor, Manual Control, Bi-level
8-Meeting 175 (Common Space Types:Conference/Meeting/Multipurpose)	
L1: L1: LED:	Occupancy Sensor, Manual Control, Bi-level
9-Corridor 201 (Common Space Types:Corridor/Transition <8 ft wide)	
L1: L1: LED:	Occupancy Sensor, Manual Control
10-Dressing Room 171 & 172 (Common Space Types:Restrooms)	
L2: L2: LED:	Occupancy Sensor, Manual Control
11-Lobby 101 (Common Space Types:Lobby - General)	
L1: L1: LED:	Occupancy Sensor, Manual Control
P: P: LED:	Occupancy Sensor, Manual Control
12-Student Lounge 102 (Common Space Types:Lounge/Breakroom)	
L1: L1: LED:	Occupancy Sensor, Manual Control
EX: EX: LED:	Occupancy Sensor, Manual Control
13-Reception 101A (Common Space Types:Office - Open Plan)	
L1: L1: LED:	Occupancy Sensor, Manual Control
14-Meeting Room 105 (Common Space Types:Conference/Meeting/Multipurpose)	
L3: L3: LED:	Occupancy Sensor, Manual Control, Bi-level
15-Newsroom 103 (Common Space Types:Office - Open Plan)	
L3: L3: LED:	Occupancy Sensor, Manual Control
16-Classroom 114 (Common Space Types:Classroom/Lecture/Training)	
L5: L5: LED:	Occupancy Sensor, Manual Control

Interior Lighting PASSES: Design 89% better than code

Interior Lighting Compliance Statement

Compliance Statement: The proposed interior lighting design represented in this document is consistent with the building plans, specifications, and other calculations submitted with this permit application. The proposed interior lighting systems have been designed to meet the 90.1 (2013) Standard requirements in COMcheckWeb and to comply with any applicable mandatory requirements listed in the Inspection Checklist.

Cyle Conoly, Engineer	Cyle Conoly	09/10/2026
Name - Title	**Signature**	**Date**

Inspection Checklist

Energy Code: 90.1 (2013) Standard

Requirements: 81% were addressed directly in the COM*check* software

Text in the "Comments/Assumptions" column is provided by the user in the COMcheck Requirements screen. For each requirement, the user certifies that a code requirement will be met and how that is documented, or that an exception is being claimed. Where compliance is itemized in a separate table, a reference to that table is provided.

Plan Review

Section # & Req.ID	Plan Review	Complies?	Comments/Assumptions
4.2.2, 8.4.1.1, 8.4.1.2, 8.7 [PR6][2]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the electrical systems and equipment and document where exceptions are claimed. Feeder connectors sized in accordance with approved plans and branch circuits sized for maximum drop of 3%.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
4.2.2, 9.4.3, 9.7 [PR4][1]	Plans, specifications, and/or calculations provide all information with which compliance can be determined for the interior lighting and electrical systems and equipment and document where exceptions to the standard are claimed. Information provided should include interior lighting power calculations, wattage of bulbs and ballasts, transformers and control devices.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	**Location on plans/spec:** Electrical Drawings

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Rough-In Electrical Inspection

Section # & Req.ID	Rough-In Electrical Inspection	Complies?	Comments/Assumptions
8.4.2 [EL10][2]	At least 50% of all 125 volt 15- and 20-Amp receptacles are controlled by an automatic control device.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
9.6.2 [EL8][1]	Additional interior lighting power allowed for special functions per the approved lighting plans and is automatically controlled and separated from general lighting.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	**Location on plans/spec:** E02.00
9.4.1.1 [EL1][2]	Automatic control requirements prescribed in Table 9.6.1, for the appropriate space type, are installed. Mandatory lighting controls (labeled as 'REQ') and optional choice controls (labeled as 'ADD1' and 'ADD2') are implemented.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	**Location on plans/spec:** E02.00
9.4.1.1 [EL2][2]	Independent lighting controls installed per approved lighting plans and all manual controls readily accessible and visible to occupants.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	**Location on plans/spec:** E02.00
9.4.1.2 [EL11][2]	Parking garage lighting is equipped with required lighting controls and daylight transition zone lighting.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	**Exception:** Requirement does not apply. **Location on plans/spec:** E02.00
9.4.1.1f [EL13][1]	Daylight areas under skylights and roof monitors that have more than 150 W combined input power for general lighting are controlled by photocontrols.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	**Exception:** Requirement does not apply.
9.4.1.3 [EL4][1]	Separate lighting control devices for specific uses installed per approved lighting plans.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	**Location on plans/spec:** E02.00

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)

Final Inspection

Section # & Req.ID	Final Inspection	Complies?	Comments/Assumptions
8.7.1 [FI16][3]	Furnished as-built drawings for electric power systems within 30 days of system acceptance.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
8.7.2 [FI17][3]	Furnished O&M instructions for systems and equipment to the building owner or designated representative.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	
9.2.2.3 [FI18][1]	Interior installed lamp and fixture lighting power is consistent with what is shown on the approved lighting plans, demonstrating proposed watts are less than or equal to allowed watts.	☐ Complies ☐ Does Not Comply ☐ Not Observable ☐ Not Applicable	*See the Interior Lighting fixture schedule for values*

Additional Comments/Assumptions:

1	High Impact (Tier 1)	2	Medium Impact (Tier 2)	3	Low Impact (Tier 3)